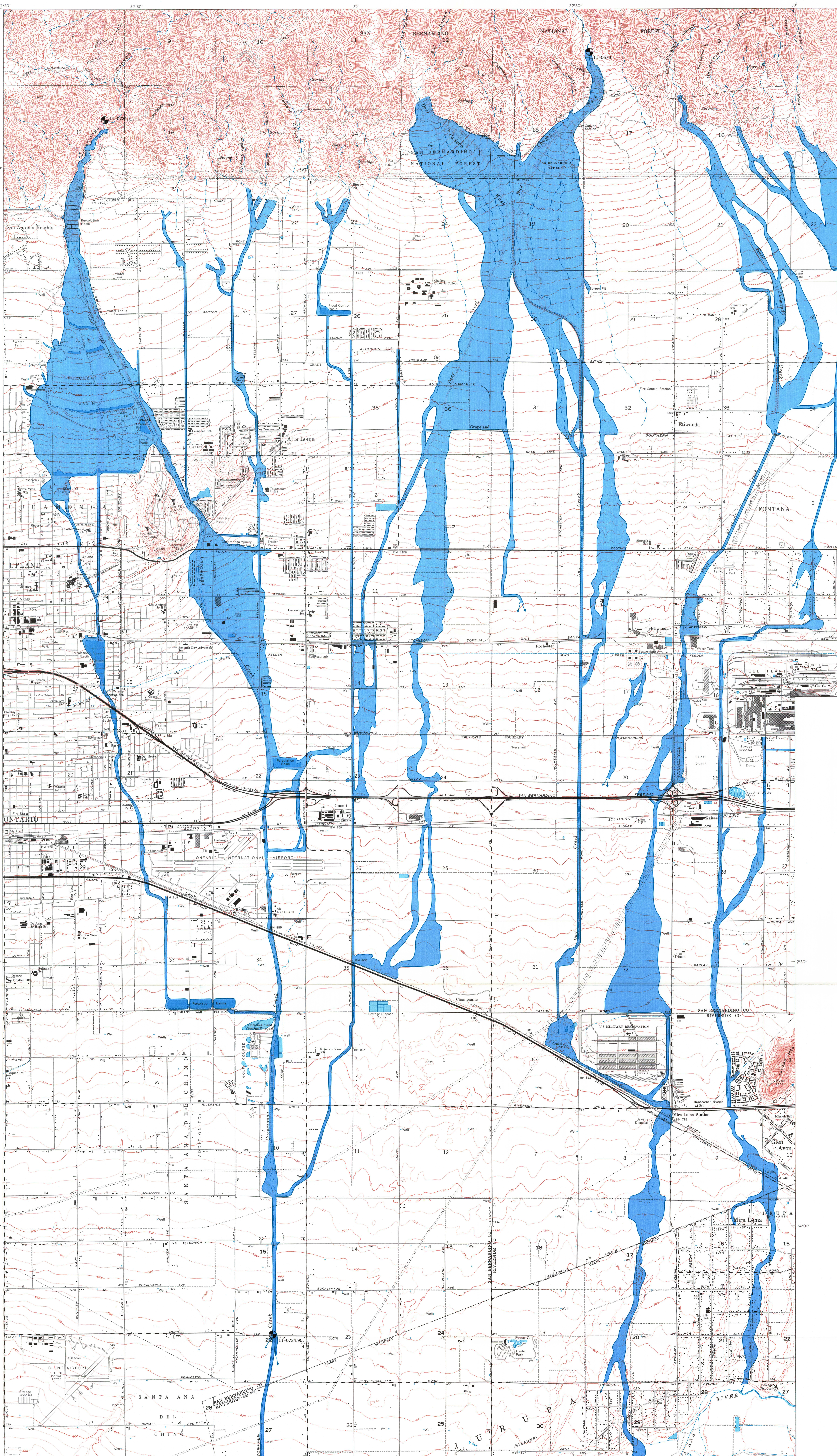

Base from U.S. Geological Survey Ontario, Mt. Baldy, Prado Dam, Fontana, and Corona North, 1967; Guasti, Devore, and Cucamonga Peak, 1966

APPROXIMATE MEAN DECLINATION, 1971

SCALE 1:24 000

CONTOUR INTERVALS 10, 20, AND 40 FEET
DOTTED LINES REPRESENT 5 AND 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

EXPLANATION

Area flooded

Boundary of 1969 flood

Gaging station 11-0670

Area in which overland flow becomes insignificant

FLOOD OF JANUARY 1969 NEAR CUCAMONGA, CALIFORNIA

Severe flooding and debris flow occurred in the Cucamonga area in southern California in January 1969 as a result of heavy storms. The approximate areas inundated by overflows from Cucamonga, Deer, Day, and Etiwanda Creeks and adjacent streams are described in this atlas. The inundation map and graphs show the results of analyses of available data on the extent and frequency of the flood. These data provide a basis for making future decisions concerning development of areas subject to flooding.

The Cucamonga area lies in the foothills of the San Gabriel Mountains about 17 miles west of San Bernardino. Streams in the area drain the south-facing slopes of the mountains and are tributary to the Santa Ana River. The stream channels are short and steep. Part of the floodflow discharged to the extensive alluvial fans constituting the foothill slopes is conveyed in natural and improved channels, and part is dispersed on the fans where percolation is rapid. A large part of the flow normally penetrates into the soils within a short distance from the mountain front.

Severe storms January 18–26 brought heavy rain to the Cucamonga area. Total precipitation at Etiwanda was 15.45 inches of which 8.07 inches occurred January 24–25. Precipitation was heavier in the adjacent mountain areas; a storm total of 42.27 inches occurred at Lytle Creek Ranger Station, elevation, 2,730 feet, 7.5 miles north-northeast of Etiwanda. The resulting floodflows washed out bridges, roads, and culverts, and caused many mudslides. The existing channels were unable to contain the runoff from the mountain areas; the resulting overbank flows spread over the alluvial fans and caused extensive damage, including deposition of sediment and other debris (figs. 1 and 2).

The extent of inundation in the Cucamonga area is shown on a topographic map base that represents a land area of about 120 square miles extending 11 miles along the foothills of the San Gabriel Mountains east from Upland nearly to Fontana. The overflow areas were identified from aerial photographs taken on January 30, 1969, and from field inspections. The principal areas of overflow are shown. The limits of flooding are generalized; thus, some lands not actually flooded may be included within the delineated areas of significant flooding, or small overflows may have occurred outside these limits. The braided type of flow common in the streams in this region is shown by the aerial photograph (fig. 3). The inundation delineated reflects the conditions during the January 1969 floods. Changes in waterway openings at bridges and culverts, channel conditions, extent and condition of vegetative cover in the upland areas, and urbanization may significantly affect the extent of areas inundated by overflows from future floods.

Acknowledgments.—This atlas was prepared under the general direction of R. Stanley Lord, district chief in charge of water resources investigations in California, and under the immediate supervision of James L. Cook, chief of the Garden Grove subdistrict. Technical assistance was provided by Howard F. Matthai, hydraulic specialist, and Arvi O. Waananen, hydrologist. The atlas is one of four prepared to describe the floods of January 1969 in selected areas in southern California as part of the U.S. Geological Survey program to document information in areas inundated by major floods.

Flood heights.—The height of a flood at a gaging station is usually stated in terms of the gage height or stage, which is the elevation of the water surface above a selected datum plane. Elevations shown on the map are in feet above mean sea level. Gage heights at three gaging stations in the report area can be converted to elevation above mean sea level by adding the gage height to the appropriate datum of gage as listed in the following table. The size of the drainage area for each gage is also listed.

Gaging station		Datum of gage above mean sea level (feet)	Drainage area (square miles)
No.	Site		
11–0670	Day Creek near Etiwanda	[a]2,870	4.59
11–0734.7	Cucamonga Creek near Upland	[a]2,360	10.1
11–0734.95	Cucamonga Creek near Mira Loma	655.3	75.8

[a]Altitude from topographic map.

The gage height and year of occurrence of annual floods (highest peak discharge in each calendar year) exceeding a gage height of 4.8 feet at the gaging station on Cucamonga Creek near Upland (11–0734.7) during the period of record 1928–69 are shown in figure 4. All data have been adjusted to the present datum. Not shown are secondary peaks that occurred in 1938, 1954, 1965, and 1966, and which exceeded the 4.8-foot gage height. The erratic time distribution of the peaks is illustrated by the graph. The 12 peaks that exceeded the 4.8-foot stage occurred in just 7 of the 42 years of record. Six of them occurred in the 5-year period 1965–January 1969, whereas only 6 occurred during the entire 37-year period 1928–64. During a year in which an outstanding flood occurs, a separate major flood is not an uncommon event. Such a flood occurred in 1969, when the peak stage on February 25 was 7.51 feet, the third highest in the period of record through February 1969.

Flood discharge.—Discharge is the rate at which water flows, expressed as volume per unit time, usually cubic feet per second (cfs). Peak discharge is the maximum value of the discharge attained during a flood. The peak discharge of 9,450 cfs January 25, 1969, in Day Creek near Etiwanda (11–0670) was more than twice that in March 1938, the previous maximum flow in the period 1927–69. The peak discharge of 14,100 cfs the same day in Cucamonga Creek near Upland (11–0734.7) was nearly 1.4 times that in March 1938, the previous maximum of record. These flows reflect the intensity of the runoff from the basins; runoff in the adjacent streams may have been comparable. The peak discharges decreased in downstream reaches in the foothill areas as a result of diversion by overbank flow, and percolation into the coarse permeable alluvial fans.

Flood frequency.—Frequency of flooding at the gaging stations on Day Creek near Etiwanda and Cucamonga Creek near Upland have been derived from a statistical evaluation of annual flood peaks. The relation among recurrence intervals, gage heights, and discharges are shown in figures 5 and 6. The curves are limited to a recurrence interval of 100 years. Large errors may result if the frequency curves are extrapolated beyond the limits shown.

The relation between stage and frequency usually is comparable to that between discharge and frequency. Changes in the physical condition of channels, flood plains, and structures constricting the streams, however, may affect the stage-discharge and the stage-frequency relations. The frequency curves of figures 5 and 6 are based on channel conditions existing at the time of the January 1969 flood.

The recurrence interval, in relation to flood events, is the average interval of time within which a given flood will be exceeded once. Flood frequency can also be stated as a probability, which is virtually the reciprocal of the recurrence interval for floods greater than the 10-year flood. Thus, a 50-year flood would have one chance in 50, or a 2-percent chance, of being exceeded in any given year. Because the 50-year flood can occur in any year or even in successive years, any inference that such a flood will occur only once during a 50-year period or at regular intervals would be misleading.

The flood of January 1969 in the Cucamonga area has a recurrence interval of more than 100 years, as shown by the frequency curves in figures 5 and 6.

Flood depths and elevations.—Depth of flooding at any specific point can be estimated by subtracting the ground elevation from the water-surface elevation at a specific point. The water-surface elevation can be roughly estimated by the intersection of the ground-level contours with the flood boundary shown on the map. Where no major drainages exist and the water fans out into individual rivulets, depth of flooding ranged from 0–3 feet. Flood stages, and therefore flood depths, tend to vary considerably in areas of shallow depths and high velocities. The depth of flooding and area inundated in future floods of the same magnitude may not be the same because of changes in control structures, channel conditions, and the effects of debris deposits and landslides. In a few instances the extent of the flooding in January 1969 may have been influenced by sandbags and other barriers placed to prevent flooding of buildings and other structures.

Additional data.—Other information pertaining to floods or streams in the Cucamonga area can be obtained at the office of the U.S. Geological Survey, 855 Oak Grove Avenue, Menlo Park, Calif. 94025, and from the following reports:

Waananen, A.O., 1969, Floods of January and February 1969 in central and southern California: U.S. Geol. Survey open-file rept., 233 p.

Young, L.E., and Cruff, R.W., 1967, Magnitude and frequency of floods in the United States, Part 11, Pacific slope basins in California, Volume 1, Coastal Basins south of the Klamath River basin and Central Valley drainage from the west: U.S. Geol. Survey Water-Supply Paper 1685, 272 p.

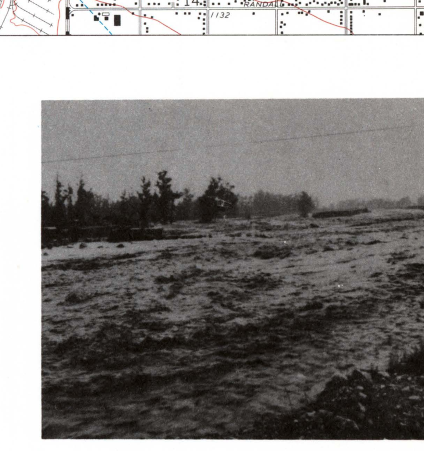

FIGURE 1.—*Cucamonga Creek flow over Foothill Boulevard at crossing near Upland, January 26, 1969. View downstream; note highway guardrails at center. Photograph, courtesy of California Division of Highways, San Bernardino.*

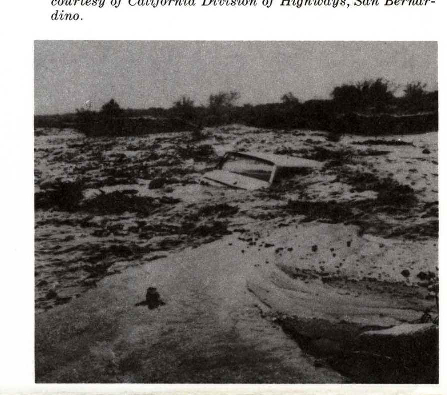

FIGURE 2.—*Channel scour, sediment deposition and flood damage, Deer Creek below Highland Avenue, 2.5 miles west of Etiwanda, February 25, 1969. Photograph, courtesy of California Division of Highways, San Bernardino.*

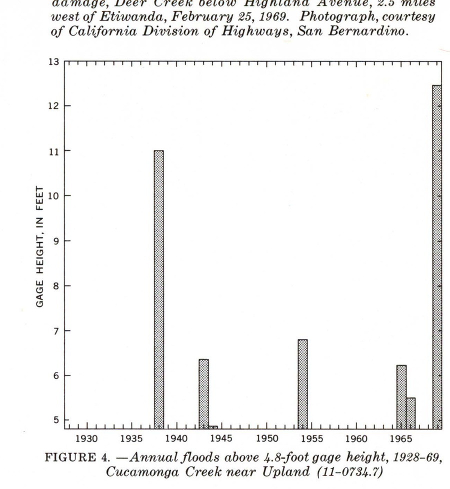

FIGURE 4.—*Annual floods above 4.8-foot gage height, 1928–69, Cucamonga Creek near Upland (11–0734.7).*

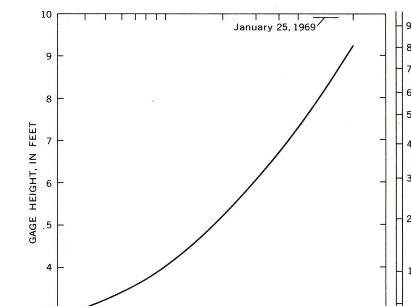

FIGURE 5.—*Frequency of floods at gaging station on Day Creek near Etiwanda (11-0670).*

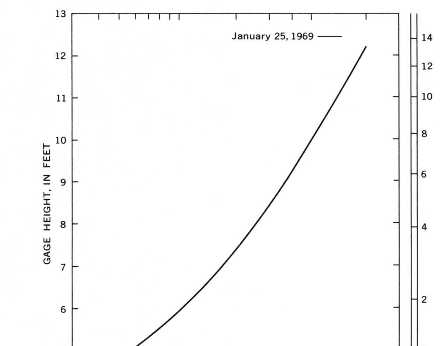

FIGURE 6.—*Frequency of floods at gaging station on Cucamonga Creek near Upland (11-0734.7)*

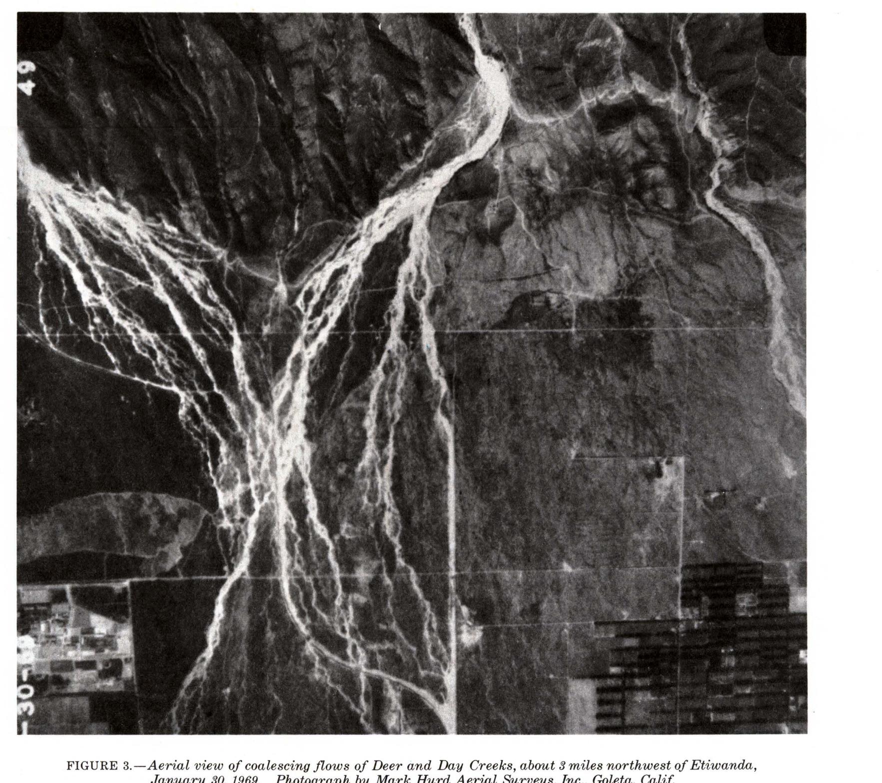

FIGURE 3.—*Aerial view of coalescing flows of Deer and Day Creeks, about 3 miles northwest of Etiwanda, January 30, 1969. Photograph by Mark Hurd Aerial Surveys, Inc., Goleta, Calif.*

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1971

FLOOD OF JANUARY 1969 NEAR CUCAMONGA, CALIFORNIA

By
John A. Singer and McGlone Price
1971

For sale by U. S. Geological Survey, price $1.00