The Indiana Flood GRID

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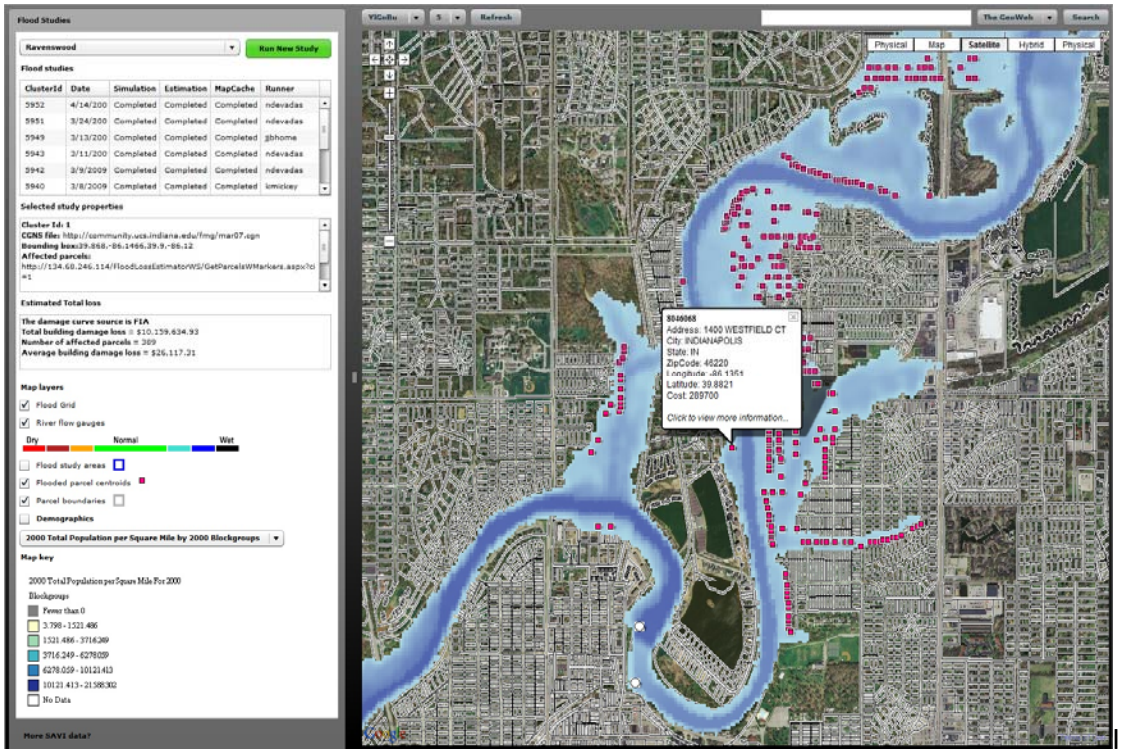
Beginning in 2007, the State of Indiana engaged in a multi-year project to develop the capacity to produce realistic estimates of potential and actual losses from flood events. The primary goals of this project include integration of real-time flood information, locally developed building data, rapid assessment of hazard identification and loss estimates, and eventual access to this information for every community in Indiana. This project is being conducted under the auspices of the Indiana Silver Jackets. The Silver Jackets are an initiative of the U.S. Army Corps of Engineers whose member organizations have a mission of enabling effective sharing of information, leveraging available agency resources, improving customer services, and promoting wise stewardship of the taxpayers' investment. The Indiana chapter of the Silver Jackets presently incorporates participation from several federal agencies including the U.S. Geological Survey (USGS), Natural Resource Conservation Service (NRCS), U.S. Army Corps of Engineers (USACE), National Oceanic and Atmospheric Administration (NOAA), Federal Emergency Management Agency (FEMA), U.S. Department of Housing and Urban Development (HUD), and U.S. Environmental Protection Agency (USEPA); Indiana state and regional agencies including the Department of Natural Resources, Department of Homeland Security (IDHS), Department of Transportation, Maumee River Basin Commission, and the National Guard; and two universities including Purdue University and Indiana University represented by The Polis Center.

The Silver Jackets became interested in HAZUS-MH after members of the organization attended HAZUS-MH training on the HAZUS Flood model conducted by The Polis Center. It quickly became evident to these individuals that one of the most valuable aspects of HAZUS-MH was its ability to integrate accurate point-level building data that defined the location of at risk structures and flood depth grids generated by credible flood studies in other tools. In 2007 the Silver Jackets were able to obtain a multi participant grant to analyze multiple flood scenarios. With this grant, two members of the Silver Jackets, the USGS and The Polis Center, collaborated on the development of a proof-of-concept project. The project involved two areas along the White River in Indianapolis, Indiana; the community of Ravenswood and the grounds of the Indianapolis Museum of Art. Availability of high resolution digital elevation model (DEM) data, a detailed building inventory, USGS/NWS data and extensive historic high water mark and flood elevation data made the selected study area ideal. During the pilot project the USGS developed a practical and credible methodology for combining real-time stream gage data and

National Weather Service (NWS) forecast data with various hydraulic models and GIS ground elevation models for the purpose of defining flood inundation between gage and forecast points and ultimately generating flood depth grids. While the USGS worked to develop the methodology for developing flood depth grids, The Polis Center team created a methodology that automated web-based delivery of GIS maps and the downloadable flood grids so that they could be easily accessed by HAZUS-MH users. The combined methodology included compiling the required HAZUS and GIS datasets; calibrating, verifying and implementing the FastMECH hydraulic model which was ultimately chosen as the most suitable model for the project needs, automating data retrieval from the USGS/NWS to create input files for FastMECH; generating flood depth grids, and performing the HAZUS analysis based on user defined facilities and user provided depth grids.

It was anticipated that by providing HAZUS users ,who are often equipped with limited skills in data management and hazard modeling ,with easy access to accurate hazard and inventory data that HAZUS would not only realize greater potential as a mitigation tool, but also expand as a potential tool for supporting response and recovery activities. This vision was largely realized during the proof of concept phase by being able to perform a HAZUS analysis of the study area based on the improved data in a matter of minutes from the point of creating a study region through generation of loss estimation output. However, this approach still required the user to have access to ArcGIS and HAZUS as well as knowledge of both applications. Therefore, in an effort to further automate the analysis process, The Polis Center, in collaboration with the USGS and IDHS, has also developed a service oriented architecture tool that builds on the lessons learned in the original pilot. This tool integrates the modeling components of FastMech, the loss estimation methodologies of HAZUS, real-time water flow gage data, as well as detailed parcel and HAZUS data, in order to generate a rapid assessment of losses. In order to achieve the desired goals, the Indiana Flood GRID tool has been developed in a heterogeneous environment taking advantage of multiple operating systems, compilers, communication protocols, development frameworks, databases, and file systems. The following graphic shows an example of the prototype interface for this tool.



The IDHS has been an avid supporter of HAZUS since it was created. Since that time they have sponsored numerous classes and trained hundreds of individuals at locations throughout the state. IDHS and their partners have also used HAZUS as a primary tool for developing enhanced mitigation plans for nearly every county in the state. IDHS plans to continue to promote the use of HAZUS, but also anticipates that it will be the combined capabilities of the powerful HAZUS desktop application and tools like the Indiana Flood GRID tool that will ultimately make it possible for communities and those that serve them to be able to more effectively identify hazards, mitigate them where possible, and respond to them when necessary.

The lessons learned in this project include two points that are relevant to the greater HAZUS-MH community. First, the project emphasized the value of integrating accurate hazard data and detailed information about structures at risk for the purpose of generating more accurate loss estimates. Not only does integration of improved data promote additional believability in the model, but it also has the potential to generate credible loss estimates in much less time than might otherwise be possible – especially if generation of that data can be automated as it was in this project. Second, the project suggests one of the many possible directions in which future versions of HAZUS might evolve. The commitment that FEMA has shown to maintaining and improving HAZUS in support of initiatives such as Risk MAP suggests that they will seek opportunities to explore the potential of new technologies, ways to integrate local data, and the means to leverage the research done in projects like this one in order to achieve those goals.