

# **EVALUATION OF SYNTHETIC RATING CURVES' RELIABILITY FOR CONTINENTAL SCALE FLOOD MAPPING**

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## **ABSTRACT**

The empirical approaches such as the Height Above Nearest Drainage method in conjunction with Synthetic Rating Curves (HAND-SRC) have emerged as particularly appealing alternatives to the traditional flood mapping techniques owing to their lower complexity and data requirements. However, SRCs use DEM derived reach averaged hydraulic properties and, assume 1D steady state and normal depth, and these implicit model assumptions may introduce errors in flood stage and extent estimates. This study investigates the reliability of SRC across continental United States (CONUS) by comparing them to USGS gage rating curves and then evaluating the uncertainty due to these model assumptions. The study finds that these implicit model assumptions significantly contribute to the error in SRC. The accuracy of the SRC is found to be significantly related to the stream characteristics like bathymetry area, slope, two-year flow and drainage area. The study finds that SRCs in coastal areas characterized by low slopes and large drainage areas have higher error and tend to overpredict, while they tend to underpredict in mountainous regions. The SRCs are most reliable for the midwestern plains of Ohio, Mid Atlantic, Tennessee and Upper Mississippi regions, and least reliable for the Rocky Mountains. Further, the study finds that Deep Neural Network models can be effectively used to judge the performance of SRC for ungaged river reaches.