ASSESSING THE RESOLUTION EFFECTS OF DIGITAL ELEVATION MODELS ON AUTOMATED FLOODPLAIN DELINEATION

A CASE STUDY FROM THE CAMP CREEK WATERSHED IN MISSOURI

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Abstract

Automated floodplain modeling commonly requires Digital Elevation Models (DEMs) to represent the topography. This thesis addresses how different DEM resolutions (data cell size), 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. Resultant stream networks, watershed boundaries, and floodplains are examined to evaluate the effects of different resolutions (cells size). Using 3- or 5- meter LiDAR DEMs produce data that agree with the 1-m data greater than the 90th percentile. Similar trends were not found when using the USGS counterparts; possibly due to the use of the same underlying source data to create the DEMs. The thesis analyzes the correlation between two separate hydraulic models, as well as the cumulative modeling effects of resolution. 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.