Jimmy Camp Creek at Fountain, Colorado

(Miscellaneous ungaged site, Arkansas River basin, USGS Colorado Water Science Center)
(1976–present, streamflow-gaging station number 07105900)

Review of peak discharge for the flood of June 17, 1965

Location: This flood was located about 3.5 mi north-west of Fountain, Colo., at 38.7196 N and 104.6459 W.

Published peak discharge: The peak discharge, as published in 1965, is 124,000 ft^3/s, June 17, 1965. The original measurement was rated fair; but this report recommends that the rating be downgraded to poor.

Drainage area: 54.3 mi^2. Map scale used for defining the drainage area is unknown. Current gaging station drainage area is 65.6 mi^2.

Data for storm causing flood: The flood of 1965 was the result of a sequence of extreme rainfall that persisted for about 5 days along the Front Range of Colorado in the headwaters of the Arkansas and South Platte Rivers. This sequence of rain resulted in large peaks in many southward- and northward-flowing streams in the Arkansas River basin near Colorado Springs and in numerous northward-flowing tributaries of the South Platte River. It also produced devastating floods on the Arkansas River downstream of Pueblo and on the South Platte River in Denver. Chatfield Dam was completed later to control floods on the South Platte River. The flooding is described by Snipes and others (1974) and is included in a report by Rostvedt and others (1970).

The June flooding in Colorado was front-page news in most area papers for several days preceding and following June 18. The Denver Post and Rocky Mountain News ran articles. However, pictures or discussion were not found of the Jimmy Camp Creek flood in these newspapers. Historical photographs taken after the June 17, 1965, flood and during the 2003 review and described herein are provided in figures A76–A81.

Method of peak discharge determination: The peak discharge is based on a two-section slope-area measurement. As part of the 2003 review, the original computation was coded for the present USGS slope-area computation program (SAC). The SAC peak discharge of 123,800 ft^3/s confirms the original discharge.

Fall in the slope-area measurement reach is large (12.22 ft of fall over the 1,680-ft reach. [**Note**: The new SAC program computed the average fall to be 12.25 ft]) and is well defined. Notes on the original computer output show that the water-surface slope of 0.00729 agrees with the channel slope over a 2.6-mi reach (0.00728). Agreement between the two profiles generally is good near the cross sections, and the right-bank profile fall is fairly uniform through the reach. The left bank, however, has a large "step" or fall in the middle of the reach. That fall is not explained in the measurement summary but may result from the channel alignment; the main channel appears to be curving to the right, which would direct flow into the left bank in that area. It is possible, given the flow direction and general topography, for the flow along the left bank to have essentially been "perched" for some distance and thus not reflect the water surface of the main part of the flow. That, however, is only speculation.

The reach contracts sharply; cross-section area decreases from about 14,000 ft^2 at section 1 to just less than 9,000 ft^2 at section 2. The conveyance change is even more pronounced with the conveyance at section 2 equal to only one-half the conveyance at section 1. The channel width is nearly equal at the two sections at about 2,900 ft. The cross sections were properly subdivided on the basis of shape. Section 1 had five subsections, and section 2 had six subsections. Alpha ranged from about 1.13 at section 1 to 1.66 at section 2.

The high degree of contraction in the reach produced high velocities in cross section 2 (25 ft/s in the main channel). Froude numbers indicate lower regime flow in all subsections of section 1, and upper regime flow in all subsections at cross section 2 (downstream section). The main channel carried about 30 percent of the flow, and the respective Froude numbers were 0.63 and 1.21.

Because of the break in slope in the middle of the reach, as part of the 2003 review, Kenneth Wahl (USGS retired) computed slope-conveyance estimates using each of the two sections and the local slopes at the sections. This was done to determine the uncertainty of the two-section result. Those slopes were identical (0.005); however, the conveyance of section 1 was about double that of section 2. The slope-conveyance results were 87,000 ft^3/s at section 2 and 171,000 ft^3/s at section 1. The square root of the multiple of these values is 128,000 ft^3/s.

Possible sources of error: The most likely sources of error in the measurement are in (1) the roughness values, (2) the assumptions that the post-flood cross section represented the cross section at the time of the peak discharge and that this two-section reach is representative, and (3) the assumption that energy losses are properly accounted for with a change in

flow regime between the sections. The latter two assumptions are particularly critical, given the large fall and irregular left-bank profile in the reach that only spans about one channel width. The roughness values are consistent with verification data for sand-bed streams. Condition of the streambed during the peak discharge is unknown, but most of the streams in the Fountain area are known to transport large quantities of sand; there possibly could have been significant scour at the peak discharge relative to the post-flood channel.

Recommendations of what could have been done differently: Every effort probably was made to obtain more than two sections (a long reach was surveyed, but profiles did not support more than two sections). However, when it became evident that only two sections could be used at this location, another reach should have been sought, either as an alternative to this reach or as a supplement. Two independent two-section results would have given some measure of the reliability of the result.

Reviews are not included with the measurement summary. Kenneth Wahl knew that measurements for the 1965 floods in Colorado were done in assembly-line fashion, and all were reviewed. Those reviews, and the names of the reviewers, should have become a permanent part of the indirect measurement. The record of those reviews likely will not be found.

Site visit and review: The site was visited June 4, 2003, by John Costa (USGS Office of Surface Water), Joseph Capesius (USGS Colorado Water Science Center), John England (Bureau of Reclamation), Mark Smith (USGS Central Region), and Kenneth Wahl (USGS retired).

The site and many reaches of Jimmy Camp Creek have changed a great deal since the 1965 flood. The 1965 photographs show a wide main channel with raw, eroded banks; top width was almost 300 ft at section 1 and more than 100 ft at section 2. Field data from 1965 show that the main channel is relatively straight through the reach, staying near the left side of the valley, and the flood plain is nearly devoid of trees and brush. In 2003, the main channel width averaged perhaps 40 ft, and the main channel meandered over perhaps a 1,000 ft of width as it passed through the reach. In addition, there were a considerable number of what appeared to be mature cottonwood trees along the channel and in the flood plain.

Recommendation: The original peak discharge of 124,000 ft^3/s should be accepted as published, but the quality rating should be downgraded to poor.

A great deal of effort was expended in 1965 to obtain a longer reach, but the two-section result was the best that could be obtained at this site. Although the two-section result contains a high degree of uncertainty, there is no evidence of errors either in procedure or interpretation, and there was no new evidence available in 2003.

Figure A76. View looking downstream from about 200 feet above cross section 2, Jimmy Camp Creek at Fountain, Colorado, July 17, 1965. (Man is holding rod at high-water mark at cross section 2.)

Figure A77. View looking downstream from about 200 feet above cross section 1, Jimmy Camp Creek at Fountain, Colorado, July 17, 1965. (Man is holding rod at cross section 1.)

Figure A78. View looking upstream, Jimmy Camp Creek at Fountain, Colorado, July 17, 1965. (Man is holding rod at high-water mark at cross section 1, 250 feet right of left end of cross section.)

Figure A79. View looking downstream near cross section 2, Jimmy Camp Creek at Fountain, Colorado), June 4, 2003.

Figure A80. View looking upstream of main channel flood plain, Jimmy Camp Creek at Fountain, Colorado, June 4, 2003.

Figure A81. View looking downstream toward flood plain upstream of slope-area reach, Jimmy Camp Creek at Fountain, Colorado, June 4, 2003.