

#### XIV. OKLAHOMA CLIMAGRAPHS AND BIOTIC REGIONS\*

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The climagraph, or more accurately, the hythergraph has proven of considerable value in the depiction of climatic characteristics, especially from the biological standpoint, as it expresses graphically the climatic rhythm and not merely totals of the two most important factors, rainfall and temperature. The biota of a given region is adjusted, not primarily to the total rainfall or the total accumulated temperatures of the local climate but to the climatic rhythm. Other factors, of course, are effective, but temperature and rainfall are quite obviously among the most important, and the hythergraph is the most convenient me-

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thod of portraying, graphically, the climatic rhythm, in so far as it is concerned with these two factors. The method was first introduced, probably, by Ball, who published an account of his method of graphically representing climate in the *Cairo Scientific Journal* in 1910. He used temperature and atmospheric humidity in his diagrams. Griffith Taylor of Australia was the first to substitute rainfall for mean monthly humidity as one component of the chart. Humidity records are generally unsatisfactory and are not recorded for many stations, while rainfall records are almost universally available.

The method used in representing the climatic rhythm of a given station is illustrated in Figure 1, which illustrates the data for Oklahoma City (heavy lines). The vertical component represents temperature (Fahrenheit), while the horizontal scale represents rainfall (inches). The mean rainfall for January at Oklahoma City is 1.17 inches and the mean temperature is 37.1° F. Thus, for that month a dot is placed at a point 1.17 divisions on the scale from the left margin, and 37.1 divisions from the lower margin. Similarly, for February a dot is placed to represent 1.1 inches rainfall and 38.5° F. and so on for the entire year. Then the points are connected in order and we have a graphic representation of the climate of the station considered. The salient characteristics of the climatic rhythm can be pointed out: Minimum temperature and minimum rainfall in December, January and February. Maximum rainfall in May, maximum temperature in July and August, etc.

For reasons given above the climatic differences between the major biotic regions (climatic formations) are especially well shown by this method, and it occurred to the writer that the state of Oklahoma, lying as it does in a region in which the climatic gradient is comparatively steep might furnish interesting material for study by this method. The results, preliminary in form, of such a study are presented herewith.

Climographs were made for all Weather Bureau stations in the state for which records covering fifteen years or more were available. The observations at all stations do not cover the same period of years, so that an error is introduced on this account. It is hoped that a more thorough study may be made later in such a manner that this error may be eliminated.

Figure 1 contains, in addition to the climograph for Oklahoma City those of Idabel, McCurtain County (light lines) and Kenton, Cimarron County (broken lines) to illustrate the climatic

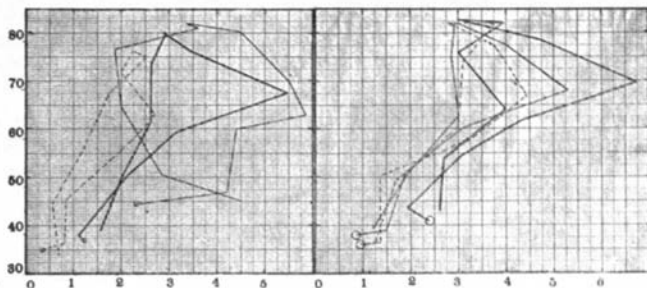


Fig. 1.

Fig. 2.

extremes of the State. The former is the most southeasterly station considered and the latter lies farthest to the northwest. The contrast in the figures is obvious. All three have May as the month of maximum rainfall and July and August as the warmest months. At all three stations January and February are cold months, but the minimum rainfall is in the late autumn at Idabel and during the winter at the other stations. The small amount of rainfall at Kenton places the graph so far to the left that it barely touches that for Oklahoma City at any point, while the higher temperature at Idabel during the autumnal period of little rain causes the figures to overlap in this region. The May rainfall maximum at Oklahoma City is as great as that at Idabel, but no other month approaches it, while at Idabel January, March, April, June and July all have more than four inches of rainfall. The figure for Tahlequah, Cherokee County is much like that for Idabel, but without the autumn rainfall minima. It shows a similar high point in March. Vinita, Bartlesville and Pawhuska are similar, but cooler and drier during the winter months.

Other series of stations with similar climographs are a) McAlester, Hartshorne, Ho'denville and Ada; b) Muskogee and Tulsa; c) Okmulgee, Cushing, Chandler, Oklahoma City, Pauls Valley, Ardmore, Ravia and Healdton; c) Newkirk, Ponca City, Stillwater, Kingfisher, and Chickasha; d) Mangum, Enid and Ada; e) Cheyenne, Woodward and Beaver. Within these graphs the variations, on a north and south line, are mainly in the vertical position of the graph and do not involve differences in the shape of the climograph. The following are illustrated in Figure 2, as examples of the series:

- a) McAlester (heavy lines)
- b) Oklahoma City (Fig. 1)



Further studies should take into account, not only averages, but critical years which have a very great influence in delimiting the distribution of species at or near the borders of their range.