A Record Storm Event on the Alamogordo Creek Watershed in Eastern New Mexico

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On the afternoon of June 5, 1960, a thunderstorm of unusually high intensity occurred on the 67-mi² Alamagordo Creek watershed in eastern New Mexico. This area is situated on the western edge of the Llano Estacado, where it breaks into the Pecos River valley. It is about 35 miles east of Santa Rosa and 40 miles north of Fort Sumner (Figure 1).

[1] In cooperation with the New Mexico Agricultural Experiment Station.

The synoptic situation preceding the storm, as drawn from published daily weather maps, was as follows: a low-pressure center near the New Mexico–west Texas border and a high-pressure center over the Gulf of Mexico were contributing to a northward flow of moist air from the Gulf. A cold front, meanwhile, moving slowly across the central and western Great Plains, had nearly reached the experimental watershed by noon of June 5. Rain in amounts

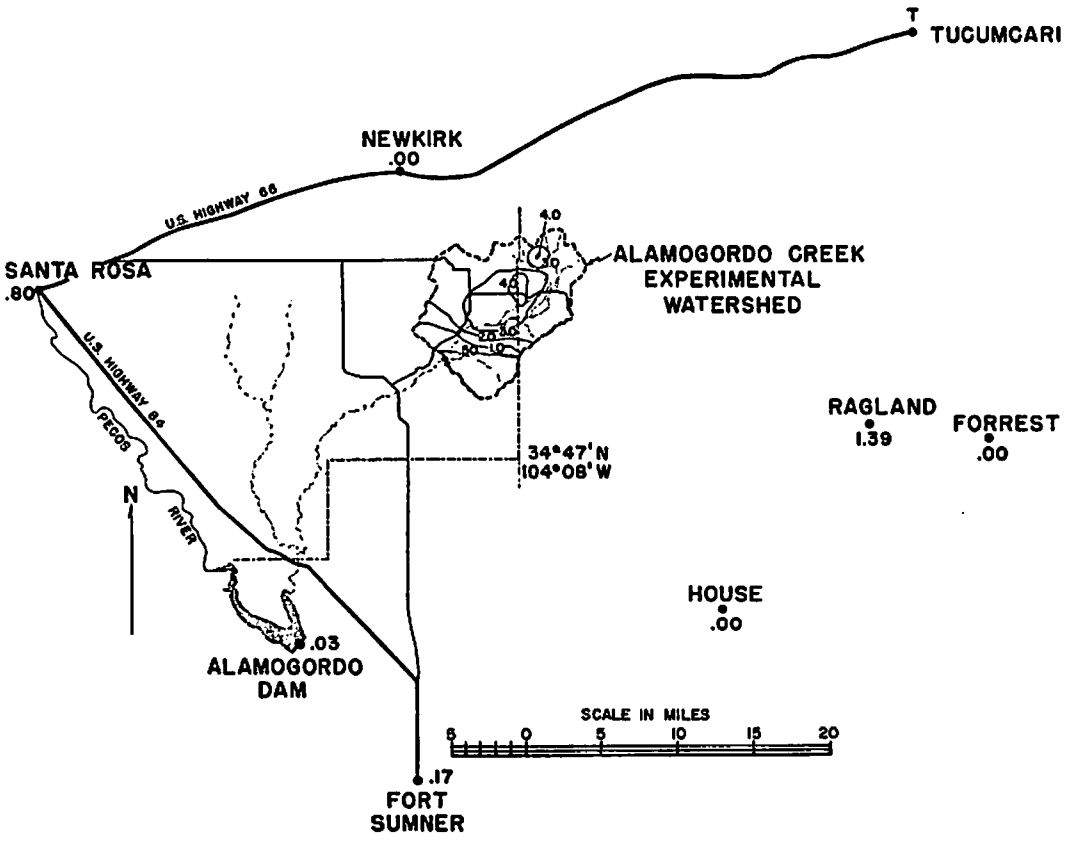

Fig. 1. Alamagordo Creek watershed and surrounding Weather Bureau stations.

of up to 0.75 inch was recorded by first-order stations as the front passed southward through the Texas panhandle and eastern New Mexico. It is probable, also, that strong afternoon convective activity ahead of the frontal system contributed to the high intensities of the thunderstorm under discussion.

As part of a research study in agricultural hydrology, the Southwest Watershed Research Center of the Agricultural Research Service maintains a network of 55 weighing, recording rain gages on the upper 67 mi² of Alamagordo Creek. Figure 1 shows the study area and several nearby stations from which daily rainfall data were available. Figure 2 is an isohyetal map of the storm, showing the locations of rain gages on the study area. From the data in these two figures it appears that the storm was localized and probably centered over the study area, and that, on the study area, rainfall varied from 0.15 inch to 4.09 inches. Five gages recorded 4.00 inches or more. At gage 34, which

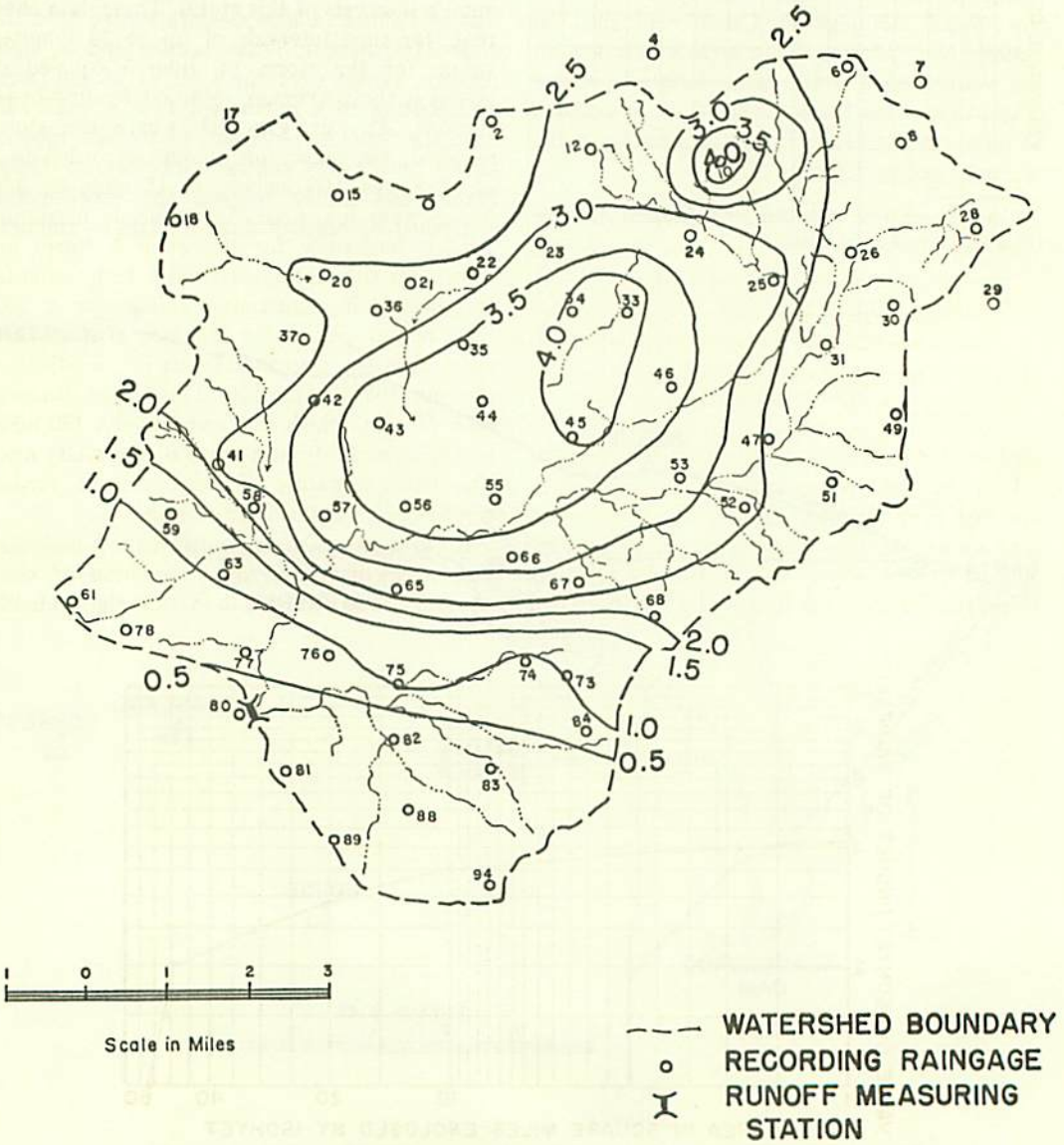

Fig. 2. Isohyetal map, June 5, 1960.

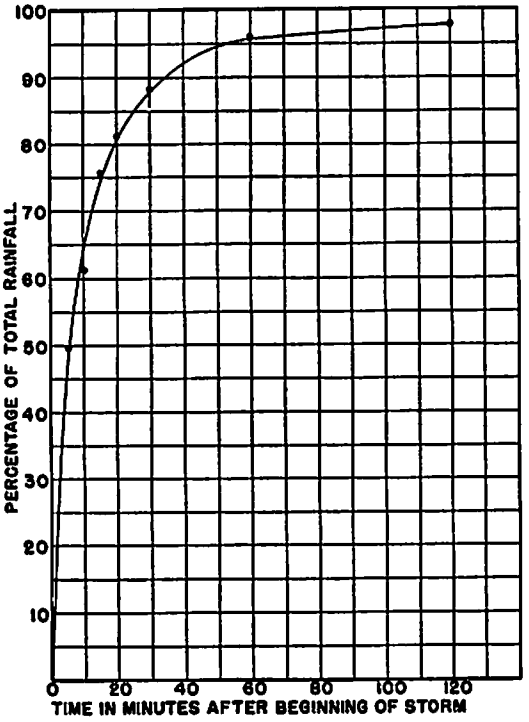

Fig. 3. Time distribution of rainfall at storm center, June 5, 1960.

measured 4.09 inches, 75 per cent of the total fell in the first 15 minutes, and 96 per cent in the first hour (Figure 3). The time distribution was similar at the other gages on the watershed. Figure 4 shows the depth-area relationship. The slope of the line is much flatter than that for any other summer thunderstorm event recorded on this or other study watersheds in the Southwest. Thirty square miles of the study area received 2.5 inches or more of rain, and over 50 square miles received 2.0 inches or more.

The most noteworthy feature of the storm was the intensities recorded for short time intervals. In Figure 5 the maximum point rainfall recorded at first-order Weather Bureau stations in the United States is compared with amounts of rainfall occurring during 5- to 60-minute intervals of this storm. These data show that, for time intervals of up to 30 minutes, values for the storm of June 5 equaled or exceeded the maximum recorded by first-order stations. At rain gage 34, where the storm centered, the maximum amount recorded in 5 minutes was 2.03 inches; in 15 minutes, 3.09 inches were measured. In Table 1, maximum rainfall intensities for the June 5 storm are shown for time intervals from 5 to 60 minutes together with comparable values for a 100-year return period for the two nearest first-order Weather Bureau stations [*U. S. Weather Bureau*, 1955], Amarillo, Texas, and Roswell, New Mexico, which are, respectively, 150 miles northeast and 90 miles south of the study area. The unusual nature of this storm is further emphasized by this comparison.

Records from dense networks of recording rain gages here and on watersheds of comparable size in Arizona show that the probabil-

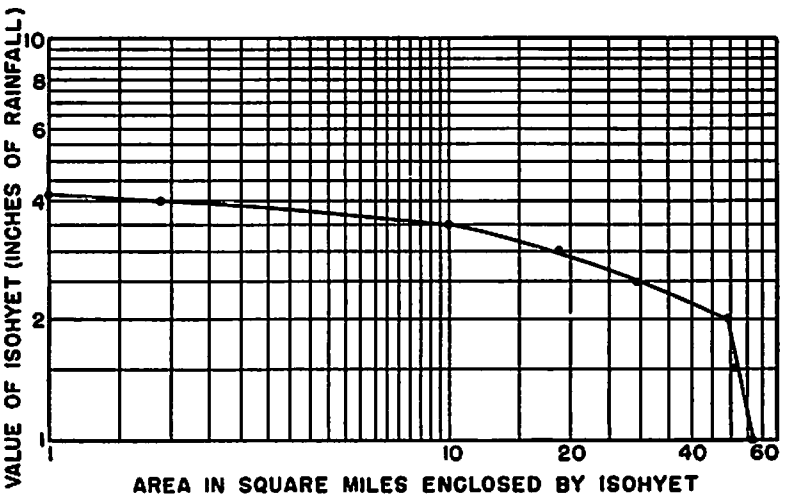

Fig. 4. Rainfall depth-area curve, storm of June 5, 1960.

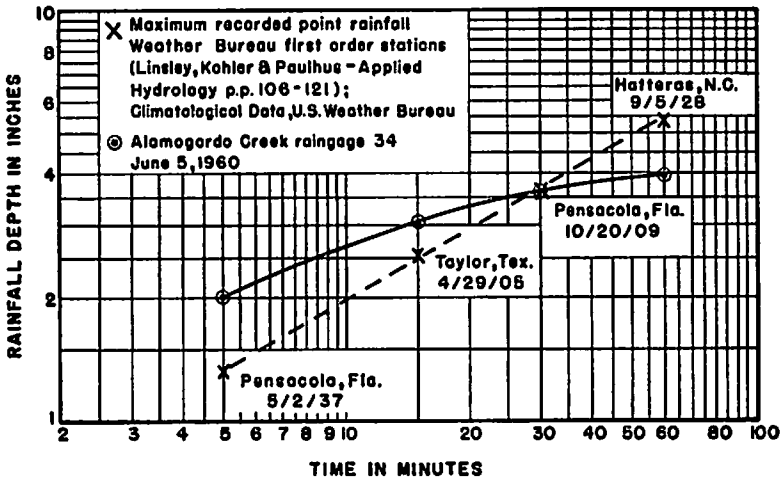

Fig. 5. Comparison of 5- to 60-minute maximum rainfall at Alamagordo Creek watershed with maximums of record for first-order Weather Bureau stations.

ity of recording a given maximum rainfall at one of the gages in the network is considerably greater than that of recording a similar maximum at a single, fixed point. Further, there is evidence that the gage-year concept is valid when applied to the records from gages in such a dense network. Using data from such a network in southeastern Arizona, *Fletcher* [1963] calculated return frequency values for periods of up to 100 years. From 216 gage-years of record, based on lengths of time varying from 3 to 7 years, he obtained values nearly identical to those derived from the 61-year record of the gage at Tombstone, Arizona, which is situated near the center of the network. Thus it appears that records from these dense rain-gage networks may give more realistic estimates of depth-area rainfall relationships than estimates based on longer periods at a point.

TABLE 1. Comparison of Maximum Rainfall Intensities (inches per hour) of June 5 Storm with Values for 100-Year Return Period from Nearest First-Order Weather Bureau Stations

	Time Interval, min				
	5	10	15	30	60
Alamogordo Creek, New Mexico Rain gage 34, June 5, 1960	24.4	15.0	12.4	7.2	3.9
Roswell, New Mexico	8.6	6.4	5.0	3.9	2.5
Amarillo, Texas	9.6	8.0	6.0	5.1	3.3

References

Fletcher, Joel E., Some characteristics of precipitation associated with runoff from Walnut Gulch Watershed, Arizona, submitted to *J. Geophys. Res.*, 1963.

U. S. Weather Bureau, Rainfall duration-frequency curves, *Tech. Paper 25*, 1955.

(Received January 19, 1962; revised April 19, 1963.)