AN EXPANDED MODEL: FLOOD-INUNDATION MAPS FOR THE LEAF RIVER AT HATTIESBURG, MISSISSIPPI, 2013

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Scientific Investigations Map 3300

ABSTRACT:

Digital flood-inundation maps for a 6.8-mile reach of the Leaf River at Hattiesburg, Mississippi (Miss.), were created by the U.S. Geological Survey (USGS) in cooperation with the City of Hattiesburg, City of Petal, Forrest County, Mississippi Emergency Management Agency, Mississippi Department of Homeland Security, and the Emergency Management District. The inundation maps, which can be accessed through the USGS Flood Inundation Mapping Science Web site at [*http://water.usgs.gov/osw/flood\_inundation/*](http://water.usgs.gov/osw/flood_inundation/)*,* depict estimates of the areal extent and depth of flooding corresponding to selected water levels (stages) at the USGS streamgage at Leaf River at Hattiesburg, Miss. (station no. 02473000). Current conditions for estimating near-real-time areas of inundation by use of USGS streamgage information may be obtained on the Internet at [*http://waterdata.usgs.gov/*](http://waterdata.usgs.gov/). In addition, the information has been provided to the National Weather Service (NWS) for incorporation into their Advanced Hydrologic Prediction Service (AHPS) flood warning system ([*http:/water.weather.gov/ahps/*](http://water.weather.gov/ahps/)). The NWS forecasts flood hydrographs at many places that are often colocated with USGS streamgages. NWS-forecasted peak-stage information may be used in conjunction with the maps developed in this study to show predicted areas of flood inundation.

In this study, flood profiles were computed for the stream reach by means of a one-dimensional step-backwater model. The model was calibrated by using the most current stage-discharge relations at the Leaf River at Hattiesburg, Miss. streamgage (02473000) and documented high-water marks from recent and historical floods. The hydraulic model was then used to determine 13water-surface profiles for flood stages at 1.0-foot intervals referenced to the streamgage datum and ranging from bankfull to approximately the highest recorded water level at the streamgage. The simulated water-surface profiles were then combined with a geographic information system (GIS) digital elevation model (DEM, derived from light detection and ranging (lidar) data having a 0.6-foot vertical and 9.84-foot horizontal resolution) in order to delineate the area flooded at each water level.

Development of the estimated flood inundation maps as described in this report update previously published inundation estimates by including reaches of the Bouie and Leaf Rivers above their confluence. The availability of these maps along with Internet information regarding current stage from USGS streamgages and forecasted stream stages from the NWS provide emergency management personnel and residents with information that is critical for flood response activities such as evacuations and road closures as well as for post flood recovery efforts.

**Disclaimer for Flood-Inundation Maps**

Inundated areas shown should not be used for navigation, regulatory, permitting, or other legal purposes. The USGS provides these maps “as-is” for a quick reference, emergency planning tool but assumes no legal liability or responsibility resulting from the use of this information.

**Uncertainties and Limitations for Use of Flood-Inundation Maps**

Although the flood-inundation maps represent the boundaries of inundated areas with a distinct line, some uncertainty is associated with these maps. The flood boundaries shown were estimated based on water stages and streamflows at selected USGS streamgages. Water-surface elevations along the stream reaches were estimated by steady-state hydraulic modeling, assuming unobstructed flow, and using streamflows and hydrologic conditions anticipated at the USGS streamgage(s). The hydraulic model reflects the land-cover characteristics and any bridge, dam, levee, or other hydraulic structures existing as of December 2013. Unique meteorological factors (timing and distribution of precipitation) may cause actual streamflows along the modeled reach to vary from those assumed during a flood, which may lead to deviations in the water-surface elevations and inundation boundaries shown. Additional areas may be flooded due to unanticipated conditions such as: changes in the streambed elevation or roughness, backwater into major tributaries along a main stem river, or backwater from localized debris or ice jams. The accuracy of the floodwater extent portrayed on these maps will vary with the accuracy of the digital elevation model used to simulate the land surface. Additional uncertainties and limitations pertinent to this study may be described elsewhere in this report.

If this series of flood-inundation maps will be used in conjunction with National Weather Service (NWS) river forecasts, the user should be aware of additional uncertainties that may be inherent or factored into NWS forecast procedures. The NWS uses forecast models to estimate the quantity and timing of water flowing through selected stream reaches in the United States. These forecast models (1) estimate the amount of runoff generated by precipitation and snowmelt, (2) simulate the movement of floodwater as it proceeds downstream, and (3) predict the flow and stage (water-surface elevation) for the stream at a given location (AHPS forecast point) throughout the forecast period (every 6 hours and 3 to 5 days out in many locations). For more information on AHPS forecasts, please see: *<http://water.weather.gov/ahps/pcpn_and_river_forecasting.pdf.>*

This report consists of a pamphlet and 13 map sheets, each sheet with data files, and metadata

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README.txt

SIM3300.pdf

SIM3300\_metadata.txt

SIM3300\_shapefiles.zip

SIM3300\_rasterfiles.zip

SIM3300\_map\_sheets.zip (sheets 1 through 13 in .pdf format)

LeafMS.kmz

Datafiles

 shape files:

 SIM3300\_shapefiles.zip

 02473000\_22 through 34.shp (dbf/.prj/.sbn/.sbx/shp.xml/.shx)

 depth grids:

 SIM3300\_rasterfiles.zip

 leafms\_01 through 13 (.aux/.rrd)

 LeafMS.kmz

Map sheets

 SIM3300\_mapfiles.zip

 SIM3300\_sheet\_1 through 13 (.pdf)

VI. INSTRUCTIONS AND DOCUMENTATION FOR U.S. GEOLOGICAL SURVEY SCIENTIFIC

INVESTIGATIONS MAP XXXX

To access the data:

The data files can be downloaded via the web from http://pubs.usgs.gov/sim/3300.The main product is a Portable Document Format (.pdf) map and pamphlet which requires Adobe Acrobat for viewing. Acrobat software runs on a variety of systems, and is available for download free of charge from Adobe at http://www.adobe.com.

Software Required:

Adobe Acrobat (6.x, 7.x, or 8.x), or Adobe Acrobat Pro (6.x, 7.x, or 8.x), or the free Adobe Reader (6.x, 7.x, or 8.x), 8.x is preferred.ArcGIS 9.3 preferred, older versions may also work.