STUDIES IN THE CLIMATE OF OKLAHOMA

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Drought is a hazard from which most counties of Oklahoma suffer. The extreme northeastern and southeastern portions suffer least for lack of moisture.

If approaching drought could be anticipated at planting time many losses might be avoided. To date, adequate means of predicting climatic conditions in the future, for any length of time, are unavailable. The weather records now available may be used to some value in making some favorable guesses. A knowledge of the climatic conditions generally prevailing in an area is of great value in determining the use of the land.

Such catastrophes as the "Dust Bowl" shockingly call to our attention the small heed given by the layman to such factors as cycles in precipitation. The fluctuations in the annual monthly amount of rainfall should be considered in determining the agricultural use of any area. Too, the temperature

of the soil and air at the time of precipitation affects the actual value of precipitation to plants. The amount of run-off is also a contributing factor.

At present there is no meteorological instrument for measuring the effectivenes of precipitation. The value of the precipitation after run-off and evaporation cannot be measured directly. Vegetation itself serves as the most satisfactory means of determining the effectiveness of the precipitation.

The five principal climatic types under discussion are determined by means of natural vegetation. It is true that soil type influences the amount and value of the available water. Likewise do the prevailing winds and their speeds.

These five principal types have developed over the earth because of their basic requirements for moisture. Because of their dependence upon precipitation for their needed moisture these types of vegetation correspond to the climatic regions of the world.

Thornthwaite, Chief, Climatic and Physiographic Divison, Office of Research, Soil Conservation Service, has worked out a formula to determine the precipitation effectiveness (P-E). He has assigned an index value based upon the precipitation and the temperature. The rain forest vegetation type or superhumid climatic region has been assigned the P-E index of 128 and above. To the forest vegetation type or humid climatic region has been assigned the P-E index of 64-127. The subhumid region which has the grassland type of vegetation has been divided into two parts. (With this division, which is used here, there are six types for our present consideration.) The moist subhumid has a P-E index of 48-63 inclusively, while the P-E index for the dry subhumid is 32-47. The steppe type of vegetation corresponds to the semiarid climatic region with a P-E index of 16-31. The vegetation in the arid regions is of the desert type having a P-E index of 15 or less.

Oklahoma has had all six of the climatic types (considering the subhumid as two types, moist and dry) during the years 1900-1939 inclusively though they do not all appear during any one year. During five years (1915, 1918, 1919, 1923, 1928) there appeared only three types *viz*, humid, moist subhumid, and dry subhumid.

Oklahoma, with elevations from 324 feet in the southeastern to 4,978 at Black Mesa, has a continental climate influenced at times by warm moist Gulf air, especially in the eastern portion. There are pronounced changes in the daily and seasonal temperatures. A marked geographical range occurs in the temperature. Its summers are long and occasionally very hot. Stations in Oklahoma have had a maximum of 120° F. The places and times of this high are: Alva on July 18, 1936, Altus on July 18, and Aug. 12, 1936, Poteau, August 10, 1936. Oklahoma's winters are short and comparatively mild, though a low of —27° F was recorded at Vinita, February 13, 1905 and at Watts on Jan. 18, 1930. The winters are comparatively dry since Oklahoma has the Plains type of rainfall with the late Spring maximum.

The mean annual temperature is 60.5° F (which is comparable to the month of March). The highest mean temperature of 64° F occurred along Red River, while the lowest of 54° F occurred in the Panhandle. The warmest years on record, 1933 and 1934, had average temperatures of 63° F. The coldest year on record was in 1892 with an average temperature of 58.2° F.

More than 80 per cent of the precipitation during the year falls during the growing season, but temperatures of 100 degrees or more may be expected during the months of June, July, August, and September. July is the warmest month with an average over 40 years of 81.4° F. The average maximum for July is 94.6° F, while the average minimum for the month is 68.2° F. These temperatures will affect the effectiveness of the rainfall, which ranges from 51.73 inches at Antlers to 17.94 inches at Kenton. The normal climatic types for Oklahoma include the humid, moist subhumid, dry

subhumid and semiarid in rather distinct strips running north and south across the state. All counties east of a line drawn from near the northwest corner of Craig to about the center of the east-west boundary of Choctaw are in the humid climatic type as determined by the P-E index. The moist subhumid extends west of this line to about the center of Grant county on the North and the western border of Jefferson county on the South. The dry subhumid extends thence to 100° 15' West Longitude while the remainder of the Panhandle is covered by the semiarid.

The arid climatic region appeared in the state in 24 counties during 7 different years (1910, 1930, 1933, 1934, 1935, 1936, 1937). The greatest number of counties were arid in 1910, during which time there was neither humid nor superhumid within the state.

In a total of 7 years (1908, 1907, 1915, 1918, 1919, 1923, 1928) the state did not have a semiarid region. In 1900, 1901, 1910, 1917, 1925 and 1936 the dry subhumid condition reached the eastern border of the state. Bartlesville, with an average of 37.25 inches, had the lowest amount (20.85 inches) of precipitation on record in 1910, while the second lowest of 23.66 was in 1917. Tahlequah had its lowest record of 30.61 inches in 1925 compared to a normal of 42.38.

The moist subhumid covered most of the state east of the 100th meridian for eleven years ,and all of the state from 100° West Longitude eastward had moist subhumid climate for two years (1905, 1923). Oklahoma had humid climate in 1901 in only small parts of Delaware, Adair and Cherokee counties and all the remainder of the state was dryer. However, in 1905 the humid climate covered all of the state east of the eastern boundary of Kay diagonally to the corners of Harmon and Beckham counties, with the exception of a small corner of the southeast which had a superhumid climate. The only other time during the 40 year period when superhumid conditions occurred in Oklahoma was in 1908 when Okfuskee and parts of the surrounding counties had a P-E index of 128 or above. Cimarron county was not completely slighted, for in 1919 it had a large part of its area in the humid climate.

No county in the state had an arid climate every year and none had a semiarid climate every year. All parts of the state had dry subhumid or semiarid climate at some time except Ottawa, Craig, Delaware and parts of Nowata, Rogers, Mayes, Cherokee, and Adair.

The driest year on record occurred in 1910, which was followed closely by 1901 and 1936. In 1910 the arid climate extended from the west central part of the state to the west border of Caddo county. No county has had a consistant P-E index year after year.

TABLE I

Precipitation for Seven Scattered Stations for the Years 1905, 1910 *with Average for That Station for* 1900-1939

STATION	PRECIPITATION, 1905	PRECIPITATION, 1910	AV. PRECIPITATION
Kenton	24.30	10.51	17.94
Woodward	18.75	14.01	25.10
Mangum	36.25	10.86	27.40
Oklahoma City	35.54	17.27	31.59
Stillwater	38.59	18.22	33.57
Tishomingo	42.45	20.39	37.89
Ada		26.99	37.89

TABLE II

Summary of Climates in Certain Counties and the Number of Years of Each Type of Climate.

COUNTY	ARID	SEMIARID	DRY SUBHUMID	MOIST SUBHUMID	HUMID	SUPERHUMID
Carter	0	2	12	23	19	0
Cherokee	0	0	4	14	27	0
Cimarron	6	27	16	2	1	0
Greer	1	15	27	13	1	0
Payne	0	2	7	17	10	0
Washington	0	1	5	16	22	0
Woodward	1	9	21	17	2	0

The western counties of Cimarron, Greer and Woodward had the greatest range in climate, from arid to humid. Carter, Payne and Washington had a range from semiarid to humid while the least variation of range is here shown in Cherokee county which had a range from dry subhumid to humid.