



# CALIFORNIA GEOLOGY

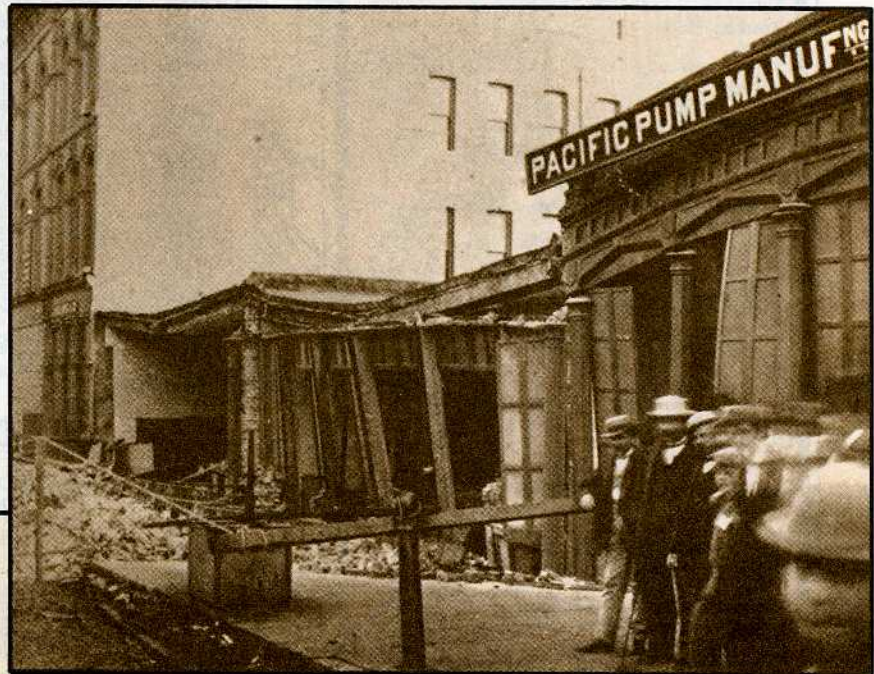
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## EARTHQUAKE DAMAGE



*LATE 1800s*

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THE RESOURCES AGENCY

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# 1892 Vacaville–Winters Earthquake and 1983 Coalinga Earthquake

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Various characteristics of the April 19, 1892 Vacaville-Winters earthquake are notably similar to those associated with the May 2, 1983 Coalinga earthquake. For example, (1) both were located along the western margin of the Great Valley and are the two largest historical seismic events known to have occurred along this boundary; (2) the main shocks in both earthquakes were in the range of magnitude 6 to 7; (3) neither sequence produced obvious primary surface rupture indicative of a causative fault; and (4) both events occurred in areas devoid of surficial evidence of recent active faulting. Because of these similarities in geologic setting and probable earthquake source characteristics, a comparison of the areas shaken at different intensities for the two events affords a means to estimate the magnitude of the pre-instrumental 1892 event.

The reports of earthquake effects of intensity VI (Modified Mercalli scale) or greater were critically reviewed to verify that intensities of both events were based consistently on the same criteria. These reports consist of the standard U.S. Geological Survey earthquake questionnaires for the 1983 event and the summaries of reported effects (Toppozada and others, 1981) for the 1892 event. Verification that intensities for both events were consistently determined ensures a meaningful comparison of the areas shaken by the two events.

The areas shaken at intensities V, VI, and VII for both events are shown on Figure 1. Clearly, the areas shaken by the 1892 earthquake are somewhat larger than those shaken by the 1983 earthquake. The relationship of magnitude to areas shaken (Toppozada, 1975) is such that doubling the size of the area shaken corresponds to about a 0.3 increase in magnitude. Comparison of the areas shaken by the two earthquakes indicates that the magnitude of the April 19, 1892 Vacaville-Winters event was at least equivalent

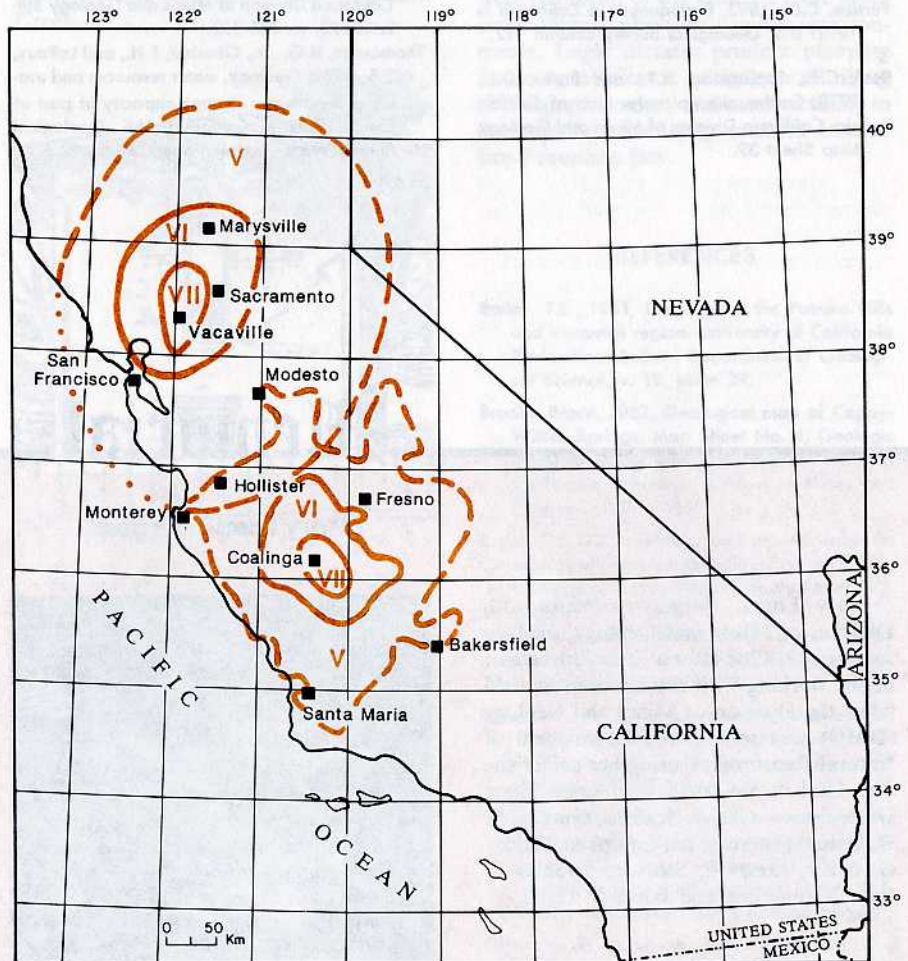


Figure 1. Isoseismal maps for the April 19, 1892 Vacaville-Winters earthquake (modified from Toppozada and others, 1981) and the May 2, 1983 Coalinga earthquake (after Stover, 1983).

to that of the May 2, 1983 Coalinga event, and up to 0.2 magnitude units larger.

The 1983 Coalinga event was assigned a magnitude of 6.7 by the University of California Berkeley Seismographic Stations and a magnitude of 6.1 by the California Institute of Technology Seismological Laboratory. Because this

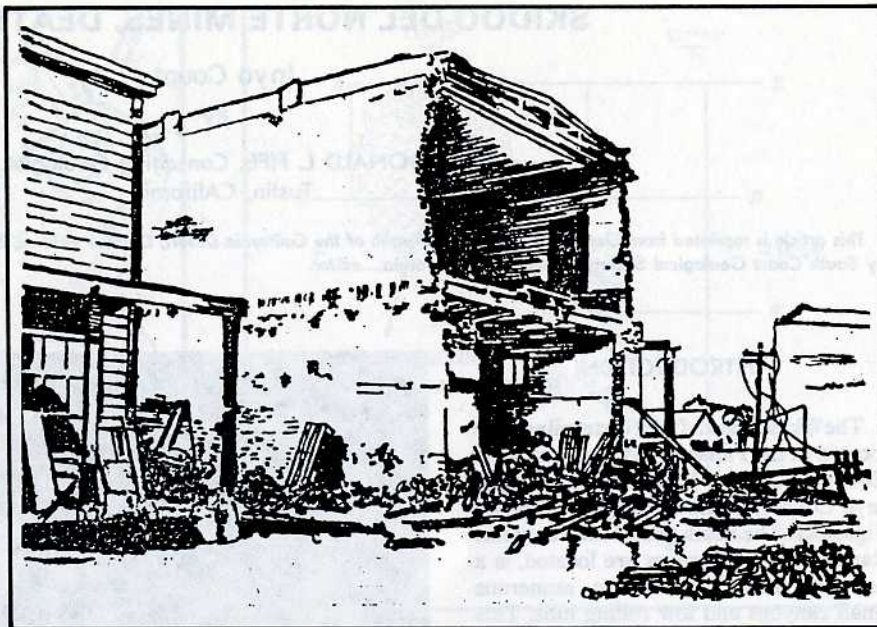
earthquake occurred near the boundary between the two networks, the appropriate magnitude is the average of 6.4 which includes readings from both northerly and southerly directions. Based on this, and on the comparison discussed in the previous paragraph, it is concluded that the magnitude of the April 19, 1892 earthquake was in the range of 6.4 to 6.6.

## ACKNOWLEDGMENT

Carl W. Stover of the U.S. Geological Survey, Denver, Colorado kindly sent me the USGS questionnaires for the area shaken at intensity VI or greater (Modified Mercalli scale) in the 1983 Coalinga event. These data made it possible to verify that the 1983 intensities were based on the same criteria as the 1892 intensities.

Building damage, Vacaville-Winters area, California, April 19, 1892. *From San Francisco Examiner, April 1892.* ▷

Building damage at Coalinga, California, May 2, 1983. *Photo by James Strata.* ▽



## REFERENCES

- Stover, C.W., 1983, Intensity distribution and isoseismal map in Bennett, J.H., and Sherburne, R.W., editors, The 1983 Coalinga, California earthquakes: California Department of Conservation, Division of Mines and Geology Special Publication 66, p. 1-4.
- Topozada, T.R., 1975, Earthquake magnitude as a function of intensity data in California and western Nevada: Bulletin of the Seismological Society of America, v. 65, p. 1223-1228.
- Topozada, T.R., Real, C.R., and Parke, D.L., 1981, Preparation of isoseismal maps and summaries of reported effects for pre-1900 California earthquakes; OFR 81-11 SAC. ✕

## CALIFORNIA/NEVADA SATELLITE IMAGE MAP

A color satellite-image map of Mariposa quadrangle is one of a series of experimental satellite-image maps produced from Landsat data by the U. S. Geological Survey (USGS). The image map (scale 1:250,000) includes a 7,600 square-mile area of California and Nevada and covers portions of Yosemite National Park, Sierra and Inyo national forests. The topographic map of the area is shown on the reverse side at the same scale.

The area covered by the eastern half of the map extends from the crests of the

Sierra Nevada to the White Mountains and includes many geologically youthful features of interest to earth scientists. The image map was produced at the request of California and USGS scientists to assist them in research efforts focused on eastern Sierra Nevada geology, hydrology, and recent regional earthquake activity.

The map is also of interest to outdoor enthusiasts who want a comprehensive view of recreational areas for sightseeing, backpacking, skiing, hunting, and fishing.

The overall measurement of the map sheet is 22 inches by 32 inches.

Copies of the Mariposa satellite-image map, experimental edition, can be purchased for \$6 each from the U. S. Geological Survey, Map Distribution, Box 25286, Federal Center, Denver, CO 80225. Orders must specify the map name and include checks or money orders payable to the Department of the Interior-USGS. Each order for less than \$10 must include \$1 for postage and handling. ✕