CALIFORNIA DIVISION OF MINES AND GEOLOGY

Fault Evaluation Report FER-16

December 30, 1976

1. Name of fault: Pine Mountain fault

2. Location of fault: Rancho Nuevo Creek, Reyes Peak, Wheeler Springs, Lion Canyon, Topatopa Mountains, Devils Heart Peak, and Cobblestone Mountain 7.5' quadrangles, Ventura County and a minor part of Los Angeles County.

3. Reason for evaluation: Part of 10-year program; the Pine Mountain fault is zoned as a secondary fault hazard in the Ventura County Seismic and Safety Element (Nichols, 1974).

4. List of references:

a) Badger, R.L., 1957, Geology of the western Lion Canyon quadrangle, Ventura County, California: California University, Los Angeles, M.A. thesis, map scale 1:14,000.

b) Crowell, J.C., 1968, Movement histories of faults in the Transverse Ranges and speculations on the tectonic history of California in Proceedings of conference on geologic problems of San Andreas Fault System, Dickinson, W.R., and Grantz, A., editors; Stanford University Publications, Geological Sciences, v. XI, p. 323-341.

c) Dibblee, T.W., Jr., 1946a, unpublished geologic mapping of the Morro Hill quadrangle, scale 1:31,680.

d) Dibblee, T.W., Jr., 1946b, unpublished mapping of the Reyes Peak quadrangle, 1:31,680.

e) Dibblee, T.W., Jr., 1946c, unpublished geologic mapping of the Wheeler Springs quadrangle, scale 1:31,680.

f) Dibblee, T.W., Jr., 1949, unpublished geologic mapping of the Hines Peak quadrangle, scale 1:62,500. Note:
No topo on base map, no roads -- streams only.

g) Dibblee, T.W., Jr., 1972, The Rinconada fault in the southern Coast Ranges, California, and its significance (preliminary expanded abstract): American Association Petroleum Geologists, Soc. Economic Geologists and Soc. Econ. Paleontologists and Mineralogists (Pacific Sections) Program Preprint to Annual Meeting, 16 p., various scale maps (1:264,000 through 1:487,000).

h) Gross, D.J., 1958, Geology of the Ortega area, Ventura County, California: California University, Los Angeles, M.A. thesis, map scale 1:14,100.

i) Hagen, D.W., 1957, Geology of the Wheeler Springs area: California Univeristy, Los Angeles, M.A. thesis, map scale 1:21,180.

j) Hill, M.L., 1954, Tectonics of faulting in southern California: California Division of Mines and Geology Bulletin 170, p. 5-13.

k) Jennings, C.W., 1975, Fault map of California with locations of volcanoes, thermal springs, and thermal wells: California Division of Mines and Geology, California Geologic Data Map Series, Map no. 1, scale 1:750,000.

l) Jennings, C.W., and Strand, R.G., 1969, Geologic map of California, Los Angeles sheet: California Division of Mines and Geology, scale 1:250,000.

m) Jestes, E.C., 1963, A stratigraphic study of some Eocene sandstones, northeastern Ventura basin, California: California University, Los Angeles, PhD. thesis, map scale 1:42,500.

n) Givens, C.R., 1974, Eocene molluscan biostratigraphy of the Pine Mountain area, Ventura County, California: University of California Publications in Geological Sciences, v. 109, 107 p., geologic map scale 1:48,000.

o) Nichols, D.R., October 1974, Surface faulting ~~in General Discussion~~ in Seismic and Safety Elements of the Resources Plan and Program, Ventura County Planning Department, section II, p. 1-35, plate 1.

p) Stanford Geological Survey, 1963, Geologic map of the upper Sespe Creek area, Ventura County, California: Stanford University, unpublished, geologic map scale 1:24,000.

q) Vedder, J.G., Dibblee, T.W., Jr., and Brown, R.D., Jr., 1971, Geologic map of the upper Mono Creek-Pine Mountain area, California: U.S. Geological Survey open-file map, scale 1:48,000.

r) Vedder, J.G., Dibblee, T.W., Jr., and Brown, R.D., Jr., 1973, Geologic map of the upper Mono Creek-Pine Mountain area, California, showing rock units and structures offset by the Big Pine fault: U.S. Geological Survey, Miscellaneous Geologic Investigation Map I-752, scale 1:48,000.

s) Weber, F.H., Jr., Kiessling, E.W., Sprotte, E.C., Johnson, J.A., Sherburne, R.W., and Cleveland, G.B., 1975, ~~(Preliminary draft of 2/27/76),~~ Seismic hazards study of Ventura County, California: California Division of Mines and Geology, Open File Report 76-5LA, 396 p., 9 plates.

~~cite final draft,~~

t) Ziony, J.I., Wentworth, C.M., Buchanan-Banks, J.M., and Wagner, H.C., 1974, Preliminary map showing recency of faulting in coastal southern California: U.S. Geological Survey, Miscellaneous Field Studies Map MF-585, 15 p., map scale 1:250,000, 3 pl.

5. Summary of available data:

The Pine Mountain fault is zoned as a secondary fault hazard in the Ventura County Seismic and Safety Element (Nichols, 1974) (figure 1). Essentially all those faults shown on Jennings and Strand (1969) were zoned in the element. (It appears that Nichols did not attempt to determine which of these faults were inactive, and thus all were zoned.)

Jennings (1975) classified the Pine Mountain fault as Quaternary after Crowell (1968) and Dibblee (1972). Crowell (p. 327, reproduced here as figure 2) shows the Pine Mountain fault as active during the Quaternary, but does not discuss the fault in the text. Dibblee (1972) states only that "The Pine Mountain fault .... is a northeast-dipping reverse fault along which the Pine Mountain Range was elevated in Quaternary time." Dibblee, in other work (1946a, 1946b, and 1946c) depicts the Santa Margarita Formation (upper Miocene) as the youngest unit cut. He also shows the Pine Mountain fault as not cutting terrace deposits (Pleistocene in age). This same data was published in Vedder, et al. (1973), with minor changes, however, the Pleistocene units were still shown as unfaulted where they overlie the Pine Mountain fault.

Hill (1954, p. 10) describes the Pine Mountain fault as a north-dipping reverse fault. Hagen (1957) suggests that the Pine Mountain fault may have a right-lateral component of slip because 1) the fault is relatively straight, 2) the fault is parallel to the San Andreas fault, and 3) of the structural folding that has taken place in the area. Hagen noted that the fault is marked by the presence of clay gouge and breccia, which is 100 feet "thick" in places. He estimated a vertical component of slip of 3 miles or more. Where he observed the fault it dipped 55° to the west. While Hagen noted a distinctive topographic break in the eastern part of his area, he also states that the fault is not "prominent" to the west -- only small saddles and slight breaks in slope were noted. Hagen also mapped the fault as buried under Pleistocene terrace deposits.

Gross (1958, p. 56) agrees with Hagen as to the amount of apparent vertical displacement that has taken place along the Pine Mountain fault. He also found that the fault was actually a zone of up to several hundred feet wide in places. Gross felt that the topographic expression of the fault was due to erosion. He cited features such as fault-line scarps and low saddles. Gross also mapped the fault as buried under Pleistocene terrace deposits.

Badger's (1957) geologic map was missing from the copy of the thesis obtained, however, he, too, describes brecciation and fault gouge along the fault. Badger found the fault to vary in dip from 30° to the north to vertical.

Jestes (1963) apparently did little original mapping in his study, but compiled data from sources already mentioned. He, too, shows the Pine Mountain fault as concealed by Quaternary terrace deposits. The traces of the Pine Mountain fault shown in Givens (1974) was compiled from Jestes and Hill, however Givens showed no terrace deposits along the fault.

The Stanford Geological Survey (1963, 1966) also depicts the Pine Mountain fault as cutting no unit younger than Santa Margarita Formation (upper Miocene). However, no younger units, except landslides, were mapped as occurring along the fault in their field areas.

Weber, et al. (1975, p. 179) cites Jennings' and notes that the Pine Mountain fault has had movement occur along it during the Quaternary. Also, they note that the fault is apparently truncated, offset, or deflected by the San Gabriel fault. This interrelationship with the San Gabriel fault and the Jennings reference (after Crowell, 1968 and Dibblee, 1972)seems to be the sole basis for their classification of the Pine Mountain fault as Quaternary fault.

Ziony, et al. (1974) concluded that the fault cut late Cenozoic deposits, but did not indicate thet the fault was overlain by any younger units.

6. Interpretation of air photos:

U.S. Department of Agriculture aerial photographs, scale 1:24,000, were examined stereoscopically for about two hours. These photos are available from the U.C. Santa Barbara library (map room). For the sake of clarity, the observations made will be discussed by quadrangle from east to west.

Cobblestone Mountain quadrangle: Time did not permit the viewing of aerial photographs covering this quadrangle.

Devils Heart Peak quadrangle: Flight AXI 8K, numbers 110-116: No lineations or features were noted, either along the mapped trace or within about three miles of the mapped trace, that are indicative of recent faulting.

Topatopa Mountains quadrangle: See plate 1. The Pine Mountain fault, as mapped in Givens (1974), does form a prominent fault-line scarp. Offset streams, notches, and breaks in slope were noted either along the mapped trace or within 1/2 mile of the trace. However, with the possible exception of the offset streams, all the features can be found along older faults, formed as the result of differential erosion. Time was limited.

Lion Canyon quadrangle: Flight AKI, 7K, numbers 81-84: No features common solely to recently active faults were noted in this quadrangle. No apparently offset streams were noted. As described in the Topatopa Mountains quadrangle, the fault forms an impressive fault-line scarp which continues across the entirety of the Lion Canyon quadrangle.

Wheeler Springs quadrangle: Flight AXI,7K, numbers 124-125: As in the Lion Canyon quadrangle, no features commonly associated solely with active faults were noted. A fault-line scarp was quite apparent; however, without the benefit of a geologic map it would be difficult to distinguish the fault trace from features formed due to differential erosion of the surrounding rock units. Bedding closely parallels the fault through most of the quadrangle.

Reyes Peak quadrangle: Flight WRD 5D6 (US Geological Survey), numbers 7420-7425: The fault is much more difficult to delineate in this area. Streams are not deflected. From state highway 33 (US 399 on the topo maps) there is not even a fault-line scarp, or other topographic break, such as exists to the east.

Rancho Nuevo Creek quadrangle: See Reyes Peak quadrangle description.

7. Field observations:

On June 23, 1976, I attempted to visit several sites along the Pine Mountain fault. At the point where the fault crosses State Highway 33 (see figure 3) the fault is obscured by landslides. The Forest Service road (6N06) does not cross the fault east of this point.

I also attempted to visit the Topatopa Mountains quadrangle area, however, the road into this area was closed for repairs that week. Before I could return to this area, it was closed by the Forest Service because of extreme fire danger.

8. Conclusions:

All of the references which state that displacement has occurred along the Pine Mountain fault during the Quaternary can be traced back to Dibblee (1972) and Crowell (1968). In no instance do any of the available geologic maps indicate the offset of any Quaternary unit. In fact, several sources indicate that Pleistocene terrace deposits are not faulted. Fault features have usually been described as erosional features (i.e., fault-line scarps, etc.), however primary fault features (fault scarps, offset streams, etc.) may exist, especially in the Topatopa Mountains quadrangle. From the Reyes Peak quadrangle westward, not even fault-related erosional features could be noted on aerial photographs. If the Pine Mountain fault has been active during the Quaternary, it was most likely active prior to the last few hundred thousand years. It is conceivable that the fault may have been active during that period in the vicinity of the Topatopa Mountains quadrangle. However, more detailed work is necessary in this remote area in order to determine if this is, in fact, the case.

9. Recommendations:

Based on the information summarized herein, it is recommended that the Pine Mountain fault not be zoned at this time. Further study could be made in the area of the Topatopa Mountains quadrangle to determine whether or not the features noted from air photos are fault-produced features, and the relative ages of these features. This area is very remote, lying within the Los Padres National Forest, and most likely will not be developed in the near future. Thus such an investigation would probably be given a fairly low priority.

10. Investigating geologist's name; date:

Theodore C. Smith

THEODORE C. SMITH
Assistant Geologist
December 30, 1976

I agree with recommendation not to zone. However, I'm not convinced that additional study would be warranted along this fault.

Earl W. Hart

EARL W. HART
Senior Geologist
January 11, 1977

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figure 2 (from fig. 3. Crowell, 1968).

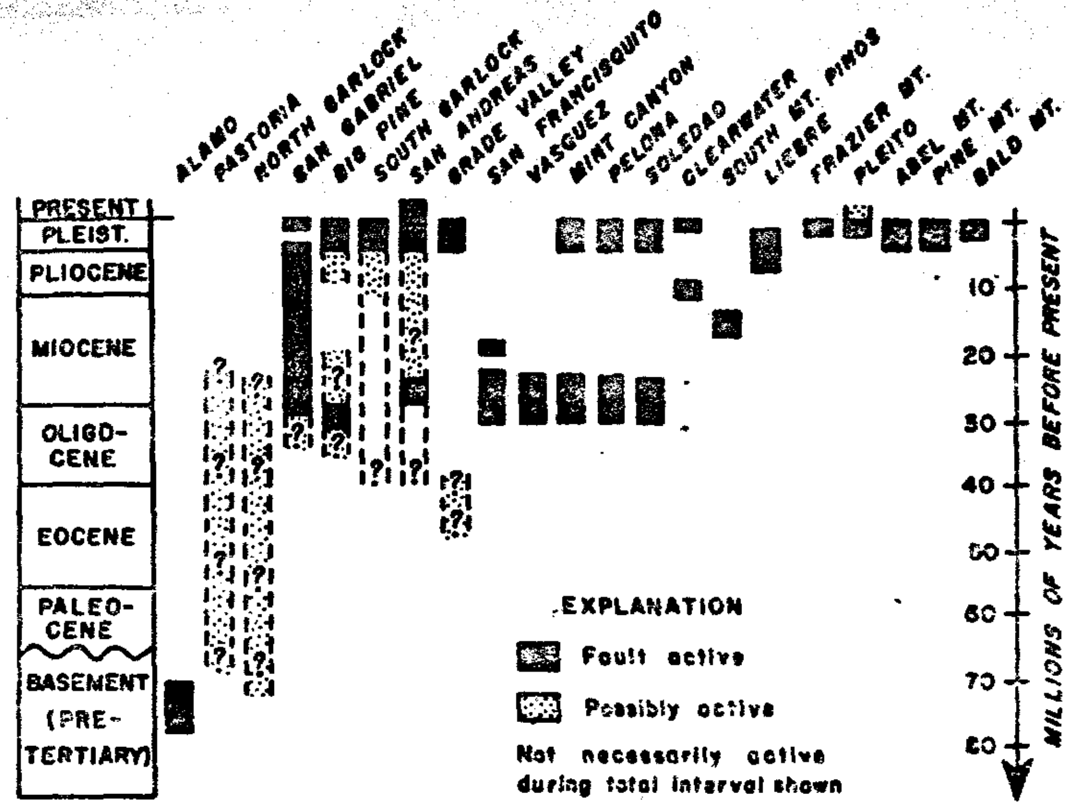

Figure 3--Time of faulting for some major faults of the Tejon Pass and Soledad Basin regions, southern California.

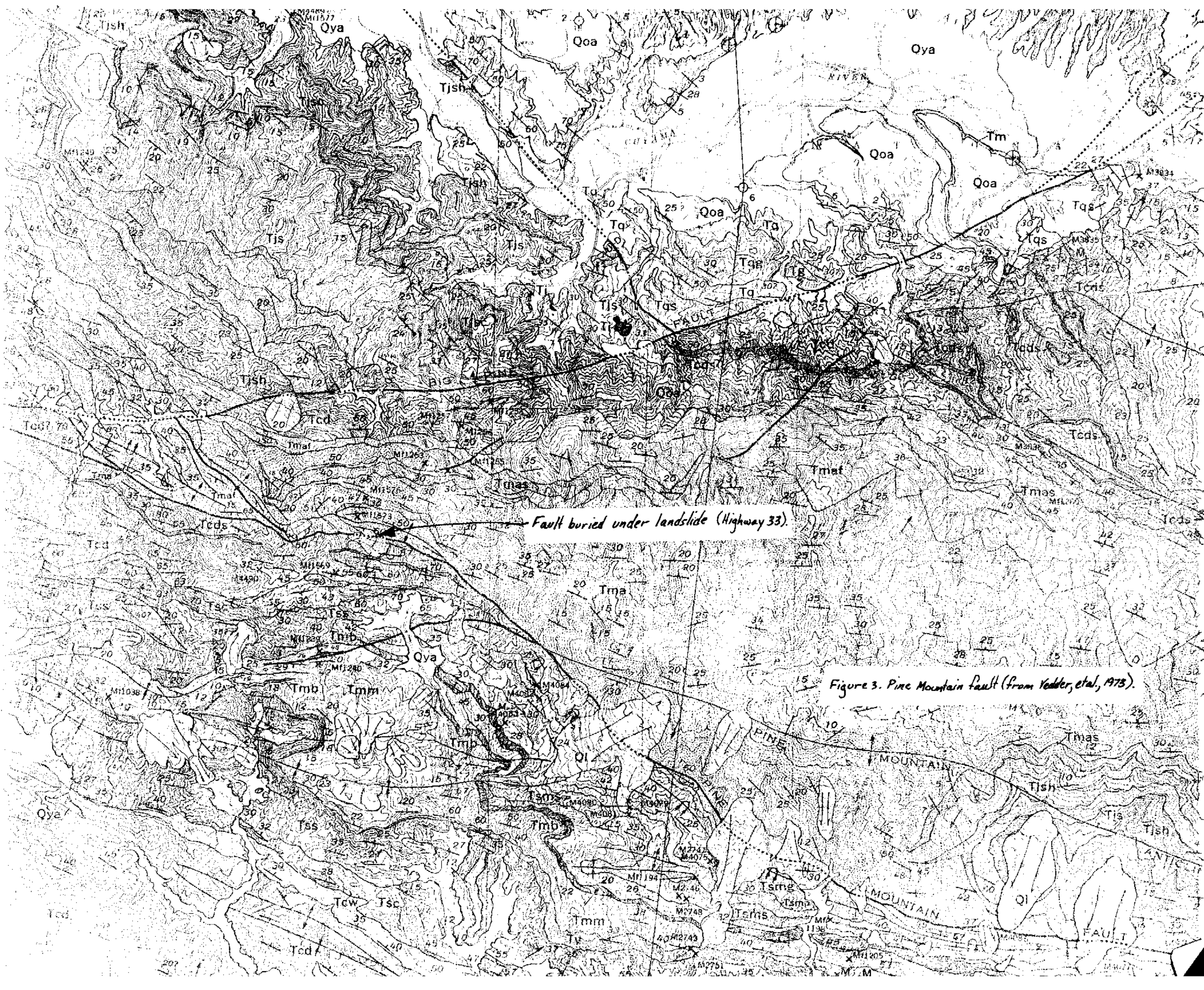

Figure 3. Pine Mountain fault (from Vedder, et al, 1973).