Georgia Automated Geospatial Flood Potential Map Development and Analysis for Decision Support

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Abstract. Since 2002, the National Weather Service uses Flash Flood Monitoring Program (FFMP) and Flash Flood Guidance (FFG) to predict flash flood events. However, these programs contain several deficiencies for several forecast areas in the nation. Developing a GIS based model that incorporates basin physiographic characteristics will allow the hydrologist to better predict flash flood events and the area being affected by such flooding. In this study, we have developed an automated geospatial model to determine the flooding potential (three different scale: high, moderate, and low) in the state of Georgia. We also developed in-depth flood spatial analysis of the three counties (Forsyth, Gwinnett, and Hall). The dynamic GIS model parameters used in the model development are: Year 2011 NLCD land cover map (30 cm resolution) to obtain vegetation spatial dynamics; slope- developed from 30 m DEM for topographic distribution; flow accumulation, derived from the 10 m DEM using the Flow Accumulation tool available with 100-years storm distribution spatial data and annual precipitation spatial distribution data of the state using 1981 – 2010 precipitation record along with mean monthly precipitation spatial data for rainy months (April to October ; and soil texture, hydrologic group, permeability, and drainage attributes, derived from STATSGO soil data of the state. All these layers were transformed to raster datasets of same resolution if they were not in raster form using the essential attribute field responsible for flooding potential analysis. The prepared individual raster were reclassified with different assigned weights based on their flood potential ranking, i.e., of least flood potential (1) to most flood potential (9). Finally, each individual layers were overlayed with a weighted overlay analysis using 'Weighted Sum' tool of ArcGIS 10.2. For the weighted overlay analysis, each spatial data layer was given certain weights, judged by their influence in flooding potential. Final output obtained was raster cells with value of 1 (least potential) to 9 (most potential). The final flooding potential map was presented as colored map with scale from 1 to 9. This automated model can be easily replicated in any other watershed or state in the nation by changing the input parameters. The Flood potential map of Georgia was classified into three categories of potential, high, moderate, and low. As the size of the data was too large to be handled by the best of the computers, we analyzed the flood potential map of three metro Atlanta counties as mentioned earlier. Zonal Statistics tools were run on the final spatial product of these counties and statistical tables were developed to show the extent of flooding potential. Individual maps for low, moderate, and high flood potentials were created for these three states. These data were compared with the FEMA flood zone map and it showed some resemblance but many discrepancies.