Public Abstract

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Title:ASSESSING THE RESOLUTION EFFECTS OF DIGITAL ELEVATION MODELS ON AUTOMATED FLOODPLAIN DELINEATION
A CASE STUDY FROM THE CAMP CREEK WATERSHED IN MISSOURI

Automated floodplain modeling commonly requires Digital Elevation Models (DEMs) to represent the topography. As a raster representation of the Earth surface, changing a DEMs resolution (data cell size) has a profound impact on the floodplain delineation. Since 1995 DEM resolution has increased from 100- to 1-meter resolution. This thesis addresses how different DEM resolutions, and different DEM data sources, affect the outcome of modeled floodplain boundaries in the Camp Creek Watershed, a predominately agricultural watershed in Missouri. Two data sets are analyzed: a Light Detection and Ranging (LiDAR) terrain model re-sampled to 1-, 3-, 5-, 10-, 15-, and 30-meter resolutions and existing United States Geological Survey (USGS) 5-, 10-, and 30-meter DEMs. The floodplain delineation process includes hydrologic modeling, hydraulic modeling, and floodplain delineation. Each process includes various input parameters and outputs. Resultant stream networks, watershed boundaries, and floodplains are examined to evaluate the effects of different resolutions. Using 3- or 5- meter LiDAR DEMs produce data that agree with the 1-m data greater than the 90th percentile. The agreement also includes the 10-m DEM data when analyses remove the floodplain modeling cumulative discrepancy effects. Similar trends were not found when using the USGS counterparts; possibly due to the use of the same underlying source material to create the DEMs. When removing the cumulative distortion effect of resolution on the entire modeling process, LiDAR DEM floodplains displayed a 1-4% increase in goodness of fit. Analyzing the results of two separate hydraulic models (HEC-RAS and CARES) finds little difference between their calculated flood surface elevations. Additionally, the thesis analyzes the data storage needs and processing time for modeling different resolutions, finding substantial savings in both as the underlying DEM resolution is decreased. The thesis begins to analyze how models are affected by input variables but many additional studies are needed. Further study of these variables is needed to determine if a single most appropriate model and DEM resolution exists, or what combination of models are appropriate for various types of automated floodplain modeling.