TR-3

Techniques for Hydrograph Synthesis Based on Analysis of Data from Small Drainage Basins in Texas

M. D. Hudlow

- Full Text

The report by the Committee on Surface Water Hydrology of the American Society of Civil Engineers (ASCE) (2) has pointed out that one of the areas in hydrology lacking adequate research is the investigation of runoff from small areas. As indicated by Meier (22, p. 55) and Barnes (4, p. 55), more work is needed for establishing lag time versus basin characteristics relationships Meier also stated that a method should be perfected for fitting unit hydrograph data to mathematical functions in order that computers can be used to generate synthetic unit hydrographs. This study has considered all three of these related areas.

Introduction

The objective of this study is hydrograph synthesis based on an investigation of runoff from small drainage basins in Texas. In addition, a technique is developed for fitting unit hydrograph data to a mathematical function.

The analyses were made for small drainage basins, ranging in size from O.5 to 75 mi2, located in central Texas. However, it should be stressed that techniques used in this study are applicable also to larger basins.

Falling within the scope of this study is the selection of a satisfactory techv-lique for obtalnlng the temporal distribuLion of infiltratiorl For basins of the size under considerationo The period of rainfall excess can then be determined. Correlations were considered between the critical hydrograph parameter, lag, and basin characteristics. In order to broaden the scope of the study, infonmation on lag obtained by two previous investigators (Meier, 22; Espey, Morgan, and Masch, 10) was compared with lag relationships developed in this investigation.

Conclusions

The following conclusions are inferred from this study:

1. The Sherman and Mayer technique (28) appears to be the only practical method available for determining the temporal distribution of infiltration capacity from rainfall-runoff data for basins larger than 1 mi2.
2. On the average, the SCS method and the Snyder method, when used in conjunction with the Pearson type III function, give comparable results.
3. The TWC technique consistently gave poor results.
4. If the lag time is estimated correctly, the Snyder and SCS methods will describe the unit hydrograph satisfactorily. Therefore, lag time appears to be the key hydrograph parameter.
5. The "goodness-of-fit" of the Pearson type III function to the seven unit-hydrograph points computed by the Snyder and TWC method is excellent.
6. The Pearson type III function, when fitted to the seven unit-hydrograph points, satisfactorily describes the shape of the unit hydrograph for the cases of this study.
7. On the basis of the preceding two conclusions, it can be further concluded that the Pearson type III function might be used for fitting observed data when few data points are available.
8. The procedure presented in Appendix B works quite well for fitting a mathematical function, such as the Pearson type III function, to unit-hydrograph data.
9. There is considerable similarity between the dimensionless unit hydrographs of the region.

Texas Water Resources Institute

1500 Research Parkway A110
2260 TAMU
College Station, TX 77843-2260

Phone: 979.845.1851
Fax: 979.845.0662
Email: twri@tamu.edu

TWRI and the Texas A&M Institute of Renewable Natural Resources are working together to foster and communicate research and educational outreach programs focused on water and natural resources science and management issues in Texas and beyond.