THE APPLICATION OF THORNTHWAITE'S WATER BALANCE METHOD TO THE LA MOINE RIVER BASIN IN WESTERN ILLINOIS

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ABSTRACT

Throughout recorded history, civilizations have always been dependent upon an adequate supply of fresh water for survival. Increasing population and the associated industrial growth have placed considerable pressure on the limited fresh water supply in many areas of the world requiring the local populations to budget their water supply.

In order to budget a water supply properly, it is necessary to determine the amount of water available for a particular location at various times during the year. In 1948, a technique was devised by C. W. Thornthwaite for determining the water balance of a basin. Other researchers have also devised techniques for the determination of a water balance. However, Thornthwaite's technique was chosen for this study because of its simplicity, accuracy, and nation-wide success.

This study applied C. W. Thornthwaite's technique to determine the water balance of the La Moine River Basin in western Illinois. The results of the study revealed the technique to be the most applicable with yearly values and less reliable as the time frame became more restricted. When the monthly values were examined by correlation analysis, the best relationships between actual and

predicted runoff occurred during the fall. This was caused by cooler temperatures during the fall which reduced the amount of moisture lost to the atmosphere from soil evaporation and plant transpiration. The cooler temperatures in combination with the more even distribution of frontal precipitation over the basin resulted in quicker responses between actual rainfall and stream discharges. This situation resulted in the very high correlation coefficients during this season.

The greatest discrepancy in the relationship between calculated and predicted runoff occurred during the winter season. The low correlation coefficients were probably caused by a combination of two factors. The first factor dealt with the inability of the technique to accurately predict the form of precipitation and the rate of snow melt with only monthly temperature data. The second factor is the accuracy of streamflows recorded at the gauging sites. Ice jams on the river and debris interfering with the equipment making discharge records highly suspect during this time of the year. Even with its several deficiencies, Thornthwaite's technique provides a very useful tool for determining a water balance.

The results of this study provide a comprehensive view of the relationship between precipitation and streamflow patterns in the La Moine River Basin, as well as a background for conducting future work on improving the accuracy of the water balance.