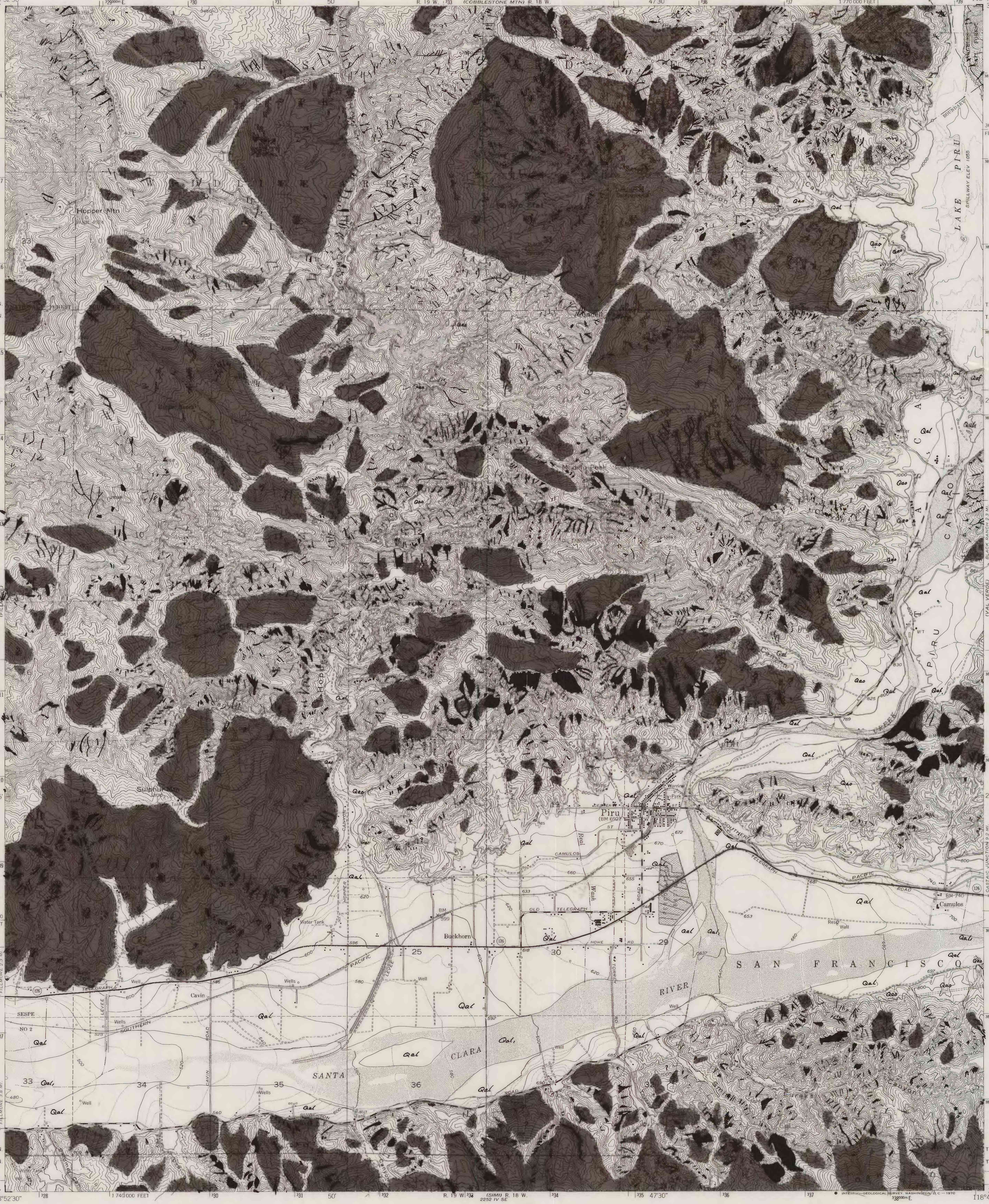
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared in cooperation with
State of California Division of Mines and Geology

U.S. GEOLOGICAL SURVEY
OPEN FILE MAP 76-210



EXPLANATION

Qaf

Artificial fill
Includes major highway fills, dams, and major hillside cut-and-fill areas

Qal

Younger alluvial deposits
Unconsolidated alluvial deposits along major drainage courses. Includes flood-plain deposits, coalesced alluvial fan deposits, occurrences of unit Qal_1, and minor colluvium along margins of upland areas

Qal_1

Alluvium in active stream channels
Major unconsolidated sandy alluvial deposits along drainage courses; subject to fluvial reworking during periods of high streamflow. Devoid or nearly devoid of vegetation

Qao

Older alluvial deposits
Unconsolidated to poorly indurated older alluvium. Includes stream-terrace deposits, dissected or perched alluvial-fan deposits, and older debris-flow deposits. Some areas interpreted to be terrace deposits may be terrace surfaces that are covered by almost no alluvial material

Qc

Colluvial deposits
Major deposits of surficial material resulting from downslope movement chiefly by creep, minor landsliding, and sheetwash

Composite soil slip and debris flow that originated in the spring of 1969

Landslide (other than soil slip) that apparently originated in the spring of 1969

RS

Reactivated pre-1969 landslide or landslide (other than soil slip) within pre-1969 landslide deposit

Scarp not well defined

Hachures indicate well-defined scarp

Feature questionably ascribed to landsliding

Pre-1969 landslides
Areas with morphology indicative or suggestive of landsliding. Where possible, scarp area is included as well as deposit

Contact, approximately located

Closed depression

Landslide scarp

DISCUSSION

Storms in January and February 1969 produced widespread soil slips and debris flows in southern California that caused considerable physical damage and resulted in at least 24 deaths (Campbell, 1975; Kojan and others, 1972; Rice and Foggin, 1971; Scott, 1971). Virtually all the 1969 debris flows began as failures of slabs of saturated surficial material during the time of high-intensity rainfall. For an analysis of storm conditions leading to the formation of these landslides, see Campbell (1975).

Only a few landslides other than soil slips formed in the mapped area during the spring of 1969. A few slump failures developed, most of which were reactivated pre-1969 landslides or new failures of landslide material within a part of a pre-1969 landslide deposit.

The accompanying map gives an inventory of the 1969 soil-slip scars and debris-flow channels and deposits in part of the Santa Clara River valley area. The map was prepared by interpretation of morphological features visible on high-quality black-and-white stereographic aerial photographs taken in August 1967 and July 1969 (scale 1:32,000). Only those features visible on the photographs were used in the determination of the nature and extent of the surficial units; only brief, widely scattered field checks were made.

The map does not distinguish between areas of soil-slip scars, routes of subsequent debris flows, or areas of debris-flow deposition--all are included together. Most of the distinguishable debris-flow scars and deposits were confined to first- through third-order stream basins (Strahler, 1952), although some of the distinguishable largest flows are in higher order basins. Most of the material transported by debris flows will eventually be transported onto major valley floors by fluvial flow.

Recognition and accuracy of delineation of the surficial deposits depends on: (1) age--the younger the feature, the more visible its morphology; (2) extent of areas concealed by deep shadow; (3) sun angle at time of photography; (4) height and density of vegetation; and (5) degree to which man has modified the landscape. Generally, the younger landslides have clearer, more distinctive landslide morphology. With increasing age a landslide is progressively modified and tends to blend with the normal morphology of the surrounding landscape; consequently the viewer's ability to recognize and delineate the landslide is diminished. Recognition based on surface features ceases completely with full integration of the landslide into the surroundings. Field observations also commonly fail to detect landslides largely or entirely integrated into the landscape. Such eroded landslides generally are recognized only in artificial exposures such as those produced by hillside grading operations.

Readily visible features of many landslides are the scarp and crown line. Distal and lower lateral limits are commonly difficult to identify on aerial photographs because: (1) erosion has modified or removed the distal part; (2) vegetation or shadow obscures the topographically low areas; or (3) the toe and lower lateral margins never formed distinctive morphology (some "incipient" landslides have well-defined scarps but did not develop distal parts).

Some large composite landslides, measured in square miles of areal extent, are difficult to recognize simply because they are so large. Such large landslides commonly contain obvious small satellitic landslides that tend to attract attention away from the larger landslide. Landslides smaller than about 300 ft in maximum dimension were difficult to see on the photographs; those suspected of being landslides are marked by a query and are not bounded by contact lines. Areas with morphological features suggestive of but not definitely known to be landslides are queried. Some landslides too narrow to be shown accurately at the scale of this map are indicated by a single arrow. Within large landslides, internal satellitic landslides and scarps are shown where they could be identified. Bedrock is not labeled.

References cited

Campbell, R. H., 1975, Soil slips, debris flows, and rainstorms in the Santa Monica Mountains and vicinity, southern California: U. S. Geol. Survey Prof. Paper 851, 51 p.

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Rice, R. M., and Foggin, G. T., III, 1971, Effect of high-intensity storms on soil slippage on mountainous watersheds in southern California: Water Resources Research, v. 7, p. 1485-1496.

Scott, K. M., 1971, Origin and sedimentology of 1969 debris flows near Glendora, California, in Geological Survey research 1971: U. S. Geol. Survey Prof. Paper 750-C, p. C242-C247.

Strahler, A. N., 1952, Dynamic basis of geomorphology: Geol. Soc. America Bull., v. 63, p. 923-938.

Weber, F. H., Jr., Cleveland, G. B., Kahle, J. E., Kiessling, E. F., Miller, R. V., Mills, M. F., Morton, D. M., and Cilweck, Blaise, 1976, Geology and mineral resources study of southern Ventura County, California: California Div. Mines and Geology Prelim. Rept. 14, 102 p. (in press)

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 10 FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey standards and nomenclature.

PIRU, CALIF.
NE/4 PIRU 15' QUADRANGLE
N3422.5-W11845/7.5

RECONNAISSANCE SURFICIAL GEOLOGIC MAPS OF THE FILLMORE, MOORPARK, PIRU, AND SIMI 7.5' QUADRANGLES, VENTURA COUNTY, SOUTHERN CALIFORNIA

by Douglas M. Morton 1976