USGS
science for a changing world

U.S. Department of the Interior
U.S. Geological Survey

Flood of January 1997 in the Truckee River Basin, Western Nevada

Background

Northern California and western Nevada were devastated by floods during January 1-3, 1997. In Nevada alone, about $540 million in projected damages along the Truckee River (fig. 1) was attributed to floodwaters (Reno Gazette-Journal, May 30, 1997). Flooding was extensive throughout downtown Reno, at the Reno/Tahoe International Airport, and in the industrial area of Sparks, Nev. (fig. 2; Berris and others, 1997).

In late December 1996, storms built up a large snowpack (more than 180 percent of normal) in the higher altitudes of the Sierra Nevada (Daniel Greenlee, Natural Resource Conservation Service, oral commun., 1997) and covered the valleys along the eastern Sierra Nevada front as well. Then, a subtropical storm system originating in the central Pacific Ocean near the Hawaiian Islands brought heavy, unseasonably warm rain to the Sierra Nevada from December 30, 1996, through January 3, 1997. During this period, the Natural Resource Conservation Service recorded 27.7 in. (provisional data: Daniel Greenlee, oral commun., 1997) of precipitation at Squaw Valley, Calif. (8,200 ft above sea level), and the National Weather Service recorded 1.9 in. (Gary Barbato, oral commun., 1997) at Reno/Tahoe International Airport (4,400 ft above sea level). Rain falling below about 10,000 ft depleted about 20 percent of the high-altitude snowpack and melted about 80 percent of the snowpack below about 7,000 ft.

Data Collection

The U.S. Geological Survey (USGS) operates more than 20 streamflow and lake-level monitoring stations in the Truckee River Basin. Most of these stations are funded by partnerships with the USGS by other Federal, State, and local agencies, and Indian tribes. Data from these stations are crucial for water-supply planning; flood monitoring and emergency response; dam and reservoir system operation; establishing flood-insurance rates; and engineering and maintenance of bridges, roads, and other structures.

Several stations provide real-time data through satellite relay or ground-communication links. Data from these stations are used by the National Weather Service and other agencies to maintain water supplies, forecast floods, and issue flood warnings.

Figure 1. Geographic and hydrologic features of the Truckee River Basin, California and Nevada. Gaging-station site numbers refer to table 1.

USGS field crews obtained some of the highest river stage (depth) and discharge (flow) measurements ever recorded at several gaging stations at or near the peak of the January 1997 flood. At stations where field crews were unable to obtain discharge measurements, hydraulic surveys were made after the flood to determine peak discharge. These data contribute to understanding flood behavior, enhance efforts to minimize the destruction by floods, and provide data for planning.

Figure 2. Flooded industrial area, Sparks, Nevada, as seen from a helicopter on January 3, 1997. The Truckee Meadows Water Reclamation Facility and Vista gaging station are at right of photo. (Photograph by Patrick A. Glancy, U.S. Geological Survey.)

Flood Magnitude of January 1997

The magnitude of peak discharges for selected gaging stations in the Truckee River Basin is shown in table 1. Table 1 also includes the site number (used on fig. 1); gaging station number and name; January 1997 peak discharge, stage, and recurrence interval; 100-year peak discharge; years of peak-flow record; and date and magnitude of the largest historical peak discharge prior to January 1997. The 100-year peak discharge is one that, statistically, has a 1-percent chance of happening in any given year (Garcia, 1997).

Several technical methods may be used to determine the recurrence interval of floods. For this analysis, flood-frequency characteristics for stations with at least 10 years of record through January 1997 were computed by fitting the logarithms of annual peaks to a Pearson Type III frequency distribution. This technique follows guidelines recommended by the U.S. Interagency Advisory Committee on Water Data (1982). For stations where flow is regulated, the procedures recommend that periods of consistent regulation be used in the analysis. For the mainstem Truckee River stations, all the annual peak discharges for 1970-97 were used in the analysis because this period is the time span when all current upstream Truckee River Basin reservoirs were completed and in operation. For those stations on tributaries with less than 10 years of data, regression equations were used to determine the 100-year peak discharge (Thomas and others, 1994, p. 45).

The January 1997 peak discharge was larger than recorded for previous floods at many stations on the Truckee River. However, few gaging stations were in operation during the historic floods in 1951, 1955, and 1963. The peak discharge in January 1997 was less than the 100-year peak discharge at all Truckee River gaging stations (table 1). Flood-frequency analysis for Truckee River at Reno and Truckee River at Vista determined that the 100-year peak discharges were 26,200 cubic feet per second and 28,200 cubic feet per second, respectively. Independent flood-frequency analyses made using alternative techniques had similar results (U.S. Army Corps of Engineers, written commun., 1997).

—Glen W. Hess and Rhea P. Williams

Table 1. Information on January 1997 flood for selected sites, Truckee River Basin, western Nevada

[Abbreviation and symbol: ft^3/s, cubic feet per second; --, not determined]

Site number (fig. 1)	Gaging station		January 1997			100-year peak discharge[1] (ft^3/s)	Years of record	Largest recorded historical flood peak prior to January 1997	
	Number	Name	Peak discharge (ft^3/s)	Peak stage (feet)	Recurrence interval (years)			Date	Magnitude (ft^3/s)
1	10346000	Truckee River at Farad, Calif.	14,800	13.17	<50	19,200	1899-1997	Nov. 21, 1950	17,500
2	10347310	Dog Creek at Verdi, Nev.	2,500	8.82	>50	[2]3,000	1992-97	Mar. 9, 1995	1,200
3	10347460	Truckee River near Mogul, Nev.	17,500	15.79	--	--	1993-95, 1997	May 1, 1995	7,070
4	10347600	Hunter Creek near Reno, Nev.	1,100	5.79	>50	[2]1,480	1962-71, 1978-81, 1997	Jan. 31, 1963	986
5	10348000	Truckee River at Reno, Nev.	18,200	14.94	<50	26,200	1906-21, 1930-34, [3]1946-97	Dec. 23, 1955	20,800
6	10348200	Truckee River near Sparks, Nev.	[4]	17.17	--	27,700	1977-97	Feb. 17, 1986	14,900
7	10348850	Galena Creek at Galena State Park, Nev.	2,610	5.54	<50	[5]6,100	[5]1961-97	Aug. 15, 1965	3,670
8	10349300	Steamboat Creek at Steamboat, Nev.	2,090	6.03	>25	4,260	1961-97	Feb. 17, 1986	3,600
9	10350000	Truckee River at Vista, Nev.	18,500	24.16	<50	28,200	1899-1907, 1958-97	Feb. 1, 1963	18,900
10	10350100	Long Valley Canyon Creek near Lockwood, Nev.	1,600	--	--	--	1955, 1967-78, 1986, 1995-97	Feb. 19, 1986	5,400
11	10350400	Truckee River below Tracy, Nev.	20,200	13.75	<50	34,200	1972-97	Feb. 19, 1986	17,500
12	10351600	Truckee River below Derby Dam near Wadsworth, Nev.	19,900	14.56	<50	26,100	[3]1918-97	Feb. 1, 1963	18,400
13	10351650	Truckee River at Wadsworth, Nev.	19,100	19.62	<50	30,000	1965-86, 1993-97	Feb. 19, 1986	16,800
14	10351700	Truckee River near Nixon, Nev.	21,200	13.92	50	27,400	1957-97	Feb. 19, 1986	16,300
15	10351850	Pyramid Lake tributary near Nixon, Nev.	75	--	<10	4,160	1968-79, 1981-90, 1992-97	Feb. 19, 1986	950

[1] Determined from U.S. Interagency Advisory Committee on Water Data (1982) guidelines except where noted. For the mainstem Truckee River stations, the flood peaks available from 1970-97, the longest most consistent period of upstream regulation, were used in the analysis.

[2] Estimated by methods of Thomas and others (1994).

[3] Does not include periods of broken record.

[4] Peak flow not determined due to overbank flow.

[5] Record combined with Galena Creek near Steamboat, Nev. (10348900). Discharges were assumed equivalent.

References Cited

Berris, S.N., Hess, G.W., Taylor, R.L., and Bohman, L.R., 1997, *Flood-control effects of Truckee River Basin reservoirs, December 31, 1996, through January 4, 1997, California and Nevada:* U.S. Geological Survey Fact Sheet FS-037-97, 4 p.

Garcia, K.T., 1997, *January 1997 Flooding in northern Nevada—Was this a "100-year" flood?:* U.S. Geological Survey Fact Sheet FS-077-97, 4 p.

Reno Gazette-Journal, 1997, *Flood damage hits $1 billion mark:* Reno Gazette-Journal, May 30, 1997, p. 1A.

Thomas, B.E., Hjalmarson, H.W., and Waltemeyer, S.D., 1994, *Methods for estimating magnitude and frequency of floods in the southwestern United States:* U.S. Geological Survey Open-File Report 93-419, 211 p.

U.S. Interagency Advisory Committee on Water Data, 1982, *Guidelines for determining flood flow frequency, Bulletin 17B of the Hydrology Subcommittee:* Reston, Va., U.S. Geological Survey, Office of Water Data Coordination, 183 p.

For More Information

For more information on water resources in Nevada

Public Information Assistant
U.S. Geological Survey
333 W. Nye Lane, Rm 203
Carson City, NV 89706

tel.: (702) 887-7649
fax: (702) 887-7629
email: usgsinfo_nv@usgs.gov
URL: http://wwwnv.wr.usgs.gov