



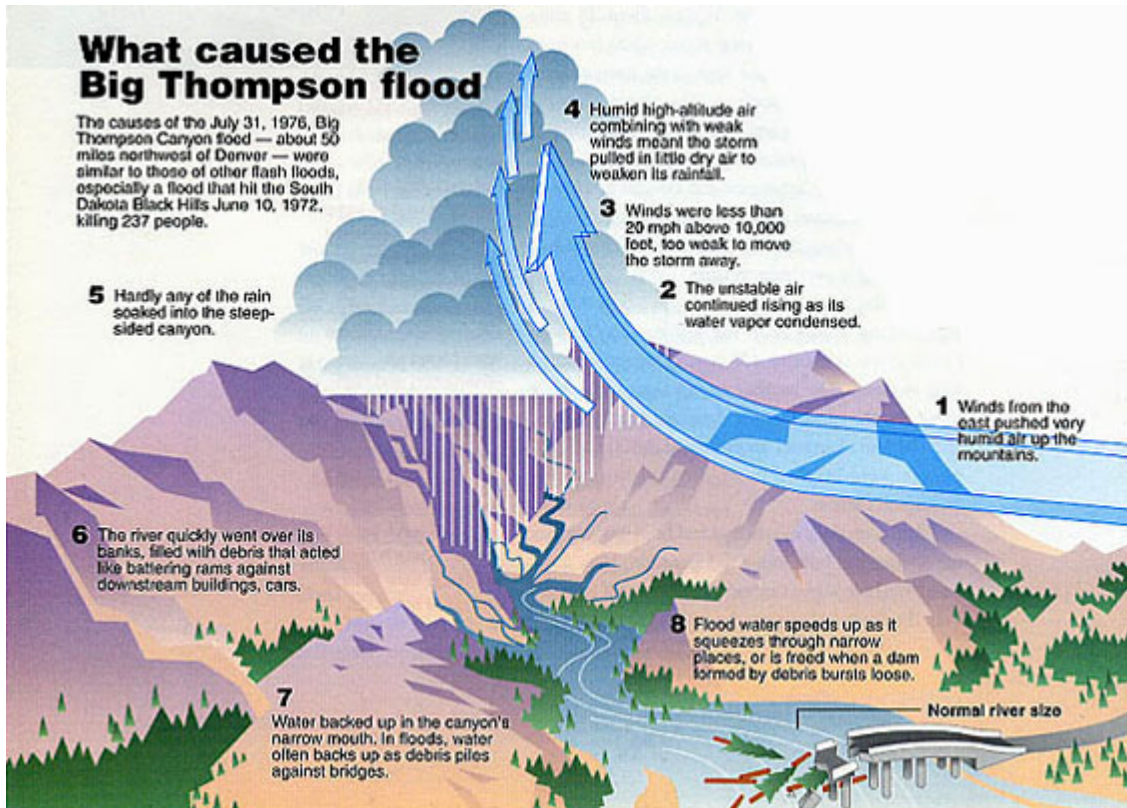
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## Big Thompson Canyon

July 31- Aug. 1, 1976



Photo Courtesy of the FCPL



**Rainfall and Streamflow Data:** [click here](#)

**Damage Estimate:** Over \$35.5 million

**Deaths:** At least 139

### Meteorology

On Saturday July 31, the air over the Central Plains and intermountain area was abnormally moist and conditionally unstable. A front had been slowly moving southward through the Great Plains during the previous two days. However, by the early evening of July 31, the front had become stationary in an east-west line through Missouri, Kansas, and Colorado, trailing northward in the foothills of the Rockies. Strong thunderstorms, fueled by moisture carried by east and southeasterly winds, developed in a north-south line in the foothills by 6:30 p.m. Over the next four-and-a-half hours, very heavy rain fell over a 70-square mile area in the central portion of the more than 800-square mile Big Thompson drainage basin.

At the time of the storm few rain gauging stations existed in the Big Thompson Basin. The nearest rain gauge at Drake, was destroyed by the flood shortly after 7 p.m. on July 31. The lack of detailed rainfall intensity data in combination with the inaccessibility of the area over which the storm occurred resulted in data depicting only 3-day totals. Unfortunately, these 3-day totals offer little evidence as to rainfall intensities associated with the severe flooding. Therefore, storm total rain amounts have been reconstructed using unofficial precipitation reports in combination with climatological network reports. The most intense rainfall, estimated at more than 12 inches, occurred over the slopes of the western third of the Big Thompson Canyon. More than four inches of rain fell over the entire canyon area from near Estes Park to Drake. Heavy rains also fell to the north over the Cache la Poudre Basin.

### Flooding and Damage



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The Big Thompson River, a tributary of the South Platte River, flows through the scenic Big Thompson Canyon. U.S. Highway 34 runs through the canyon, adjacent to the river in many spots. This highway is the main link between the plains, near Loveland, and Rocky Mountain National park. The river basin contains little topsoil and the streambed has steep slopes. The small river is usually only 1 to 2 feet deep and flows rapidly, descending some 2,500 feet through the 25-mile long canyon. These characteristics make the Big Thompson River and Canyon susceptible to damaging flash floods.

Disastrous flash flooding occurred within hours of the first rains. The major brunt of the flood lasted only a few hours, but the flooding was violent and caused much destruction in a very short time. Flooding began below the town of Estes Park and extended down the canyon for 25 miles to Loveland. The flash flood effect was greatly amplified by the constriction of the narrow channel in the Big Thompson Canyon.

Dozens of usually small tributary streams in the basin contributed large amounts of runoff to the Big Thomson River. In Dark Gulch and in at least two other small basins, discharge exceeded previously recorded discharge rates for basins less than 4 square miles in Colorado. However, Noels Draw, which lies just to the south of Dark Gulch, experienced a much lower maximum discharge of 2,050 cfs from the 3.37-square mile basin. This difference in runoff is probably related to velocity and direction of storm movement past the opposite-facing valley slopes and demonstrates the extreme concentration of the rainfall intensities experienced during this storm event.



Photo Courtesy of the FCPL

Further down in the drainage basin, above Drake, the peak discharge at the Big Thompson was 3.8 times the estimated 100-year flood discharge for that site. East of Drake, witnesses told of a wall of water six to eight feet high in the narrows of the Big Thompson Canyon and in its north fork. The flood crest moved through the 7.7-mile

stretch between Drake and the canyon mouth in about 30 minutes for an average travel rate of fifteen miles per hour.

At the mouth of the canyon, the raging river smashed into supports that held up a 227,000-pound water pipe where it crossed the highway. The flood pulled the pipe, filled with an estimated 873,000 pounds of water, and carried it a quarter of a mile downstream. The crest reached the mouth of the canyon at 9:40 p.m. Although the gauge was destroyed by the sharp rise, the river stages were based on observer readings and high-water marks left by the flood. The peak discharge was four times the previously known maximum discharge recorded in 1945 and was 1.8 times the estimated 100-year flood flow for that site. The peak stage of 19.7 feet exceeded the previous record peak stage by more than ten feet. Luckily, at the mouth of the Big Thompson Canyon, the riverbed widens rapidly and the peak flow quickly attenuated.



Photo Courtesy of the FCPL

On Sunday August 1, 840 people were evacuated by helicopter with 250 reported injured. Six miles northeast of Estes Park in the Big Thompson Canyon is the town of Glen Haven, one of the hardest hit towns. About 200 people were still stranded there at 6 p.m. Sunday. President Ford declared Larimer County a major disaster area on Monday August 2.

A reported 3,500 tourists were in the canyon on July 31 preparing to celebrate Colorado's centennial statehood anniversary the following day. The flood claimed 139 lives. Five people are still unaccounted for. About two-thirds of the victims were Colorado residents and their ages ranged from 2 years to 94 years. Most of these victims had little warning. According to several of the deputies and highway patrolmen who issued warnings, most of the people in the canyon were not officially warned. Person-to person warnings were concentrated on the area at the mouth of the canyon. At the lower end of the canyon, it was not raining. Many did not believe the possibility of a flood and did not heed the officers' warnings. Studies completed after the flood showed that people who climbed to higher ground in the canyon had the greatest chances of surviving the flood, whereas those who were driving alone through the canyon were at the highest at risk. Although some people escaped the flood by driving out of the canyon, they were the lucky ones. Dozens of people died when the roaring water smashed their vehicles against the rocky stream channel. State Patrol Sgt. Hugh Purdy was killed in the flood. His patrol car could only be identified by a key ring labeled "Colorado State Patrol".

The flood in the Big Thompson Canyon destroyed 316 homes, 45 mobile homes, 52 businesses, and 438 automobiles. On the Big Thompson River, from just west of Glen Comfort downstream to Loveland there was almost complete devastation. Devastation also occurred along the North Fork Big Thompson River in the vicinity of Glen Haven. In the north fork of the canyon, hundreds of cars and campers were strewn and destroyed. The floodwaters gouged out many dirt roads and much of Highway 34, which follows the Big Thompson River through the canyon, was



Photo Courtesy of the FCPL

washed away. Almost one-half the damage estimate was related to rebuilding the highway. There was also significant damage to the Big Thompson dam, pipeline, and power plant. The U.S. Army Corps of Engineers was contracted to remove destroyed automobiles and over 300,000 cubic yards of debris from the canyon, much of which used to be houses. Governmental cleanup operations cost over \$1.6 million.

Flooding was also severe along the Cache la Poudre River, although the levels were not as unprecedented as in the Big Thompson drainage. The area was sparsely populated and damage was less severe than in the Big Thompson area.

### **Rainfall Data:**

<b>Date</b>	<b>Location</b>	<b>Peak Rainfall</b>
7/31	Fort Collins 9 NW	1.8" from 9-10 pm; 1.6" from 10-11 pm; 1.2" from 11-12 pm; 4.6" in 3 hrs.
7/31	Red Feather Lakes 2SE	1.2" in 24 hrs.
7/31	Near Drake: 14°25'N 105°26'W, Elev. 8,000'	12.5" in 4 hrs.
8/1	Estes Park	3.59" from 4 p.m. July 31 to 4 p.m. Aug. 1

### **Peak Discharge:**

<b>Date</b>	<b>Location</b>	<b>Peak Discharge</b>
7/31	Big Thompson River at Drake	32,700 cfs at 2100 MDT
7/31	Big Thompson River at the canyon mouth	31,200 cfs at 2140 MDT
7/31	Unnamed tributary downstream from Glen Haven (1.38 mi <sup>2</sup> drainage basin)	9,670 cfs at 2300 MDT (7,007 cfs per sq. mi.)
7/31	Dark Gulch (1.00 mi <sup>2</sup> drainage basin)	7,210 cfs (7,210 cfs per sq. mi.)
7/31	Devils Gulch (0.91 mi <sup>2</sup> drainage basin)	3,090 cfs (3,395 cfs per sq. mi.)
7/31	North Fork Big Thompson River at Drake	8,710 cfs 2110 MDT

#### Sources

-Geological Survey Professional Paper 1115, "Storm and Flood of July 31-August 1, 1976 in the Big Thompson River and Caches la Poudre River Basins, Larimer and Weld Counties, Colorado," 1979.

-Storm Data, July 1976

-NOAA Technical Memorandum NWS SR-133, "A Centennial Survey of American Floods, Fifteen Significant Events in the United States, 1890-1990," 1990.

-Natural Disaster Survey Report 76-1, "Big Thompson Canyon Flash Flood of July 31-August 1, 1976," National Oceanic and Atmospheric Administration, Rockville, MD, 1976.

-[http://www.ucar.edu/educ\\_outreach/webweather/floodstory.html](http://www.ucar.edu/educ_outreach/webweather/floodstory.html)

-Gruntfest, E. "What People Did During the Big Thompson Flood", Natural Hazards Research and Applications Information Center, Working Paper, 1977.

-Hydrometeorological Report No. 55A (HMR 55A) Probable Maximum Precipitation Estimates- United States between the Continental Divide and the 103rd Meridian, U.S. Department Of Commerce National Oceanic And Atmospheric Administration, U. S. Department Of Army Corps Of Engineers, U. S. Department Of Interior Bureau Of Reclamation Silver Spring, Md. June 1988.