
**AWRA 2005 ANNUAL WATER RESOURCES CONFERENCE
Seattle, Washington**

November 7-10, 2005

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**COMPARISON OF METHODOLOGIES TO ESTIMATE
HYDROLOGIC RESPONSE OF TEXAS WATERSHEDS**

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ABSTRACT: Texas Department of Transportation (TxDOT) engineers rely upon the TxDOT Hydraulic Manual for peak streamflow frequency analysis to design bridges and culverts. The TxDOT Hydraulic Manual documents different methodologies for flood frequency analysis and provides guidelines for implementing those methodologies on the basis of watershed drainage area. The manual suggests the use of rational method for watersheds with areas below 200 acres. For watersheds in the area range of 200 acres to 10 sq.mi., the manual suggests the use of NRCS curve number method in combination with NRCS Unit Hydrograph; and regional regression equations for watersheds larger than 10 sq.mi. The research presented in this thesis compares the methodologies documented in the TxDOT Hydraulic Manual and studies the scale issues related with hydrologic modeling. The watershed dataset for the present study was composed of 40 watersheds of varying size range located mainly in central and eastern Texas. For the purpose of addressing scale issues, the methodologies were applied to all watersheds irrespective of the size guidelines suggested by the TxDOT Manual. The peak streamflows for 2-, 5-, 10-, 25-, 50-, and 100-years were estimated for all the watersheds using each of the methodologies. The results were then compared to the peak streamflows estimated from four parameter kappa distribution fitted to l-moments of annual maximum peak streamflow data of each watershed. The comparisons were made based on watershed scale characteristics such as drainage area, main channel length, and basin shape factor. Apart from these methodologies, kappa distributions generated from the regional l-moments developed for the state of Texas were also studied.

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