# American Water Resources Association
# 2010 SUMMER SPECIALTY CONFERENCE
# GIS & Water Resources VI
## March 29 – 31, 2010
**Orlando, FL**

**Tuesday, March 30**
**3:30 PM – 5:00 PM**
**SESSION 23: Flood Inundation I**

**GIS as the Foundation for FEMA Flood Map Modernization Success - Andrea Ryon**, Michael Baker Jr Inc, Alexandria, VA (co-author: Doug A. Bellomo)

The Federal Emergency Management Agency (FEMA) is nearing completion of Flood Map Modernization (Map Mod), a multi-year effort to transform FEMA's flood map inventory from a paper format into a digital format in order to provide communities across the nation with updated flood hazard maps and data. This paper will describe Map Mod goals and accomplishments-to-date as well as benefits to local, state, and regional entities. It will also describe the Risk Mapping, Assessment and Planning (Risk MAP) program FEMA is currently initiating which builds upon the successes of Map Mod. By the end of this multi-year, billion-dollar effort, FEMA will have created modernized, digital flood maps for 92 percent of the U.S. population, covering 65 percent of the U.S. land area. As of September 2009, 81 percent of the population has digital GIS data. Storing and Maintaining the Data and Making it Available for Future Use. A web-based system, the Mapping Information Platform, was developed for use by FEMA and its mapping partners to develop and store the nation's flood hazard data, and provide a standardized national process for map making. Highlights include: * National Flood Hazard Layer (NFHL), a nationwide set of flood hazard GIS data * GIS tools used to create Digital Flood Insurance Rate Maps (DFIRMs), and supporting GIS databases, used by 30 percent of map study projects. * Management functionality: FEMA and its partners track flood study project progress and report on project health and key program indicators. Partnering for Success. Map Mod increases opportunities for sharing common data sets and leveraging resources across all levels of government and industry. FEMA maintains a Geospatial Data Coordination Policy to maximize the use of Federal, State, and local partnerships for the acquisition and production of geospatial data. This policy's goals include recognizing of the value of existing coordination efforts at the State and local levels; and minimizing duplicative requests from Federal agencies to State and local data stewards. Communities contribute in-kind services or data including topographic data, engineering and GIS analyses, Communities utilize FEMA's digital data at the local level for floodplain management and other purposes.

**Flood Map Desktop - Joshua Price**, PBS&J, Denver, CO

Flood Map DesktopTM (FMD) is a freely available ArcGIS 9.3 extension that creates FEMA's DFIRM map panels and database, profiles, metadata, LOMR maps, Scoping Database, and DCS Database. FMD operates on the user's desktop leveraging personal or enterprise databases (through ArcSDE) so the user maintains control over all aspects of their project. Therefore there is no Internet or Citrix connection needed to operate the software and no password or license management since the software is free. FMD uses standards-based, open and scalable software programming so the user is free to write additional code around FMD. None of the standard ESRI ArcGIS features are withheld from the user and, without a rigid workflow, the user is allowed to apply their own process innovations around the FMD software that produces FEMA's standardized products. Development of FMD focuses on a wide range of user skills and user professions creating a product that can be used from GIS novices to GIS experts and from Floodplain Administrators to Floodplain Model Engineers. Therefore a broad range of tools such as: GIS profile creation; automated cartographics; riverine and coastal model import; and quality review are present. This presentation will review the significant improvements of Flood Map DesktopTM for ArcGIS 9.3 and give the audience information for implementation decisions.

**Remote Sensing Approach to Flood Inundation Mapping: Case Studies for Wetlands on the Lower Darling River and in Koondrook Perricoota Forest, New South Wales, Australia - Mustak Shaikh**, NSW Office of Water, Parramatta, NSW, Australia (co-author: Narendra Tuteja)

A remote sensing approach is widely adopted in mapping historical flooding events in the state of New South Wales, Australia. The results of these studies are used in various applications, such as monitoring environmental flows, establishing a relationship between flooding and bird population, wetland condition monitoring and as a validation data for hydraulic modelling. Two case studies are presented here. A remote sensing approach was adopted to determine environmental flow requirements for wetlands in the Lower Darling River. The regulation of river flows upstream has altered the natural flow regime in the river and is likely to be affecting the health of both the river and its wetlands. Landsat Thematic Mapper images corresponding to a number of flood events of different magnitude were analysed and a relationship between river flow heights and wetland inundation was established. Wetlands were grouped according to broad commence-to-flow river discharges. The study concluded that 13,000ML/d (megalitres per day) would inundate approximately 50% of the wetlands along the Lower Darling River, some 10,000Ml/d less than estimated in a previous field based study. Hydraulic modeling of the Koondrook Perricoota Forest (KPF) wetlands adjoining the River Murray in southeastern Australia was performed for historical flooding conditions using MIKE FLOOD in three stages, progressively moving from simple to more complex forms. Validation data sets for model implementation were prepared from remote sensing, field work, mapping of the inundation area from airborne surveys, reconnaissance surveys and local knowledge. Knowledge of the KPF flood inundation process was improved in each stage to better formulate more complex model forms. It was concluded that at flows up to 28,000 ML/d, all three hydraulic models provided similar estimates of the inundation area in the range 0-10%. Results from complex hydraulic modeling were synthesised into simple and practical tools designed for use by water managers and for the application of basin-scale hydrological models incorporating the effects of environmental flow diversions in large wetlands.

**Impementation of New Tools to Manage Flood Risk - Jose Maria Bodoque**, University Of Castilla La Mancha, Top;edp, TOL, Spain (co-authors: Ballesteros-Canovas, J.A., Sanchez, M., Diez-Herrero, A., Nieto, A., Larsen, P.T.)

The approval of the EU flood Directive, on 26 November 2007, deals with the reduction and management of the risk that floods pose to human health, environment, infrastructure and property. In this context, this work is focused on developing a modelling framework that aims to minimize the cost-benefit ratio regarding the total expected costs of several measures within a flood control plan. The study site was the Village of Navaluenga, which is located 110 km West from Madrid, Spain. This urban area was chosen, as the threat to this community from flood hazard events is well documented. The model consisted in a semidistributed hydrologic model, in which de basin model was automatically obtained from a 5 meters grid DEM and applying the ArcGIS 9.2 GIS extension HEC-GeoHMS. This model was calibrated using an automatic routine and subsequently validated. The return-period rainfall scenarios taken into account were 10, 100 and 500 years. With the calibrated peak discharges for each recurrence interval, the 1D/2D hydraulic model MIKE FLOOD was used to delineate flooding areas. Grid generation was obtained from urban mapping available (1: 1000 scale, CAD file format) and based on implementing data management tools existing in ArcGIS 9.2. In a first stage this cartography had to be simplified and later edited in order to correct topological errors and to accomplish spatial adjustments. Previously to the grid construction, an urban TIN was defined editing the natural terrain model with the several elevation data linked to the main man-made features. The hydraulic model was calibrated using scars left by former flood events on riverine trees. The use of this dendrogeomorphologic approach enables to determinate both a conservative estimate of the peak depth and the date. Resulting economic impacts due to the different flood inundation scenarios considered, was done using an object-oriented evaluation based on the urban cadastral map of Navaluenga. A flood control plan consisted of several structural measures is also suggested, so that the abovementioned methodology was revaluated for each one of them. Additionally, a risk analysis was implemented to optimize the cost effectiveness of investments in the structural measures considered.