

Publications Document Floods of January 1997 in California and Nevada

In January 1997, California and Nevada experienced devastating floods. In California, most of the flooding occurred in the Sacramento and San Joaquin River Basins (fig. 1). Flood damage in California was estimated at nearly \$2 billion (Flood Emergency Action Team, 1997). In Nevada, the Truckee, Carson, and Walker River Basins and the Lake Tahoe Basin (each of which straddles the state boundary) were heavily flooded (fig. 1). Damages in Nevada were estimated at more than \$550 million (Reno-Gazette Journal, 1997). A summary of publications by U.S. Geological Survey (USGS) staff that document the January 1997 floods in California and Nevada is presented in table 1.

Like most large floods of streams in the Sierra Nevada, the January 1997 floods occurred as a result of rain on snow. Precipitation in the mountains of California and Nevada

produced an above-normal snow pack during November and December 1996 (Daniel Greenlee, Natural Resources Conservation Service, oral commun., 1997). At higher altitudes of the Sierra Nevada, estimated water content of the snow pack ranged from 150 to more than 200 percent of normal for late December and early January. Even the lower lying valleys along the eastern Sierra Nevada were covered with snow. This large accumulation of snow was followed in late December by a large subtropical, low-pressure system originating in the central Pacific Ocean that produced intense, warm rain across the region at altitudes up to 10,000 feet above sea level. Precipitation totals as great as 24 inches were recorded between December 29, 1996, and January 4, 1997 (Gary Barbato, National Weather Service, oral commun., 1997). The rain on snow melted as much as 80 percent of the snow pack below 7,000 feet and 20 percent of



Water from the Cosumnes River, left, surges through a broken levee near Wilton, Calif., January 2, 1997. Photograph by Laura Chun, *Sacramento Bee*.



EXPLANATION

1 Basins affected by flooding January 1997—Number corresponds to table 1

- | | |
|---------------------------|-----------------------|
| 1 Sacramento River Basin | 4 Truckee River Basin |
| 2 San Joaquin River Basin | 5 Carson River Basin |
| 3 Lake Tahoe Basin | 6 Walker River Basin |

Figure 1. Geographic and hydrologic features of California and Nevada basins flooded during January 1997.

Table 1. Water-resources publications on 1997 flooding, by location.

Location number (fig. 1)	Senior author ¹	Brief description of publication
--	Bonner ^{2,3}	Water-resources data for Nevada, 1997
--	Garcia	Discussion of flood-recurrence intervals, the 100-year flood (applicable in California and Nevada)
--	Hunrichs ⁴	Peak-discharge data for 292 sites in northern and central California
1	Anderson ³	Water-resources data for California, 1997, volume 3
2	Rockwell ³	Water-resources data for California, 1997, volume 4
3	Rowe	Peak-discharge data for 20 sites in Lake Tahoe Basin
4	Berris	Flood-control effects of Truckee River Basin reservoirs: model simulation
4	Hess	Peak-discharge data for 15 sites in Truckee River Basin
4,5,6	Rigby ⁵	A chronology of floods in western Nevada
5	Hoffman	Mercury and suspended-sediment loads in lower Carson River and Lahontan Reservoir, Nevada
5	Thomas	Peak-discharge data for 21 sites in Carson River Basin
6	Thomas	Peak-discharge data for nine sites in Walker River Basin

¹ Full citation available in "Selected References" section.

² Report includes data for all of Nevada gaging stations and selected stations in adjacent states.

³ Annual reports are produced in cooperation with Federal, State, county, and local agencies, and Indian tribes as part of ongoing water-resources data-collection programs in each State.

⁴ R.A. Hunrichs, U.S. Geological Survey, written commun., 1998.

⁵ Report was prepared by Nevada Bureau of Mines and Geology in cooperation with U.S. Geological Survey and University of Nevada, Reno Cooperative Extension.

the high-altitude snow pack in the central Sierra Nevada range. Rapid, widespread runoff caused minor to record-breaking floods in both states.

DATA COLLECTION

The USGS has compiled water-resources data in California and Nevada for more than 100 years. Many of these data were collected at or near streamflow, lake, and reservoir gaging stations operated by the USGS in partnership with Federal, State, and local agencies, and Indian tribes.

During January 1997, several hundred floodflow (discharge) measurements on affected rivers and tributaries were made by USGS hydrographers, who are trained in flood-data collection. California and Nevada hydrographers were assisted by USGS staff from other offices across the country. Many post-flood hydraulic surveys also were made. These and other measurements are required to determine peak (maximum) discharges. In Nevada, suspended-sediment samples were collected from the Carson River during the flood to determine the volumes (load) of sediment and mercury that were transported (Hoffman and Taylor, 1998). All these data contribute to the understanding of flood behavior, enhance efforts to minimize the destruction by floods, and provide information for water-resources management (Hess and Williams, 1997).

DATA ANALYSIS

When a flood occurs, interest in the recurrence interval and the magnitude of peak discharges is common. Flood frequency (recurrence interval) is defined as the average interval of time

within which a flood of a given magnitude will be equalled or exceeded. A USGS publication by Garcia (1997) details this especially in relation to the Nevada flooding. The USGS computed the flood frequency at selected sites in California and Nevada to provide this information (table 1).

The data collected during the flood also can be used in models that route streamflow and determine the effects of existing and proposed control structures. Such an analysis was done for the Truckee River Basin by Berris and others (1997) to determine flood-control effects of reservoirs in the Truckee River Basin.

DATA AND INFORMATION DISSEMINATION

Near-real-time stage data from stations operated by the USGS and the California Department of Water Resources (CDWR) Division of Flood Management, the Army Corps of Engineers, and the Bureau of Reclamation are available by satellite relay. In California, this has been used to implement a flood-warning system developed by the CDWR. In Nevada, the USGS is working with Federal, county, and local agencies to develop a flood alert system for the Truckee River Basin.

Near-real-time streamflow data for all states are available on the USGS home page at <<http://water.usgs.gov/public/realtime.html>>. The USGS provides many products to document the Nation's natural hazards such as floods, earthquakes, and landslides. Information regarding USGS research and resulting products can be found at <<http://www.usgs.gov>>.

—Stephen E. Hammond and Jerry G. Harmon

SELECTED REFERENCES

- Anderson, S.W., Rockwell, G.L., and Hayes, P.D., 1998, *Water resources data, California, water year 1997, volume 3*: U.S. Geological Survey Water-Data Report CA-97-3, 479 p.
- 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.
- Bonner, L.J., Etchemendy, L.P., Elliott, P.E., and Swartwood, J.R., 1998, *Water resources data, Nevada, water year 1997*: U.S. Geological Survey Water-Data Report NV-97-1, 636 p.
- Flood Emergency Action Team, 1997, *Final report of the Flood Emergency Action Team*: Sacramento, Calif., The Resources Agency of California, 279 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.
- Hess, G.W., and Williams, R.P., 1997, *Flood of January 1997 in the Truckee River Basin, western Nevada*: U.S. Geological Survey Fact Sheet FS-123-97, 2 p.
- Hoffman, R.J., and Taylor, L. R., 1998, *Mercury and suspended sediment, Carson River Basin, Nevada—Loads to and from Lahontan Reservoir in flood year 1997 and deposition in reservoir prior to 1983*: U.S. Geological Survey Fact Sheet FS-001-98, 6 p.
- Horton, G.A., *The flood of 1997—Final report: An analysis of snowpack water content and precipitation changes in the waterbasins of western Nevada and the effects on runoff and streamflows, December 16, 1996-January 6, 1997*: Nevada Division of Water Planning, accessed August 5, 1998, at URL <http://www.state.nv.us/cnr/ndwp/flood-97/floodint.htm>.
- Reno Gazette-Journal, 1997, *Flood damage hits \$1 billion mark*: Reno Gazette-Journal, May 30, 1997, p. 1A.
- Rigby, J.G., Crompton, E.J., Berry, K.A., Yildirim, U., Hickman, S.F., and Davis, D.A., 1998, *The 1997 New Year's Floods in western Nevada*: Nevada Bureau of Mines and Geology Special Publication 23, 111 p.
- Rockwell, G.L., Anderson, S.W., Freibell, M.F., and Webster, M.D., 1998, *Water resources data, California, water year 1997, volume 4*: U.S. Geological Survey Water-Data Report CA-97-4, 476 p.



The amphiheater is all that is visible of Wingfield Park in downtown Reno, Nev. Just above the roof is the intersection of Arlington and 1st Streets, January 2, 1997. Photograph by David B. Parker, *Reno Gazette-Journal*.

- Rowe, T.G., Rockwell, G.R., and Hess, G.W., 1998, *Flood of January 1997 in the Lake Tahoe Basin, California and Nevada*: U.S. Geological Survey Fact Sheet FS-005-98, 2 p.
- Thomas, K.A., and Hess, G.W., 1997, *Flood of January 1997 in the Walker River Basin, California and Nevada*: U.S. Geological Survey Fact Sheet FS-182-97, 2 p.
- Thomas, K.A., and Williams, R.P., 1997, *Flood of January 1997 in the Carson River Basin, California and Nevada*: U.S. Geological Survey Fact Sheet FS-183-97, 2 p.

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