ILLINOIS RAINFALL

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In presenting the subject of this paper, it seems proper to first lay the ground work on which the data is based, and later to touch briefly upon some of the influences that contribute to the wide variations in rainfall experienced.

Publication of Illinois climatological data was begun in 1887, with the organization of the Illinois Section of the U. S. Weather Bureau's climatological service, with some 60 reporting stations. Equipment of stations, proper exposure of equipment, and a reasonably adequate distribution of stations was advanced as rapidly as practicable to bring the recordings up to an acceptable plane. At present we have 112 well distributed stations in this State, all equipped with standard rain gages, and manned in the great majority of cases by Cooperative Observers who have carefully been selected for their dependability and fitness for the work, as well as their individual interest therein. Expectations are that the number of rainfall stations will be materially increased during the next year or so, with the addition of a considerable number of rate-recording gages, this to particularly meet the needs of engineers concerned in water run-off problems. A material increase in the number of recording stations while not

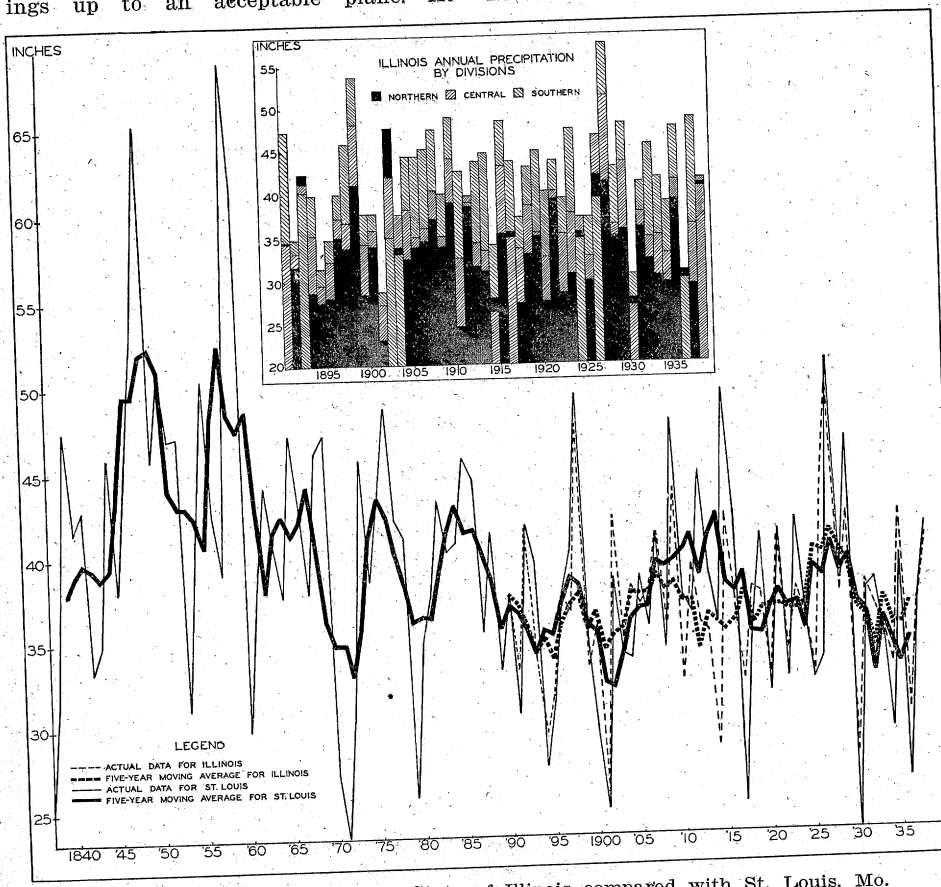

Fig. 1.—Annual precipitation. State of Illinois compared with St. Louis, Mo.

particularly important from the standpoint of computing State and division averages from year to year, is very desirable from many other viewpoints, and especially are more automatic records of rainfall needed.

At this point it seems desirable to emphasize the fine public service our Cooperative Observers are performing. Their careful daily observations throughout the year, Sundays and holidays included, is a remarkable contribution to science when it is considered that they receive no compensation for their work. Their fine calibre of service can not be too highly commended, and among the many cooperative observers we have a few who have made these observations for more than 25 years, 30 who have served for more than 15 years, and one, Mr. O. C. Nussle, of Walnut, who has maintained a continuous and excellent record since 1892. In the United States as a whole there are more than 5,000 of these cooperative observers rendering this day-in and day-out service to their community and the U. S. Weather Bureau; certainly they derive much satisfaction in doing a very useful job extremely well.

Illinois precipitation, based upon a 49-year record, averages 36.67 inches, with the southern division receiving 23 per cent more precipitation annually on the average than the northern division. Annual averages during this period have ranged from 49.39 inches in 1927, to 26.25 inches in 1901. At individual stations annual totals vary from 71.24 inches at Golconda in 1882, to 16.15 inches at Pontiac in 1887. In order to project our State averages backward over a longer period, Illinois average rainfall has been superimposed on a graph over the Saint Louis record. The close relationship in trend will be noted between the two records. In the graph actual records are shown; also the data has been smoothed out somewhat by means of charting a 5-year moving average. It will be noted that during the past 49 years Illinois has experienced about as severe drouths as is indicated by the Saint Louis record of 100 years, and that these severe drouths have occurred with greater frequency during the past 50 years than in the preceding like period. Illinois has had six major drouths since 1890, while only 3 are indicated by the Saint Louis record for the more than 50 years preceding. The five-year moving average quite definitely brings out that the past half-century was not nearly so wet as the half-century preceding, and the Saint Louis record shows by its five-year moving average a timing of about 30 years between its extreme dry periods, with the intervening period of maximum rainfall not so well defined. Unfortunately years of Saint Louis heavy rainfall, 1848 and 1858 precede by a number of years inception of state-wide records in Illinois; however, the few records that are available for this State for 1858 well bear out the Saint Louis inference that 1858 represents the year of maximum precipitation for Illinois in the past 100 years. Based upon 49 years of record the northern division of Illinois receives 28 per cent of its annual rainfall in the spring months, 32 per cent in the summer months, and 26 per cent in the autumn months, the central division 30 per cent in the spring, 29 per cent in the summer, and 24 per cent in the autumn, and the southern division 30 per cent in the spring, 26 per cent in the summer, and 23 per cent in the autumn, showing that on the average for the crop season rainfall is progressively less from north to south across the State; however, while the northern division averages 86 per cent of its annual rainfall during the nine warmer months in comparison with 83 per cent in the central division and 79 per cent in the southern division, the actual average amounts for that period vary by only a few inches because of the usually larger average rainfall values with advance southward. Further comparison between the three divisions of the State shows that the north is less subject to wide variations from normal than the south. Blocks on the graph represent annual precipitation for the three divisions.

There are possibilities of monthly amounts ranging from nearly 10 inches to about 20 inches, available records for individual stations giving maximum totals exceeding 11 inches in every month except December, and December has a record of 9.53 inches. Monmouth recorded 20.03 inches in September, 1911, Shawneetown 19.04 inches in January, 1937, and Anna 18.21 inches in June, 1928. Several stations on the Illinois side of the Ohio River during the great flood of January, 1937, recorded from

about 17 to 19 inches during a 25-day period. The greatest amount within the State for a 24-hour period for which we have a record is 10.25 inches at LaHarpe on June 10, 1905. Several other stations in various parts of the State have recorded from 7 to 9 inches within a similar period of time.

The natural question arises as to the meteorological causes for these large variations in amount of precipitation, and the source of the moisture that on the average provides Illinois with roughly 150 billion tons of water annually. Evaporation of water within the State, from the Great Lakes, and to the areas to our westward and southwestward do of course contribute a small part of this enormous volume of water; however, our main source of supply is the Gulf of Mexico from which warm, moisture laden air is brought by the southerly winds devedoped in front of low pressure areas advancing in our direction from the west and southwest. These northerly moving masses of warm, moist tropical air moving up in front of a "Low" meet masses of cool polar air associated with the rear section of the "Low", and as the lighter and warmer tropical air glides upward over the denser polar air, the gain in altitude of the tropical air forces cooling and condensation of its vapor. The frequency and development of these low pressure processes, the period of time they function over a given area, and the favorableness of conditions for the moving northward of moist tropical air together with the contrasting presence of cool polar air are factors that largely determine abundance or deficiency of precipitation.