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

Flood of January 1997 in the Lake Tahoe Basin, California and Nevada

Background

Northern California and western Nevada, including the Lake Tahoe Basin, were affected by floods during January 1-3, 1997. In the two California counties surrounding Lake Tahoe, El Dorado and Placer (fig. 1), about $91 million in estimated damage was attributed to flood waters (Reno Gazette-Journal, May 30, 1997). Flooding in the Lake Tahoe Basin was mainly along the Upper Truckee River in the city of South Lake Tahoe (Tahoe Daily Tribune, January 7, 1997).

In late December 1996, several storms produced a large snowpack (more than 180 percent of normal) in higher altitudes of the Sierra Nevada (Daniel Greenlee, Natural Resource Conservation Service, oral commun., 1997). Valleys along the eastern Sierra Nevada front were covered with a large snowpack as well. A subtropical storm system originating in the central Pacific Ocean near the Hawaiian Islands then brought heavy 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 11.6 in. (Gary Barbato, oral commun., 1997) at Tahoe City, Calif. (6,230 ft). Rain falling below 10,000 ft depleted about 20 percent of the high-altitude snowpack between 7,000 and 10,000 feet and melted about 80 percent of the snowpack below 7,000 ft.

The level of Lake Tahoe rose more than a foot during the storm, to 6,229.40 ft (Bureau of Reclamation datum), the highest elevation since 1917, and more than the maximum permissible by Federal Court decree (6,229.10 ft). The peak for the period of record (1900-97) for Lake Tahoe at Tahoe City, Calif. (station number 10337000, fig. 1) is 6,231.26 ft in July 1907.

Data Collection

The U.S. Geological Survey (USGS) operates 21 streamflow and 2 lake-level monitoring stations in the Lake Tahoe Basin. These stations are funded by the USGS in partnership with the Tahoe Regional Planning Agency, California Department of Water Resources, and Carson City. Data from these stations are important for environmental management decisions; 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.

Two stations (Incline Creek near Crystal Bay, site 12, and Lake Tahoe at Tahoe City, site 10337000 on fig. 1) 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 forecast floods, issue flood warnings, and maintain water supplies. USGS field crews obtained some of the greatest river depth measurements and highest discharge (flow) measurements ever recorded at several gaging stations in the Lake Tahoe Basin 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.

Base from U.S. Geological Survey digital data, 1:24,000 and 1:100,000,1969-85.
Universal Transverse Mercator projection, Zone 11

EXPLANATION

- Selected hydrologic basin used in this study
- Boundary of Lake Tahoe Basin
- Boundary of subbasin
- Gaging station
- Lake-level station

Figure 1. Geographic setting, hydrologic basins, selected gaging stations, and lake-level station in the Lake Tahoe Basin, California and Nevada.

Flood Magnitude of January 1997

The magnitudes of peak discharges for selected gaging stations in the Lake Tahoe Basin are shown in table 1. Table 1 also includes a site number (shown 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 recorded 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 those sites with less than 10 years of peak-discharge data near gaged sites on the same stream with at least 10 years of annual peaks, drainage-area ratios were used to determine the recurrence interval (Thomas and others, 1997, p. 15). For those stations with less than 10 years of data not near gaged sites on the same stream, regression equations were used to determine the recurrence interval (Thomas and others, 1997, p. 45).

The January 1997 peak discharge was larger than what had been recorded for previous floods at 15 stations in the Lake Tahoe Basin. However, none of the gaging stations were in operation during floods in 1951 and 1955, and only two stations were in operation during the flood in 1963. These three water years had large floods that included 100-year peak discharges at several sites in the area. The peak discharge in January 1997 was greater than the 100-year peak discharge at two gaging stations on the Upper Truckee River and one on Blackwood Creek in the Lake Tahoe Basin and was less than the 100-year peak discharge for the remaining 17 stations (table 1).

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Table 1. Information on January 1997 flood for selected sites, Lake Tahoe Basin, Calif. and Nev.

[Abbreviation and symbols: ft^3/s, cubic feet per second; <, less than; >, greater than]

Site number (fig. 1)	Gaging station		January 1997			100-year peak discharge[1] (ft^3/s)	Years of record	Largest recorded historical peak prior to January 1997	
	Number	Name	Peak discharge (ft^3/s)	Peak stage (feet)	Recurrence interval (years)			Date	Magnitude (ft^3/s)
1	10336580	Upper Truckee River at South Upper Truckee Road near Meyers, Calif.	1,730	11.32	<100	1,790	1991-97	May 16, 1996	945
2	103366092	Upper Truckee River at U.S. Highway 50 above Meyers, Calif.	5,120	8.95	>100	4,060	1991-97	May 16, 1996	2,320
3	10336610	Upper Truckee River at South Lake Tahoe, Calif.	5,480	9.95	>100	4,930	1972-74, 1978, 1980-97	Mar. 8, 1986	2,740
4	10336645	General Creek near Meeks Bay, Calif.	797	[2]7.86	<25	1,360	1981-97	Dec. 20, 1981	765
5	10336660	Blackwood Creek near Tahoe City, Calif.	2,940	[2]9.82	>100	2,780	1961-97	Dec. 22, 1964	2,100
6	10336674	Ward Creek below confluence near Tahoe City, Calif.	1,220	8.85	<50	1,890	1992-97	May 16, 1996	434
7	10336675	Ward Creek at Stanford Rock Crossing near Tahoe City, Calif.	2,370	7.58	>50	3,030	1992-97	May 16, 1996	866
8	10336676	Ward Creek at Highway 89 near Tahoe Pines, Calif.	2,530	9.36	>50	3,330	1973-97	Dec. 19, 1981	1,800
9	10336698	Third Creek near Crystal Bay, Nev.	108	3.24	<10	246	1970-73, 1975, 1978-97	June 18, 1982	150
10	103366993	Incline Creek above Tyrol Village near Incline Village, Nev.	52	2.71	10	129	1991-97	June 26, 1995	52
11	103366995	Incline Creek at Highway 28 at Incline Village, Nev.	143	3.25	<50	189	1990-97	July 11, 1996	90
12	10336700	Incline Creek near Crystal Bay, Nev.	179	3.87	<50	270	1970-73, 1975, 1988-97	Jan. 21, 1970	87
13	10336730	Glenbrook Creek at Glenbrook, Nev.	144	6.46	50	225	1972-75, 1988-97	May 16, 1996	37
14	10336740	Logan House Creek near Glenbrook, Nev.	11	4.74	<25	25.2	1984-97	May 31, 1995	8.5
15	103367585	Edgewood Creek at Palisades Drive near Kingsbury, Nev.	51	2.50	[3]<10	[3]201	1991-97	Aug. 14, 1991	57
16	103367592	Eagle Rock Creek near Stateline, Nev.	4	5.68	[3]<5	[3]94	1990-97	Mar. 2, 1991	2.3
17	10336760	Edgewood Creek at Stateline, Nev.	136	6.12	([4])	([4])	1993-97	Dec. 12, 1995	32
18	10336770	Trout Creek at U.S. Forest Service Road near Meyers, Calif.	95	5.62	<10	239	1993-97	June 27, 1995	166
19	10336775	Trout Creek at Pioneer Trail near South Lake Tahoe, Calif.	525	7.59	>50	595	1989, 1991-97	June 30, 1995	337
20	10336780	Trout Creek near Tahoe Valley, Calif.	535	9.33	<25	896	1961-97	Feb. 1, 1963	535

[1] Determined from U.S. Interagency Advisory Committee on Water Data (1982) guidelines except where noted. [2] Affected by backwater. [3] Estimated by methods of Thomas and others (1997). [4] Affected by regulation, value not determined.

References Cited

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For More Information

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