



Using Hazus Loss Estimations for Mitigation Planning

Jamie Caplan
Jamie Caplan Consulting LLC
Northeast Arc Users Group
Smith College, May 17, 2011



What is Hazus?

- Hazus is a powerful risk assessment methodology for analyzing potential losses from floods, hurricanes and earthquakes.
- In Hazus, current scientific and engineering knowledge is coupled with the latest geographic information systems (GIS) technology to produce estimates of hazard-related damage before, or after, a disaster occurs.
- Potential loss estimates analyzed in Hazus include:
 - **Physical damage** to residential and commercial buildings, schools, critical facilities, and infrastructure;
 - **Economic loss**, including lost jobs, business interruptions, repair and reconstruction costs; and
 - **Social impacts**, including estimates of shelter requirements, displaced households, and population exposed to scenario floods, earthquakes, and hurricanes.

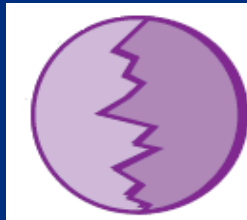
Supported Hazards



Hurricane Winds



**Riverine and
Coastal Floods**



Earthquakes

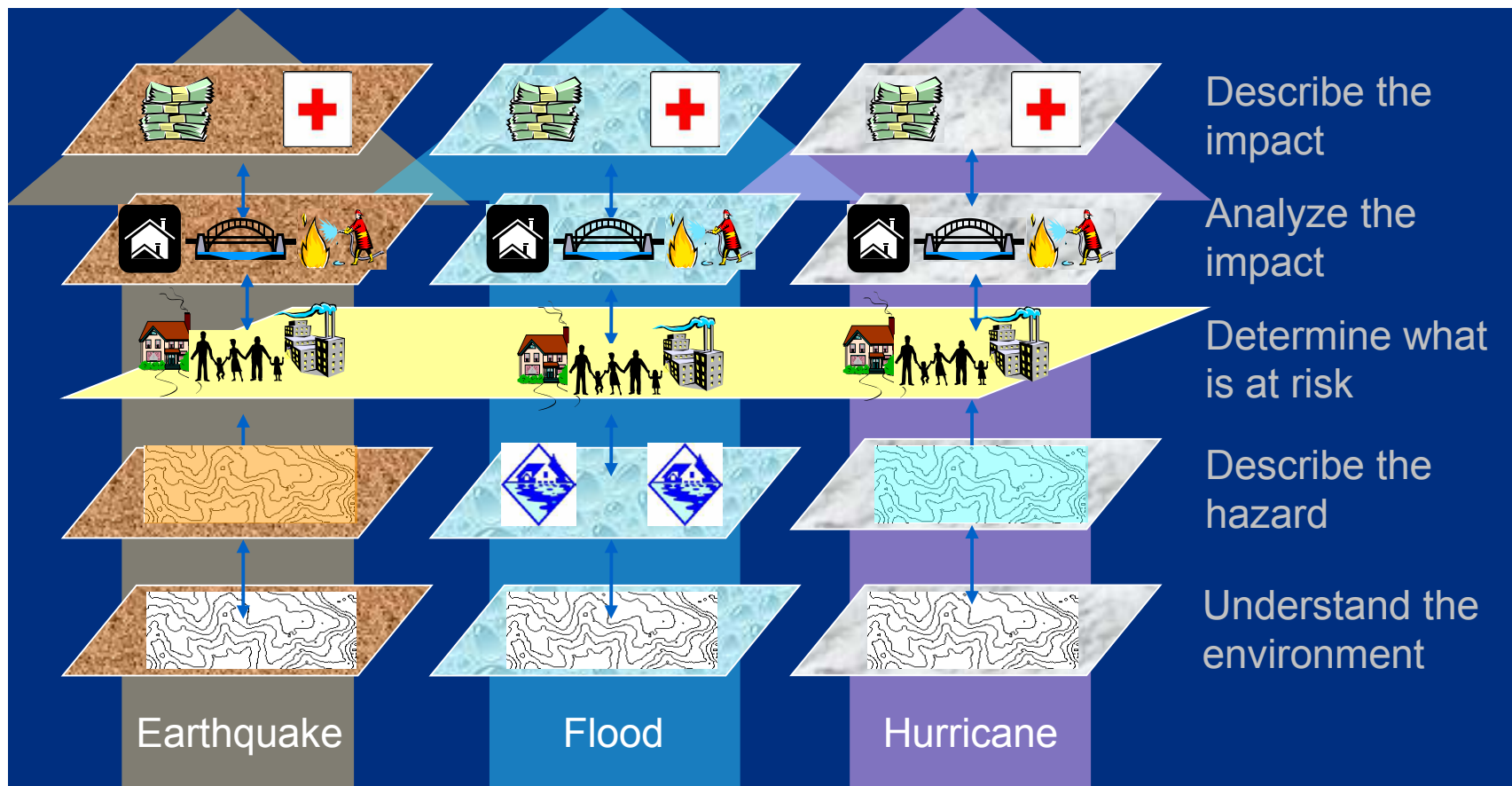
Hazus 2.0

- CDMS Integrated.
- Visual Basic for Applications (VBA) ArcGIS extension is no longer required.
- User Defined or Essential Facilities now import the latitude / longitude with full precision (no truncation).
- Riverine Velocity has been added to the Flood module as a What-if in both Hazard and Analysis.
- Flood Shelter analysis has been optimized to run faster for large regions.
- The 200-year Return Period has been removed and a 25-year Return Period has been added to the Suite of Return Periods in the Flood module.
- A Hazus Packaged Region (HPR) extract utility has been added that allows users to extract specific tables and data from exported Hazus study regions.
- The terrain roughness and tree coverage data sets have been updated in the Hurricane module to use the latest available data from the Multi-Resolution Land-Use Consortium (MRLC) at both the census block and census tract levels.
- Updates to the historical storms data for the Northeast U.S. region have been made to the Hurricane module.

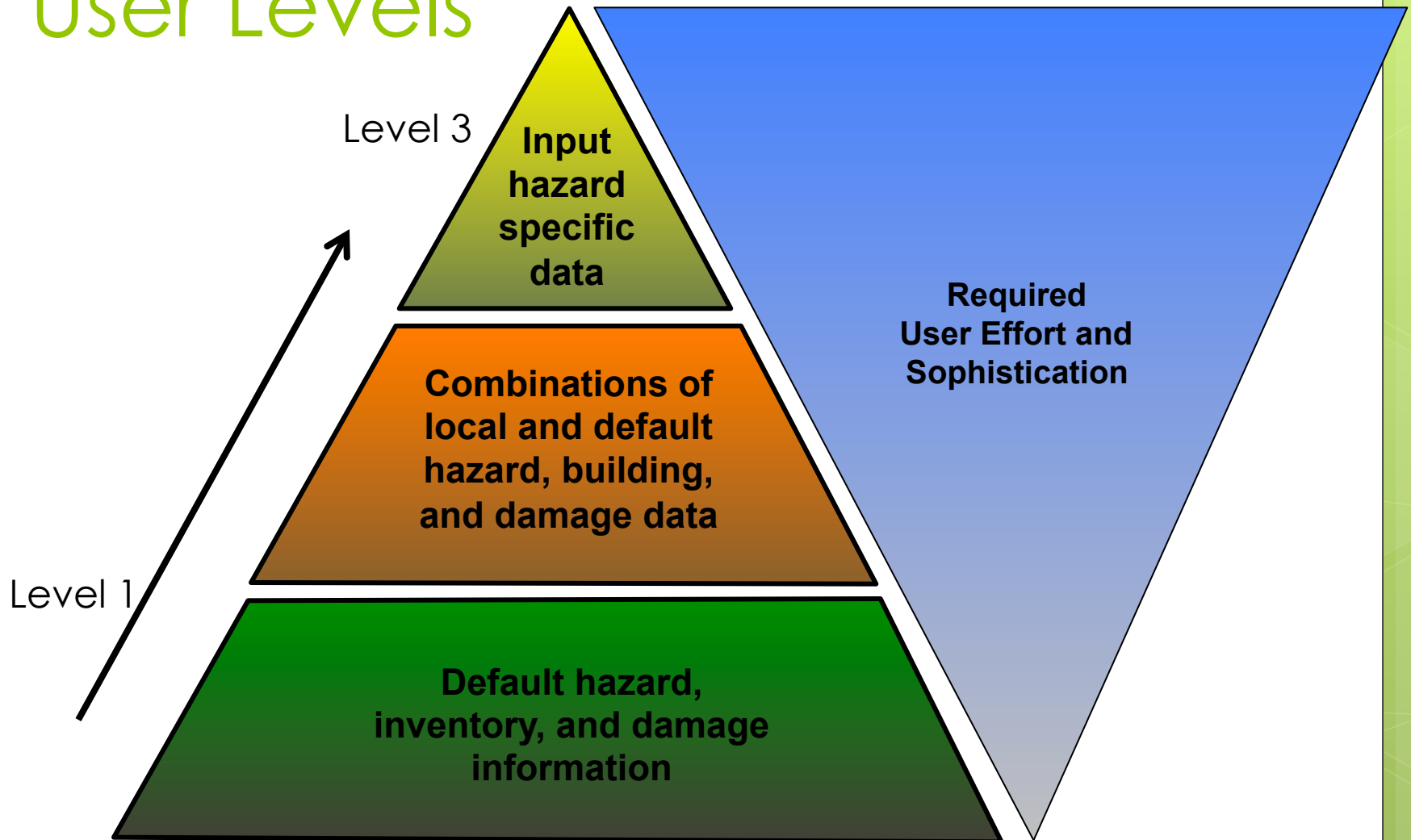
Hardware and Software Requirements

- Computer Speed: 2.2 GHz dual core or higher
- Memory: 2 GB or higher
- Disk space: 10GB for one multi-hazard large urban study region, plus inventory data size varies by state, or 30 GB to store entire U.S. inventory data
- Graphics Adaptor: 24-bit capable video card with at least 128 MB of video memory, resolution of 1078 x 768 or higher
- Operating System: Windows XP SP3 or Windows 7 Professional/Enterprise, English*
- Supporting Software: Appropriate version of Esri ArcGIS and Spatial Analyst extension for flood model

How Does Hazus Estimate Losses?



User Levels



Hazus Allows Users To:

- Identify vulnerable areas
- Assess level of readiness and preparedness
- Estimate potential losses from specific hazard events
- Decide on how to allocate resources
- Prioritize mitigation measures

Hazus Output

		Earthquake Ground Shaking Ground Failure	Flood Frequency Depth Discharge Velocity	Hurricane Wind Pressure Missile Rain
➤ Direct Damage				
General Building Stock	✓	✓	✓	
Essential Facilities	✓	✓	✓	
High Potential Loss Facilities	✓			
Transportation Systems	✓	✓		
Utility Systems	✓	✓		
➤ Induced Damage				
Fire Following	✓			
Hazardous Materials Release				
Debris Generation	✓	✓	✓	
➤ Direct Losses				
Cost of Repair	✓	✓	✓	
Income Loss	✓	✓	✓	
Crop Damage		✓		
Casualties	✓	Generic Output		
Shelter Needs	✓		✓	
➤ Indirect Losses				
Supply Shortages	✓	✓		
Sales Decline	✓	✓		
Opportunity Costs	✓	✓		
Economic Loss	✓	✓		

Hazus in Emergency Management and Mitigation Planning

- Mitigation Assessment
 - Identify “at-risk” communities
- Mitigation Measures
 - Strengthen existing structures
- Mitigation Programs
 - Adopt and enforce hazard-resistant building codes
 - Land use planning

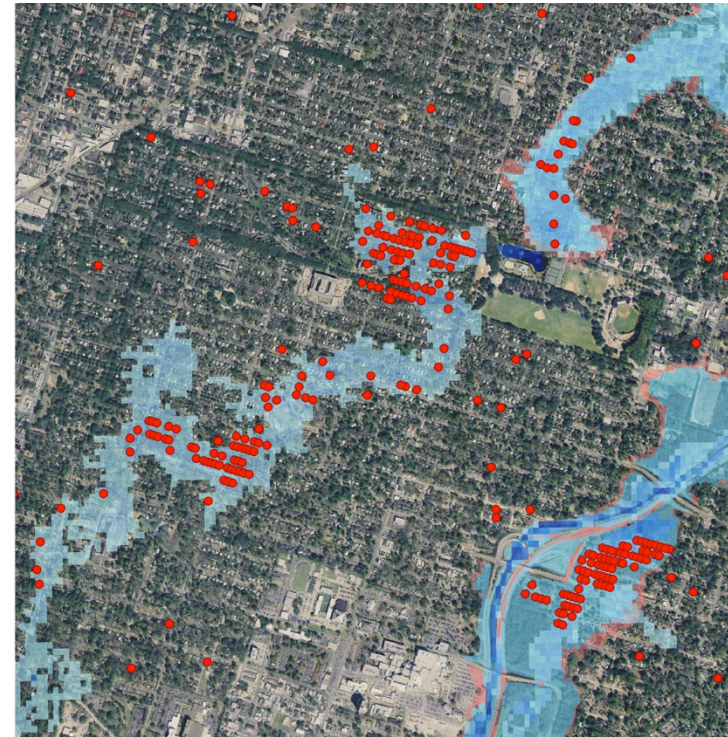
Hazus for Mitigation Planning Earthquake

- Assess potential earthquake losses for buildings both in their existing condition and after some amount of seismic rehabilitation.
- This might be used to advise a local jurisdiction regarding the merits of adopting an ordinance to require wall strengthening of older wood- frame residences.

Hazus for Mitigation Planning

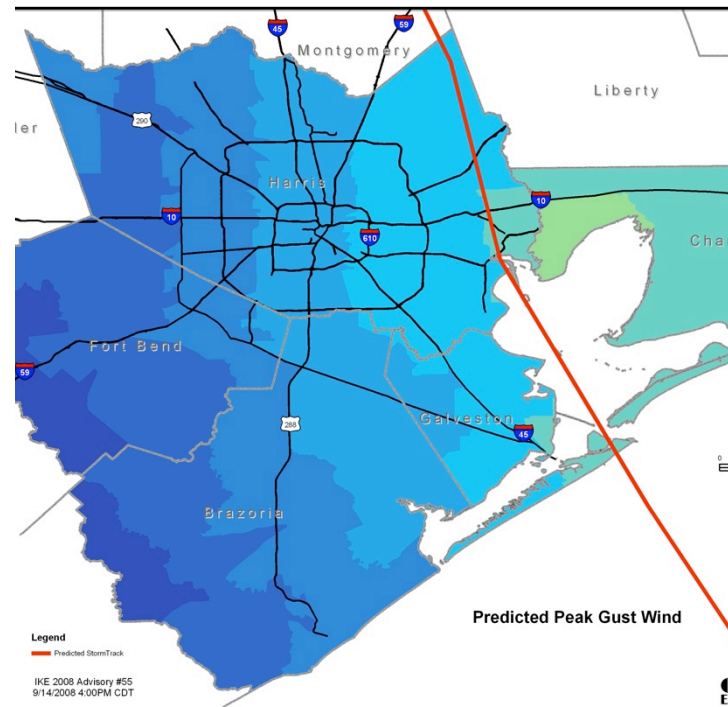
Flood

- Use the What-If Scenarios in the Flood Model to examine levee and flow regulation structures.
- Examine the impact to the damages and losses by creating scenarios where inventory is removed to simulate mitigation 'buy out' programs.
- Change the basement types and first floor elevations to simulate mitigation measures.



Hazus for Mitigation Planning Hurricane

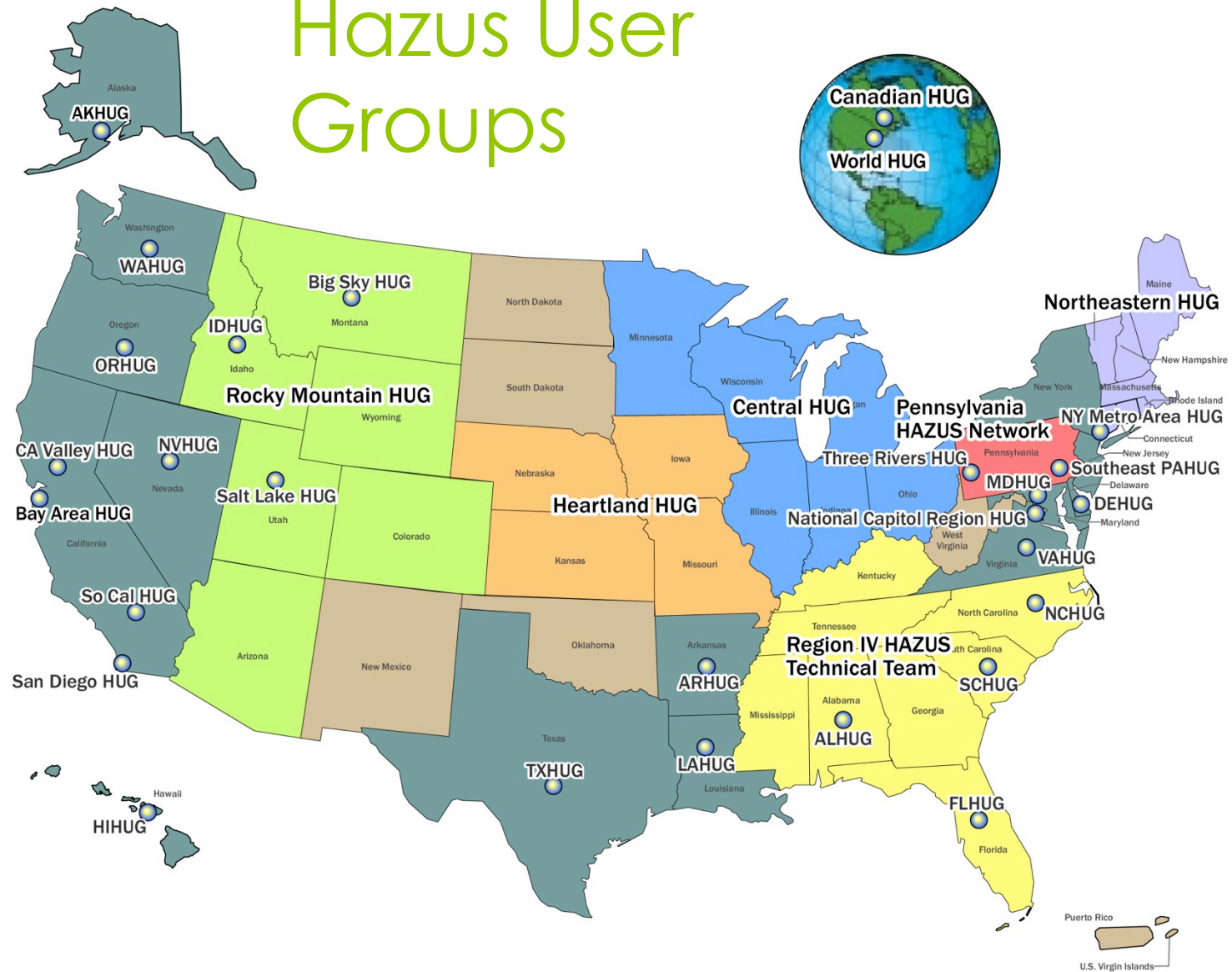
- Use the mitigation options built into the Hazus-MH Hurricane Model to simulate changes in building codes for current and future infrastructure.
- Residential, Commercial and Industrial building types can be simulated with improved building construction.



Hazus for Response Planning Debris Management


- Use Hazus-MH debris estimates to examine current debris management strategies for a jurisdiction. Do plans need to be created or updated?
- Use Hazus-MH to examine the potential issues from sheltering, displaced households, and casualties
- Create mitigation actions centered around these issues as well as determine if the communities are properly prepared for these social impacts.



Hazus User Groups



Hazus User Group Opportunities

- Hazus Hot Zone
- Hazus User of the Year
- Hazus Success Stories
- Hazus Technical Compendium
- Annual Hazus Conference



USGS and FEMA Collaborate to Expand Flood Mapping and Risk Assessment Science

Albany, Georgia Flood Inundation Mapping and Risk Assessment Project

Background

Floods are the leading cause of natural-disaster losses in the United States. The U.S. Geological Survey (USGS) is actively involved in the development of flood inundation mapping across the nation. This work is pursuant to its major science strategy goal of reducing the vulnerability of the people and areas most at risk from natural hazards. Working with partners including the National Weather Service (NWS), U.S. Army Corps of Engineers (USACE), the Federal Emergency Management Agency (FEMA), state agencies, local agencies, and universities, the USGS is providing flood inundation mapping science resources to build more resilient communities.

Introducing RT-FIM

Collaboration involving a powerful new tool, called real-time flood inundation mapping (RT-FIM) and the USGS was created to assist with the Survey Flood Inundation Mapping Science Project. This tool, developed for flood response and mitigation, provides digital geospatial flood-inundation maps that show flood water extent and depth on the land surface. Flood inundation maps that are tied to USGS, real-time stream gage data and NWS flood forecast sites enable officials to make timely operational and public safety decisions during floods, and to better plan for and mitigate the effects of future flood events. USGS pilot projects to evaluate this new technology are currently underway in nine different states.

FEMA and USGS Collaborate for Advanced Loss Estimation

FEMA and the USGS are developing a Web-based module that incorporates Hazus flood loss estimates to the RT-FIM site in Albany, Georgia. Albany was affected by a major flood due to Hurricane Alberto in July, 1994.

References


Musser, Jonathan W., and Dyar, Thomas R., 2007, Two-dimensional flood-inundation model of the Flint River at Albany, Georgia: Atlanta, Georgia, U.S. Geological Survey Scientific Investigations Report 2007-5107, 49 p., Web-only publication at <http://pubs.usgs.gov/sir/2007/5107>

Online Resources

- <http://cat.usgs.gov/albany/>
- http://cat.usgs.gov/albany/Albany_Intro_text.pdf
- <http://pubs.usgs.gov/sir/2007/5107>
- http://water.usgs.gov/osw/flood_inundation/

Authors/Points of Contact

- Paul Hearn, USGS Eastern Geographic Science Center; phearn@usgs.gov
- H.E. "Gene" Longenecker, III, FEMA Region IV MT-Risk Analysis Branch; herbert.longenecker@fema.gov



RiskMAP
Increasing Resilience Together

www.fema.gov/plan/prevent/thm/rm_main.shtm • 1-877-FEMA MAP

Hazus Higher Education Resources Consortium

- The Hazus HERC is a vibrant networking and information sharing user group serving as the leading Hazus resource for participants in higher education and academia.
- Research: stimulate work in higher education
- Service Learning: give students with Hazus training a chance to work with state and local governments
- Education: expand Hazus education and curriculum



Hazus in New England

- The Northeastern HUG is a forum for Hazus-MH users in public, private, and academic organizations in New England to develop, collaborate, and coordinate on disaster-related GIS projects.
- NEHUG is a forum for Hazus users to offer technological, academic, and strategic assistance to each other in our collective efforts to build disaster-resistant communities in New England.

<http://www.usehazus.com/nehug/>

Technical Resources

- FEMA Map Service Center (MSC) Web Store at msc.fema.gov
- Hazus Help Desk
 - e-mail helpdesk@support.hazus.us
 - <https://support.hazus.us>
 - 24/7 technical assistance

Hazus Education

Training Options

- FEMA's Emergency Management Institute (EMI)
- Virtual Courses
www.esri.com/hazusmhtraining
- Regional Training
 - May be offered in New England soon

Expert Certification

- Hazus Trained Professional
 - Foundation of basic skills plus focused instruction for 1 hazard
- Hazus Practitioner
 - Further training with specialized instruction in topic areas such as data management or ArcGIS for Emergency Managers.

Online Resources



- FEMA
 - www.fema.gov/plan/prevent/hazus
- USEHAZUS
 - www.usehazus.com
 - Follow USEHAZUS on FB and Twitter
- Podcasts on iTunes
 - Search for hazus
- GovDelivery



Thank you

Jamie Caplan

JAMIE CAPLAN CONSULTING LLC
Emergency Management Services

413-586-0867

jamie@jamiecaplan.com

www.jamiecaplan.com

www.usehazus.com