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Rainfall Distribution in Alabama

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Rainfall distribution is the most important climatic factor affecting yields of most crops grown in Alabama. Total rainfall is adequate in most years, but poor distribution causes frequent drought or excessively wet periods that result in reduced yields, lowered quality, and increased production costs.

Average total rainfall is uniform at about 50 to 55 inches throughout the State, except for the Gulf Coast Area. In that region, centering in Baldwin and Mobile counties, the average is above 60 inches per year. Distribution through the year is much more important than the total amount, and this varies considerably between some areas.

Records of rainfall in the past offer the best available basis for predicting rainfall distribution in the future. This study was conducted to delineate areas with distinct rainfall patterns and to determine average distribution of rainfall for each of these areas.

The map on pages 2-3 showing five areas of relatively uniform rainfall distribution was prepared using rainfall records from about 150 stations. Years of record varied from 9 to 49. Statistical procedure used in preparing the map is described on page 4.

Average rainfall for each area by 10-day periods throughout the year is shown in the bar graphs. These graphs also have a curve connecting the average daily rainfall for each month.

APPLICATION

The maps and the graphs should be useful in predicting periods of low or high rainfall in the different areas of Alabama. They can be used as a basis for long range planning of farm operations, such as plowing, planting, fertilizing, irrigating, and harvesting. These operations should be planned in advance to coincide with periods when conditions tend to be favorable. Short range weather forecasts should be used for planning day to day operations. The information in these graphs can be used to supplement data published in Auburn University Agricultural Experiment Station Bulletin 316, "Agricultural Drought in Alabama." This bulletin gives frequency of occurrence of drought based on both rainfall and water use in different areas of the state.

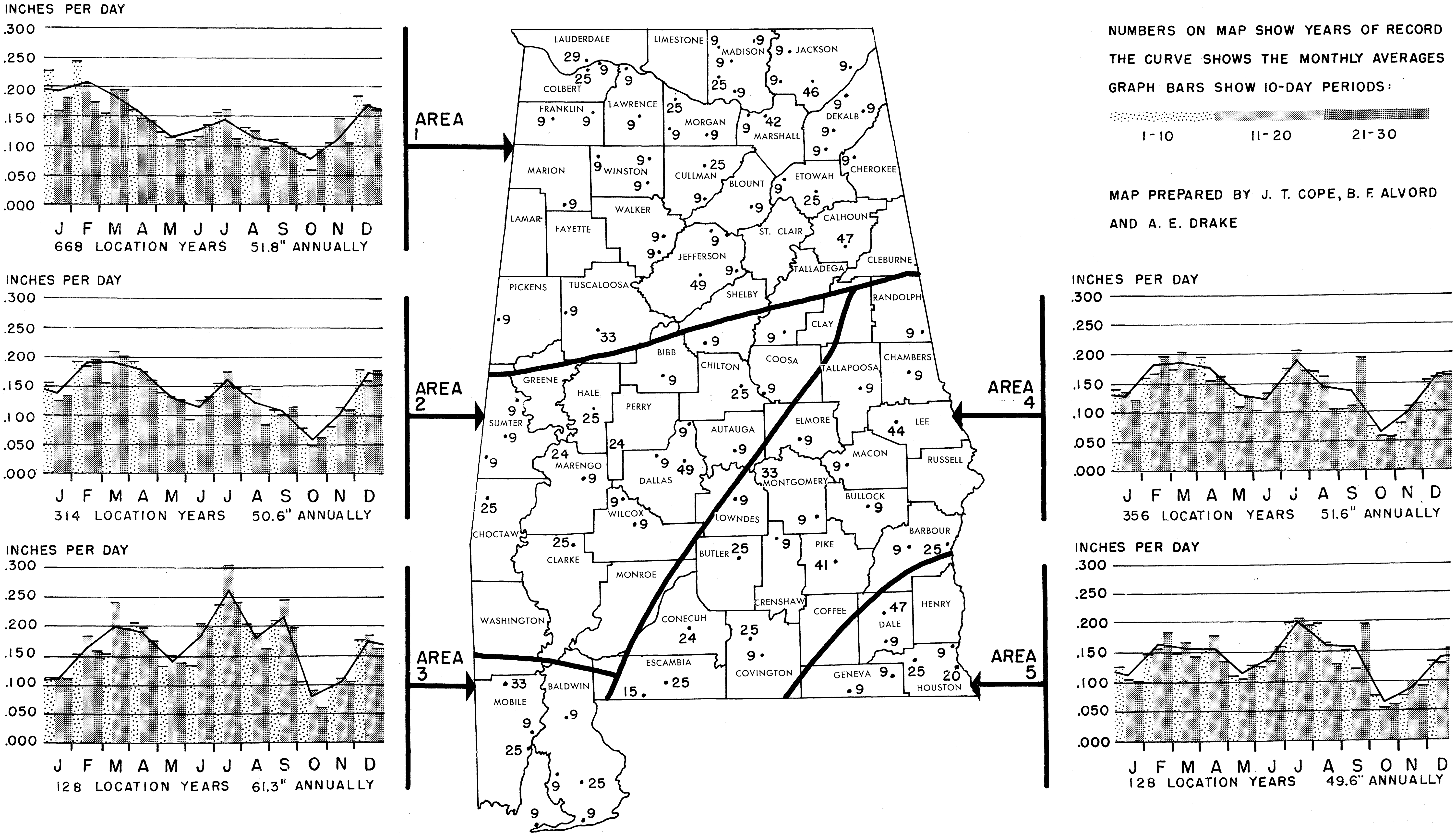
The following general observations on rainfall distribution in areas 1 to 5 are based on the graphs presented:

Area 1. Northern Alabama receives more winter rain than the remainder of the State. Late May and early June are the driest summer periods, with a slight peak in mid-July. It receives less rain in summer and more in the fall than the other areas.

Area 2. West central Alabama receives more rain in February, March, and December than in the other months. Early June is the driest summer period and the summer peak is in mid-July.

RAINFALL DISTRIBUTION IN ALABAMA

AVERAGE PER DAY BY 10-DAY PERIODS



October is the driest month, as is the case throughout the State.

Area 3. The Gulf Coast Area, which includes Mobile and Baldwin counties, receives about 10 inches more annual rainfall than the remainder of the State. Most of this excess falls in the summer and early fall. Rainfall in June, July, August, and September is higher than in any other area. Rainfall in October, November, and December is only slightly greater than in northern and central Alabama.

Area 4. This area includes all of southeastern Alabama except about 4 counties in the southeast corner. Its rainfall distribution is similar to that in area 2, except that it receives more rain in June, July, and August. It also has a pronounced peak in the last 10-day period of September.

Area 5. The Wiregrass Area has a similar rainfall pattern to that of area 4. It receives less rain in February, March, and April and more in July and August than the adjoining area. It shows the same peak in late September, but has less rain in November and December than any of the other areas.

STATISTICAL PROCEDURE

The map showing five areas of relatively uniform rainfall distribution was prepared by using data on some 300,000 IBM cards furnished by the National Weather Records Center of the U.S. Weather Bureau at Ashville, N. C. These cards included daily rainfall for 26 stations for the 25-year period 1933-1957, and for 114 stations for the 9-year period 1949-1957.

From these cards, average rainfall by 10-day periods was determined for each station. Since the last period in January, March, May, July, August, October, and December contains 11 days and in February contains 8¼ days, these figures were converted to average rainfall per day for each of the 36 periods in the year.

These data were punched on cards, and subjected to correlation analyses. Correlation coefficients for each station with every other station in the 25-year group were determined. The same was done with the 9-year stations. These correlation coefficients were used as a basis for grouping the stations into areas within the State.

Maps of Alabama showing county lines and all of the weather stations by number were printed on translucent paper. One of these maps was prepared for each station showing all stations having correlation coefficients of .80 or higher to that station. The area including all of these highly related stations on each map was shaded so that the maps could be compared by laying one over another. These maps disclosed five areas within which rainfall distribution was similar. Boundaries between these areas were not clear and distinct lines but represent transitional zones between areas.

The choice of .80 as the lower limit of the correlation coefficient was in part a theoretical one. The highest correlation coefficient at each station was isolated for the 9-year data. Where duplication of paired stations existed in this list, one of the two values was eliminated. The data were then transformed to Fisher's z-scale[1] and were assumed to be samples from a normal distribution. The mean and the lower confidence limit for the 99 per cent probability level were established for the 9-year data. A retransformation back to the original scale showed the latter value to be about .80. Using this value as the lower confidence limit resulted in a probability level of 67 per cent for the 25-year data. All correlation coefficients above .80 were then assumed to belong to the same rainfall distribution pattern for any one station, while those below this value were assumed to be significantly different.

Weighted averages of the rainfall for the 36 periods were calculated using the stations within each area. Data from some stations located near boundries between areas and that did not show high correlation with either area were not included in these averages. Data from a few stations that did not show high correlation with nearby stations were also discarded. Data from 17 stations obtained in a previous unpublished study by M. J. Funchess and W. H. Weidenbach were included in the averages. These data covered 15 to 24 years between 1901 and 1924. This made data from some stations include rainfall records for up to 49 years.

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[1]Snedecor, George W., **Statistical Methods,** (Fifth Edition, Iowa State College Press, Ames, Iowa, 1956), 175-180.