SIGNIFICANCE OF THE EVAPORATION-TRANSPIRATION FACTOR IN OKLAHOMA

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The evaporation-transpiration factor, or "nature's take" provides two novel concepts that are significant in analysis of climatic influences and requisite to optimum environmental adjustment under actual conditions in Oklahoma. First, it emphasizes in mathematical terms the fundamental difference which exists in moisture relationships between the humid and semi-arid sections of the State. Second, it graphically reveals on a map of Oklahoma a pattern of distribution of evaporation and transpiration that is strikingly at variance with previously prepared representations based only upon climatic data.

Agriculture, manufacturing, flood control and stream regulation, and construction activities, in which Oklahomans are interested, could be more satisfactorily regulated by taking cognizance of the great difference in evaporation conditions on watersheds as shown by this method. Previous application of such information by the U. S. Corps of Engineers has been limited to runoff studies.[1]

The evaporation-transpiration factor is expressed as the derived difference between effective precipitation and total runoff, and is calculated on a yearly basis. To understand the technique of computation necessitates an understanding of the two terms ,"effective precipitation" and "runoff", as defined for this purpose.

[1]*Oklahoma Water.* United States Geological Survey, Water Resources Branch, Oklahoma Planning and Resources Board, 1945.

Effective precipitation is calculated by the equation:

$$P_e = (1 - C_p)\ P_a \text{ plus } C_p\ P_s \text{ or } P_a + C_p\ (P_s - P_a)$$

P_e equals annual effective precipitation, in inches; P_a equals annual observed precipitation, in inches for a given year; P_s equals annual observed precipitation, in inches, for the antecedent year; C_p equals a fraction representing the weight assigned to the antecedent year; $1 - C_p$ equals a fraction representing the weight assigned to a given year.

"Runoff" is determined as the surface and ground water loss that finds its way into streams where the water is measured as flow. With isohytel lines determined for a particular year, it is possible to ascertain, by means of a planimeter, the amount of precipitation for a drainage area. Then, by use of the arbitrary formula explained previously, it is possible to compute the effective precipitation. Runoff records are used. Subtraction of the runoff from effective precipitation yields the evaporation-transpiration factor for the year.

The method reveals that there is a very rapid transition in climatic and hydrologic attributes from east to west within Oklahoma. Locations only fifty miles apart reveal as great a difference in evaporation as will be found over a distance of two hundred miles in Nebraska. Hence, the evaporation-transpiration factor is particularly applicable to research in Oklahoma.

Watersheds were grouped on a map into evaporation-transpiration units of the same intensity. It was discovered that each of these units assumed an overall, distinctive elongated, triangular shape with its apex extending far westward.

The pattern of distribution is unique in that it is at odds with those maps previously drawn using only climatic criteria. With understanding of this distribution of available moisture for crops and for pasture in certain areas of the state, betterment of man's adjustment to the environment should be forthcoming with larger crop yields and other beneficial results. However, to test validity and practical application of the methods and the information it provides will require further research in field and library.