Kansas Department of Transportation

TECHNICAL SUMMARY

A Comparison Study of One- and Two-Dimensional Hydraulic Models for River Environments

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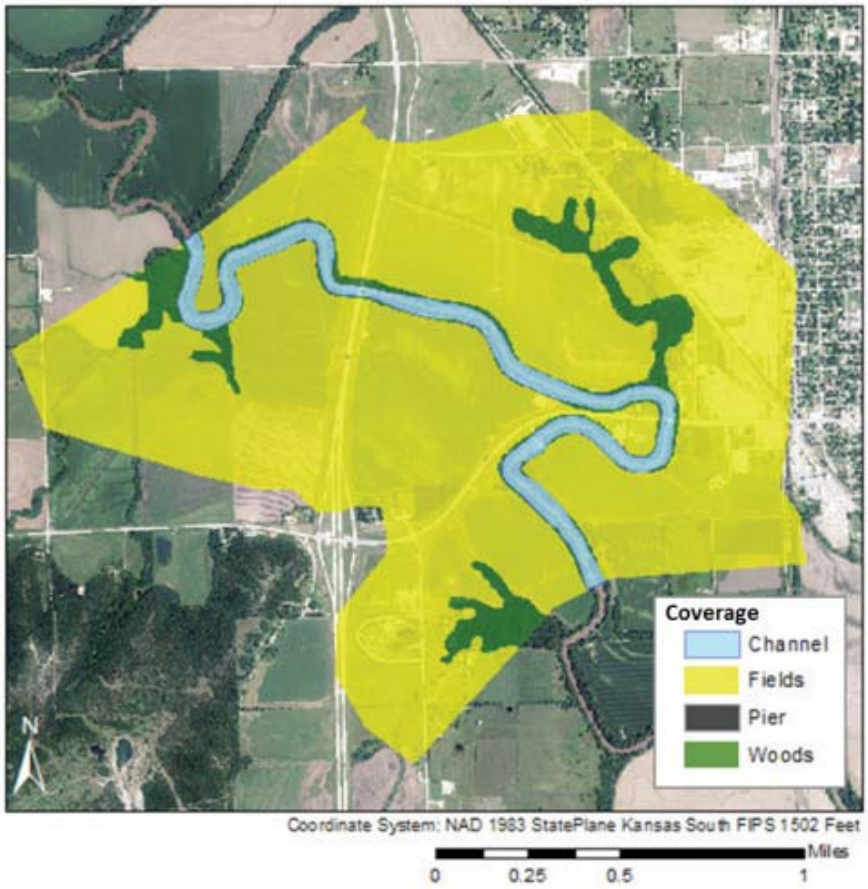
Introduction

Computer models are used every day to analyze river systems for a wide variety of reasons vital to the public interest. For decades most hydraulic engineers have been limited to models that simplify the fluid mechanics to the unidirectional case. With the advent of higher quality data and greater computational power, two-dimensional hydrodynamic models have become practical for widespread use.



Manning's Roughness Coverage Polygons for the Neodesha Floodplain Study Site

Project Description

Two models are considered in this report: HEC-RAS v.5.0, v.5.0.1, and v.5.0.3, and SRH-2D v.3.0. These two-dimensional models were compared to the most common one-dimensional model (HEC-RAS). While the latest version of HEC-RAS is capable of both one- and two-dimensional analyses, previous versions were restricted to one-dimensional flow.

Project Results

Findings in this report include: differences in the flow divisions for multiple opening bridges for all three models, less subjectivity in the construction of the 2D models than for the 1D, differences in the sensitivity of each 2D model to the Manning's roughness coefficient, great similarity in the expansion and contraction rates at bridges for the 2D models when using the full momentum equations with HEC-RAS 2D, differences in the response of the two-dimensional models at steady state conditions to vortex shedding through bridge openings with cylindrical piers, shorter computation times for HEC-RAS 2D than SRH-2D using highly comparable model setups, and in general, higher depths predicted by SRH-2D than HEC-RAS 1D but the highest depths overall predicted by the HEC-RAS 2D full momentum model.

Project Information

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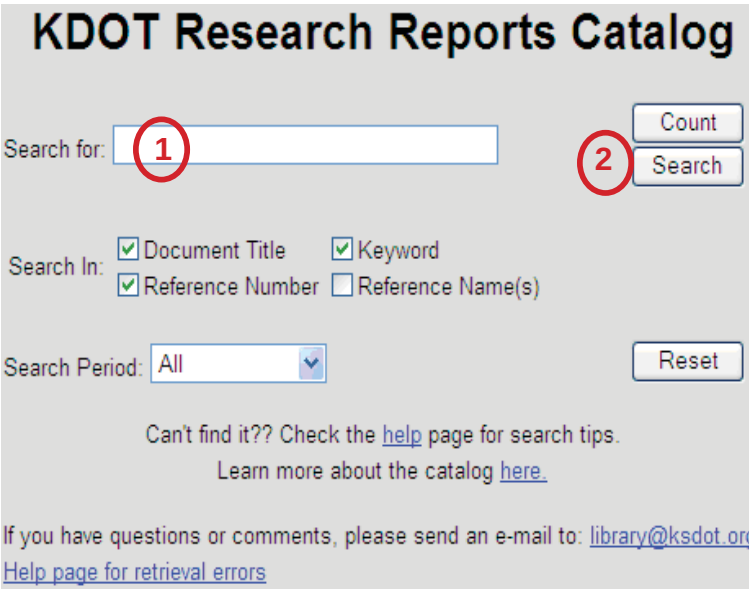

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