

HAZUS-MH BEST PRACTICES:

State of Florida

The state of Florida is a leader in the use of HAZUS-MH. Interest in HAZUS-MH took off after the 2004 hurricane season, when the model was used by [FEMA](#) and the [Florida Division of Emergency Management](#) (DEM) for hurricanes Charley, Jeanne, Frances and Ivan. This article highlights the use of HAZUS-MH in Florida since 2004, with emphasis on current statewide initiatives that will shape HAZUS-MH best practices.



2004 Hurricane Season: A Catalyst

In the months leading up to the 2004 hurricane season, FEMA Region IV worked closely with Florida DEM to develop Standard Operating Procedures for the use of HAZUS-MH for hurricane impact assessment and disaster response operations. Three important products emerged from the 2004 hurricane season:

1. *HAZUS-MH Standard Operating Procedures for Disaster Operations*, which included standardized HAZUS-MH templates.
2. Documentation of lessons learned from the use of HAZUS-MH for response.
3. Extensive damage data collection for HAZUS-MH validation studies, which compared HAZUS-MH predicted damages against actual or observed damages.

SW Florida HAZUS Pilot Project

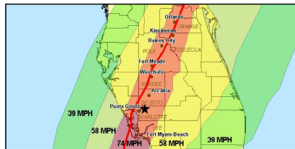
In the aftermath of Hurricane Charley, the City of Punta Gorda – under the leadership of Rick Burgess, GIS Coordinator – embarked on a major effort to collect building damage data. This project was coordinated with the Charlotte County Long-Term Recovery Planning initiative, and HAZUS-MH.

In January, 2005, FEMA and Florida DEM – in coordination with the City of Punta Gorda – launched the [SW Florida HAZUS Pilot Project](#), which was guided by four objectives:


- To develop a technical capacity in SW Florida to effectively use HAZUS-MH to assess potential impacts of hurricanes and floods in support of ongoing planning and hurricane preparedness initiatives.

CITY OF PUNTA GORDA WATER TREATMENT PLANT


SITE LOCATION (★) STORM TRACK (→)



OVERVIEW SITE PHOTO:



SAMPLE DAMAGE PHOTO:



FIELD OBSERVATIONS:

- Physical street address: 38100 Washington Loop Road, Charlotte County
- Facility constructed in 1964
- Expansion projects in 1985 and 2001
 - Expansions included construction of maintenance building (1985) and installation of water treatment room screens (2001)
- Extensive wind damage to roof of plant
- Water damage observed to primary control room
 - Damage to main control panel and automation system
 - Damage to three (3) desktop workstation computers
- Water damage observed to primary lab facility
 - Lab equipment was evacuated to secondary lab at other end of complex
 - Damage to some delicate lab equipment during move
- Water damage observed to storage room
 - Plan documents, equipment manuals, procedural manuals damaged by water entering room from roof damage/leaking ceiling
- Wind damage observed to water treatment room screens
- Wind and water damage observed to maintenance building (pictured left)
 - Sidewall and bay doors damaged by wind—all maintenance equipment exposed to wind and rain
 - Damage to some heavy equipment
- Facility remained in operation despite damage

HAZUS [™] DAMAGE ESTIMATES	ACTUAL DAMAGE
• 35% probability of moderate damage to facility	• Major damage to roof • Water damage to control room

HURRICANE CHARLEY POST-DISASTER HAZUS[™] VALIDATION: InCAST SUMMARY REPORT

In the 2004 hurricane season, FEMA gave priority to validating the HAZUS-MH flood and hurricane model. This template displays data that was captured following Hurricane Charley.



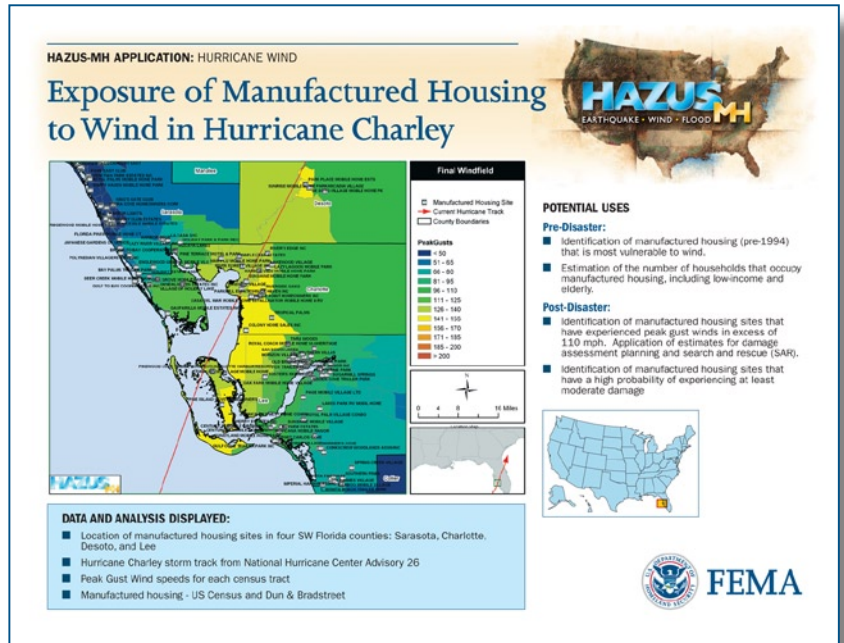
FEMA

- To identify, prioritize, collect and enter data into HAZUS-MH that will enable the state of Florida and participating counties to carry out advanced (Level 2) HAZUS-MH analyses.
- To promote the use of HAZUS-MH by the State of Florida and SW Florida counties to analyze mitigation options, and to use the analysis in preparation of local mitigation plans and strategies.
- To promote the use of HAZUS-MH by the State of Florida and SW Florida counties to support pre- and post-disaster planning for response and recovery.

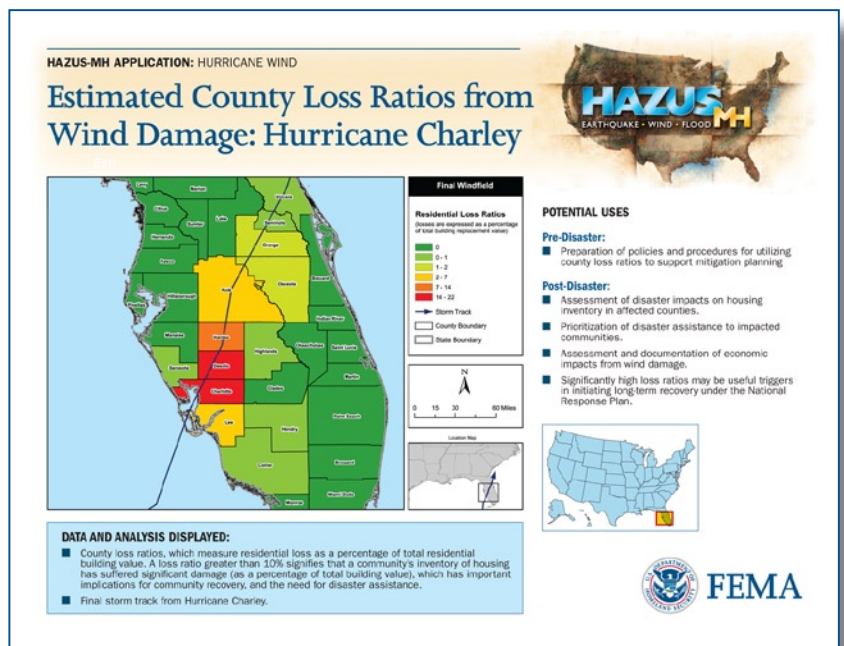
The SW Florida HAZUS Pilot Project accomplished these objectives. More specifically, the project:

- Brought together GIS professionals and emergency managers from eight SW Florida counties, FEMA and the State to focus on HAZUS-MH and potential applications.
- Resulted in the formation of three work groups: Mitigation and Recovery, Data Acquisition and Stewardship, and Preparedness and Response.
- Put the spotlight on HAZUS-MH in Florida, laying the groundwork for the formation of the Florida HAZUS Users Group (FLHUG).

One of the more innovative initiatives under the SW Florida project was a partnership effort with FEMA and Florida DEM to develop the HAZUS-MH Map Series. The idea was simple. Develop a HAZUS-MH template that could be used to depict a range of model outputs and potential applications of those outputs. For each map-based template, the following information was compiled: 1) HAZUS-MH map; 2) Data and Analysis Displayed; and 3) Potential Uses, organized by pre-disaster uses and post-disaster uses of the analysis.



Exposure of Manufactured Housing to Wind in Hurricane Charley



Estimated County Loss Ratios from Wind Damage: Hurricane Charley

The SW Florida HAZUS-MH Pilot Project ultimately brought together representatives from eight SW Florida counties, FEMA, Coastal Services Center (NOAA), Southwest Florida Regional Planning Council, Institute for Business and Home Safety, and several local consulting firms. These organizations have all become active in the FLHUG.

Florida HAZUS-MH Users Group

The Florida HAZUS User Group (FLHUG) was formally organized in January 2006 when the group met to elect officers, create committees, form regions, and adopt a charter. Rick Burgess, City of Punta Gorda, was elected President.

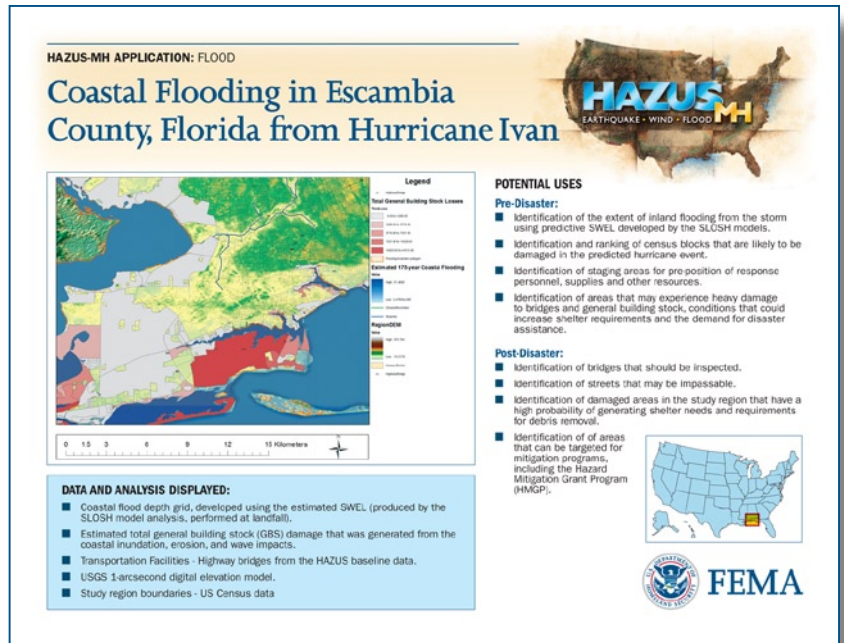
The overall goal of the FLHUG is to promote the use of HAZUS-MH across the state of Florida to improve risk assessments, mitigation, preparedness and disaster response. One way of doing this is through a committee structure, including the Outreach Committee, Technical Committee/Data Group, and Training Committee.

Outreach Committee

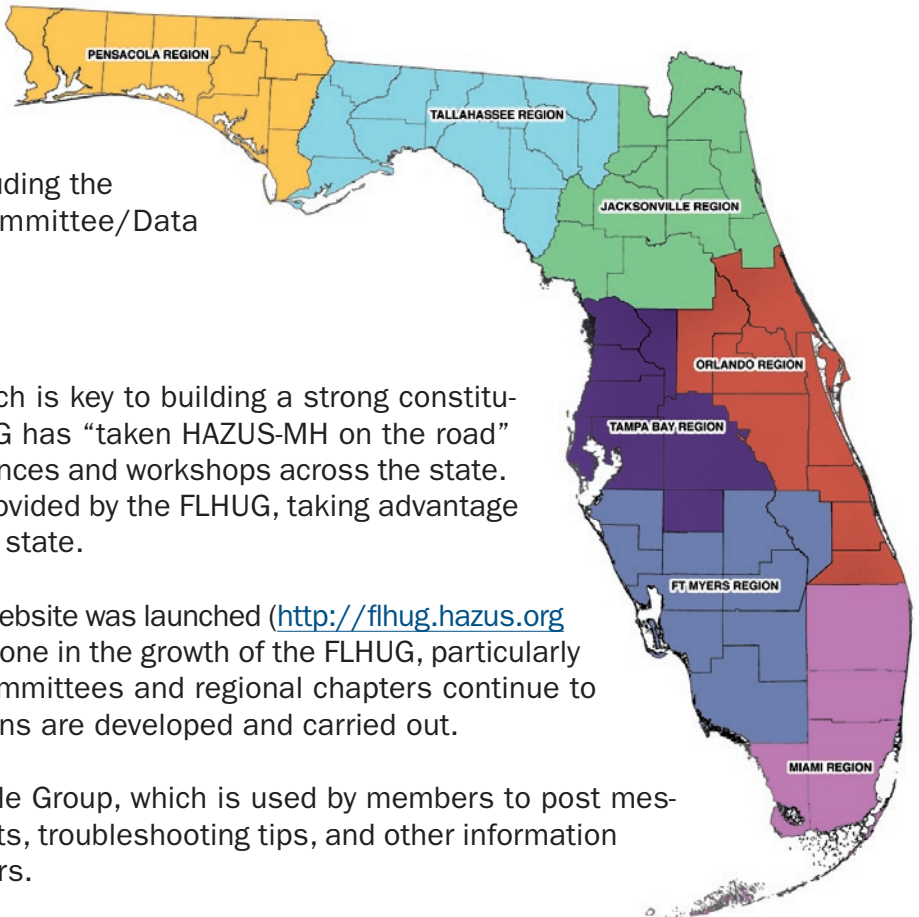
Acknowledging that effective outreach is key to building a strong constituency of HAZUS-MH users, the FLHUG has “taken HAZUS-MH on the road” and demonstrated its use at conferences and workshops across the state. Training sessions have also been provided by the FLHUG, taking advantage of the six HAZUS-MH vendors in the state.

In early November, 2007, the FLHUG website was launched (<http://flhug.hazus.org>). The website is an important milestone in the growth of the FLHUG, particularly as new members are added, the committees and regional chapters continue to grow, and new HAZUS-MH applications are developed and carried out.

The FLHUG has also formed a Google Group, which is used by members to post messages, articles, links, announcements, troubleshooting tips, and other information that is of interest to HAZUS-MH users.



Coastal Flooding in Escambia County, Florida from Hurricane Ivan



The FLHUG brings together GIS professionals, emergency managers, researchers, government officials and others from across the state of Florida to promote the use of HAZUS-MH. The FLHUG is organized into seven regions, shown above.

Technical Committee - Data Group

Since its inception, a priority of the FLHUG has been to coordinate the statewide collection and processing of high-resolution hazard inventory data, and to integrate the data into HAZUS-MH. A Data Group was formed, headed by Tracy Toutant, Sarasota County, to coordinate the FLHUG's data management strategy. At the outset, one of the objectives was to develop a "master state database" that was consistent with the Florida DEM datasets. Richard Butgereit, GIS Administrator, Florida DEM, continues to work very closely with the FLHUG Data Group to coordinate State and local data needs assessment, data collection, and data sharing.

Four categories of data were targeted by the Data Group for updating:

- Essential Facilities
- User Defined Facilities
- General Building Stock
- Demographics

The Data Group has made significant progress since January, 2006, guided by four project goals:

- To partner with the Florida Division of Emergency Management (DEM) to provide a level two replacement of Critical Infrastructure data. FLHUG members created a new dataset, which is available to FEMA and National Institute of Building Sciences for replacing existing datasets distributed for all HAZUS-MH users modeling Florida Wind, Flood, and Earthquake events.
- To train GIS professionals across the state in HAZUS-MH and specifically the Comprehensive Data Management for HAZUS-MH, which provides in-depth instruction on data collection for HAZUS-MH
- To support the development of wind damage assessment tools
- To coordinate with the Florida DEM in the development of the Critical Facilities Inventory Data Dictionary

Finally, the Data Group will take the lead in a proposed project to develop a HAZUS-MH web based portal, in coordination with FEMA Region IV.

Training

Training may be viewed as the "engine" that makes the FLHUG go. The goal is to make quality HAZUS-MH training available in all Florida regions in the next two years, in close coordination with Florida DEM and the Florida ESRI Group.

The FLHUG has a core group of experienced HAZUS-MH users who can lead a statewide training initiative in Florida, including four members who are FEMA authorized HAZUS-MH vendors under the Private Sector Initiative.

In 2008, several revised and updated courses will be offered through FEMA that incorporate changes in HAZUS-MH MR3. The FLHUG will be able to capitalize on these courses through field training in the Florida regions.



Moving Forward: Potential Statewide Initiatives

The state of Florida will continue to be a national leader in the use of HAZUS-MH. This is due to several factors:

- High visibility of natural hazards in Florida, and the proactive role of FEMA Region IV and Florida DEM in the use of HAZUS-MH in Florida.
- Strong and active technical community, including GIS professionals and HAZUS-MH specialists who routinely use HAZUS-MH
- Ongoing support from research and academia, including the National Hurricane Center and state-supported universities.

With a strong foundation to build upon, the state of Florida has an opportunity to carry out innovative HAZUS-MH projects. The final section highlights potential initiatives in three areas:

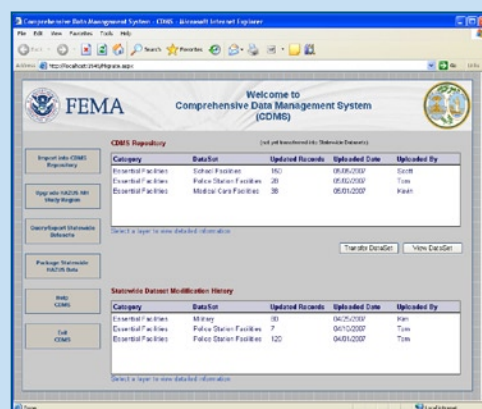
1. Data Management,
2. Disaster Preparedness and Response Operations, and;
3. Mitigation and Post-Disaster Redevelopment.

Data Management

The state of Florida has an opportunity to “break new ground” in data management using HAZUS-MH. Three important pieces are in place: 1) an active network of GIS professionals across the state; 2) leadership that is provided through the Florida DEM and FLHUG; and 3) the Comprehensive Data Management System (CDMS) and a FEMA sponsored pilot project FEMA to develop a web-based HAZUS-MH portal.

The new [Comprehensive Data Management System \(CDMS\)](#) permits HAZUS-MH MR3 users to update and manage statewide datasets that support analysis in HAZUS-MH (previously, this task was very complicated and time consuming). The CDMS supports a variety of methods for managing data, including: 1) Site Specific Inventory (e.g., essential facilities, high potential loss facilities); 2) Aggregated General Building Stock Data (e.g., building counts, square footage); and 3) Building Specific Data.

In January, 2007, FEMA and the [South Carolina Emergency Management Division \(SCEMD\)](#) launched a pilot project to develop a **HAZUS-MH Web-based portal** that enables users to easily enter, update and share default/up-to-date data for HAZUS-MH, which will greatly facilitate hazard identification and risk analysis for earthquake, flood and hurricane hazards.



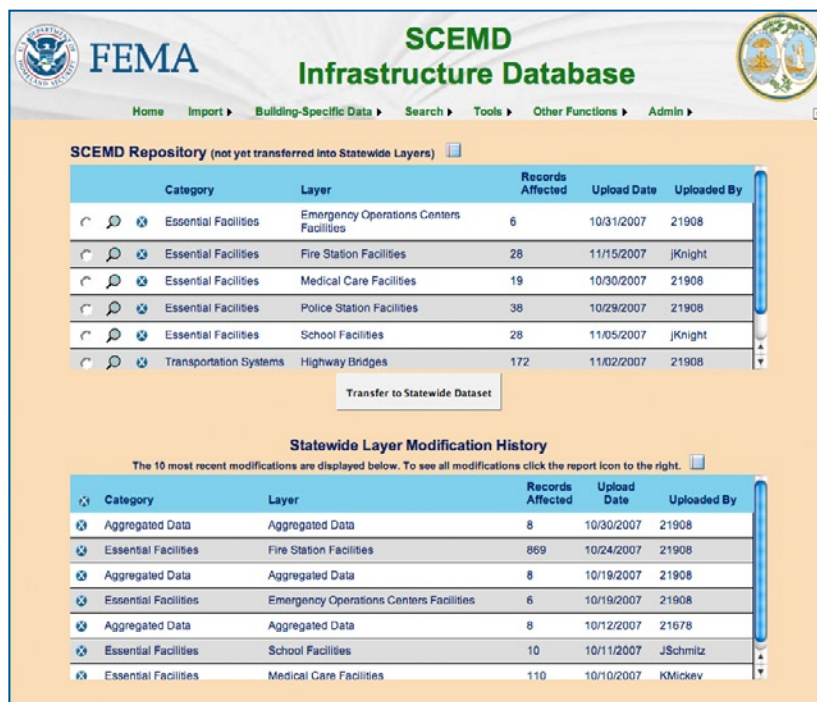
Florida DEM is in discussions with FEMA Region IV to implement a Florida HAZUS-MH Web-Based Project that incorporates many of the features of the SCEMD pilot project. A Florida Web-Based Project can provide several important advantages for Florida:

- It will facilitate the sharing, updating and management of HAZUS-MH datasets, yet provide a degree of control (e.g., in merging data) through the Florida HAZUS-MH Administrator.
- It will provide structure and protocols that are important to the development, updating and maintenance of a master state database.
- It will make it much easier for the Florida DEM and FLHUG leadership to assign roles and responsibilities to FLHUG members in reviewing, adding and/or updating data layers.
- It will facilitate data layer searches (county, census tract, census block).

A Florida HAZUS-MH Web-based portal is a tool that will simplify and streamline data management in Florida, and greatly facilitate FLHUG coordination – working through the Florida regions.

The Web-based portal can become an integral part of a Florida DEM supervised data management strategy that is closely coordinated with existing statewide data inventories, including the Critical Facilities Inventory. These tools can become the underpinning of an expanded data management strategy in Florida that examines the following:

- Identification and prioritization of additional categories of data to be included in a master state database.
- Evaluation of the Web-based portal capabilities and specifications, and potential applications in a statewide data management initiative – including use in disaster operations.
- Steps for updating demographic data, and the evaluation of tools and techniques for aggregating and extracting demographic data to support social vulnerability analyses.



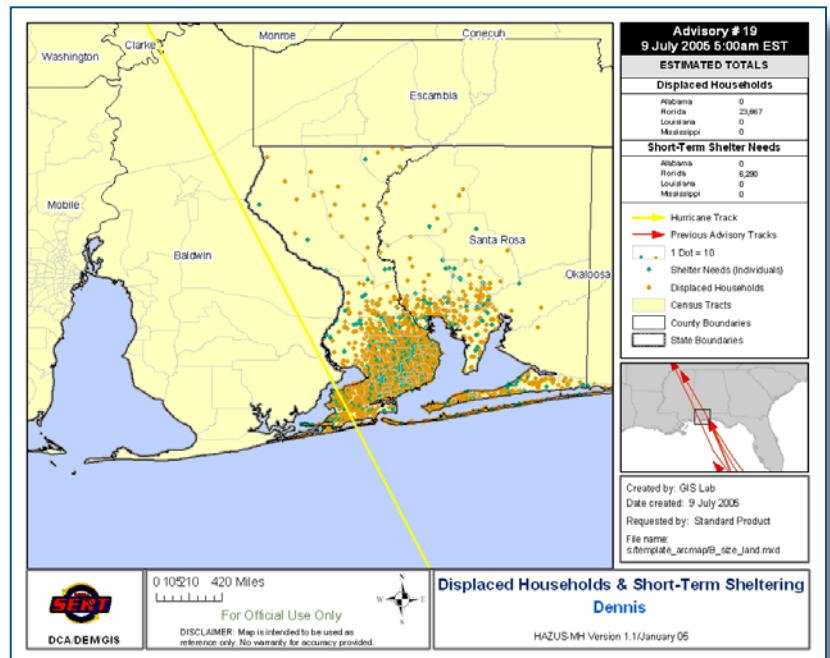
The Florida DEM will take the lead in developing a HAZUS-MH Web-based portal project for Florida, which will incorporate many of the features from the South Carolina pilot project.

Preparedness and Disaster Response

Since 2004, Florida has played a major role in the use of HAZUS-MH for disaster operations. The State Emergency Response Team (SERT) has incorporated HAZUS-MH analysis into pre- and post-landfall assessments of potential damages.

During the 2005 hurricane season, the following HAZUS-MH outputs were used in SERT briefings following each National Hurricane Center advisory:

- **Maximum Sustained Winds**, which shows the latest storm track and maximum sustained winds (by census tract).
- **Displaced Households and Short-Term Shelter Requirements**, which estimates number of households displaced due to damage to residence or loss of utilities, and number of households that require short-term, emergency shelter.
- **Hospitals – Potential Loss of Functionality**, which identifies hospitals in the area of impact and their potential loss of use, expressed in intervals of < 3 days, 3 – 7 days, > 7 days.



Displaced Households and Short-Term Shelter Requirements: Hurricane Dennis (2005)

- **Nursing Home Wind Exposure**, which shows the location of hospitals; wind speeds; and storm track.
- **Estimated Concrete and Steel Debris**, which uses dot density map to show concrete & steel debris concentrations; wind intensity; and storm track.
- **Mobile Home Exposure**, which shows distribution of mobile home parks; peak gust winds, and storm track.
- **Essential Facilities at Risk**, which shows the location of police, fire, schools, emergency operations centers, and hospitals; peak gust winds; and storm surge (from SLOSH model).

Lessons Learned and Next Steps

Florida and FEMA are well positioned to build on lessons-learned from the 2005-2006 hurricane season to further develop and test the use of HAZUS-MH to support disaster operations. This initiative should address at least two questions:

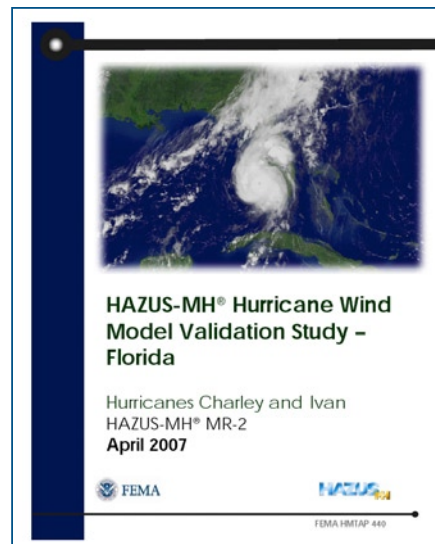
1. What HAZUS-MH analysis should be incorporated into revised HAZUS-MH standard operating procedures for disaster operations?

This is a key question, and has two interrelated parts: 1) Which “essential elements of information” (e.g., spatial boundaries of damages) are most critical to emergency managers; and 2) Which HAZUS-MH outputs are most reliable, based on findings from the recently completed [HAZUS-MH Hurricane Wind Model Validation Study – Florida](#).

The following HAZUS-MH map-based templates have been developed to support rapid needs assessments:

- Area of projected damage
- Population at risk
- Expected damage to essential facilities
- Expected shelter requirements
- Expected residential damage
- Debris generated
- Mitigation operations

A new initiative – led by FEMA, Florida DEM and the FLHUG – should re-examine HAZUS-MH analysis to identify additional map-based templates that can be used in the 2008 hurricane season – for rapid needs assessment, response and recovery planning, and mitigation operations. The goal is to identify additional HAZUS-MH outputs that **can be readily used** by FEMA, Florida DEM and local governments to make decisions before, during and after hurricane landfall.



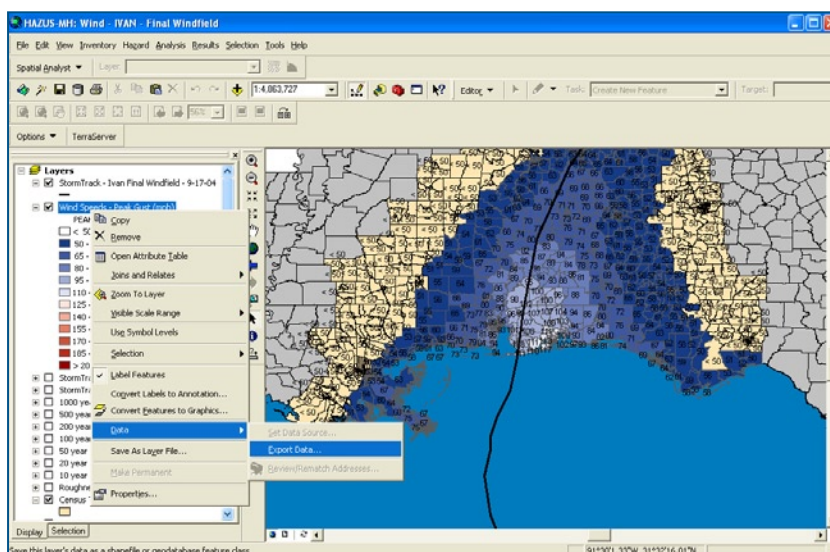
< See www.fema.gov/plan/prevent/hazus/hz_windvalidationstudy.shtm for report details >

2. What steps need to be taken to fully integrate HAZUS-MH into disaster operations?

Once Florida DEM and FEMA have identified and prioritized HAZUS-MH templates for use in disaster operations, the next step is to develop the planning and technical capacity to fully integrate HAZUS-MH into disaster operations.

Based on lessons learned from previous disaster operations using HAZUS-MH, it is recommended that a new strategy and action plan be based on the following steps:

- Provide executive briefing on use (and limitations) of HAZUS-MH for rapid needs assessment and response.
- Conduct a needs assessment involving key State and local agencies to identify information requirements – including rapid needs assessments – that can be met using HAZUS-MH.
- Incorporate HAZUS-MH into State and local Comprehensive Emergency Management Plans, including Emergency Support Function 5 (Planning and Information).



HAZUS-MH was used by FEMA HQ and Florida DEM during Hurricane Ivan.

- Train key State and local emergency management staff in the use of HAZUS-MH analysis for rapid needs assessments and response.
- Use HAZUS-MH in exercises, including scenario development.

For the FLHUG, Collier County has taken the lead in promoting the integration of HAZUS-MH analysis into operations planning. Rick Zyvoloski, Collier County Emergency Management and Chad Bowers, Bold Planning Solutions, have collaborated in the use of HAZUS-MH for local emergency management planning.

Escambia County

Escambia County Emergency Management has done perhaps the best job in Florida of fully incorporating HAZUS-MH into the Comprehensive Emergency Management Plan (CEMP) and specifically Emergency Support Function 5 (ESF 5).

The purpose of ESF 5 is to: 1) collect, analyze, and disseminate tactical information on the nature, scope and potential impacts of an incident or major disaster; 2) use this intelligence to support the Command Group, Logistics, and Operations in their impact assessment and response missions; and 3) identify and anticipate future needs and resource requirements, and incorporate this analysis into Incident Action Plans.

The Escambia County CEMP shows how ESF 5 generated information and analyses can be used in three phases of disaster operations: pre-landfall (predicted impacts of hurricanes); post-landfall immediate response; and sustained response/immediate recovery phase. A matrix is contained in Appendix A of the CEMP that identifies specific HAZUS-MH outputs that can be used to support decision making for each Emergency Support Function (e.g., Transportation, Mass Care, Medical and Health, Mitigation and Community Recovery).

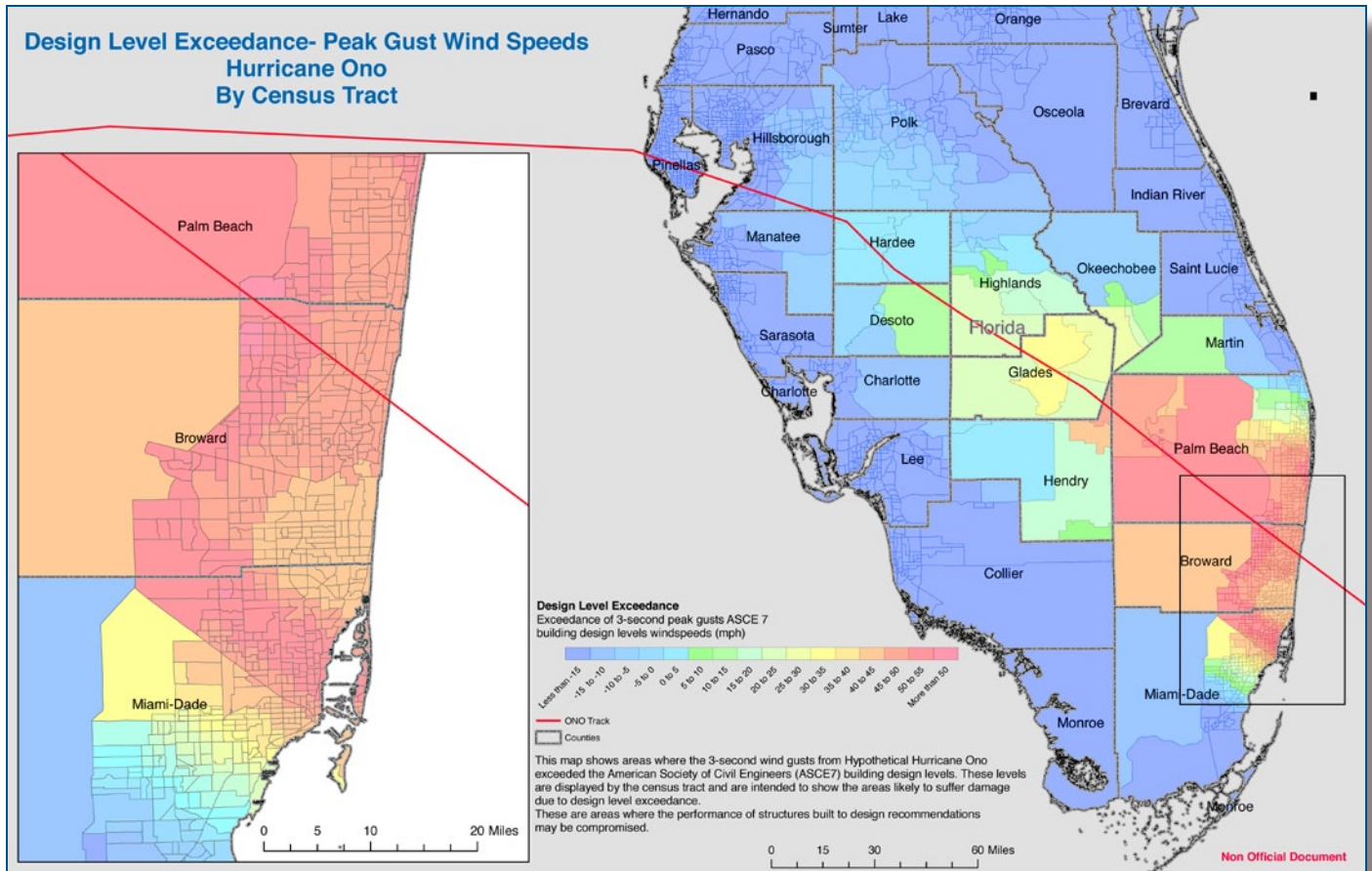
Florida Catastrophic Planning Initiative

In 2007, HAZUS-MH has been used for Florida Catastrophic Hurricane Initiative, a FEMA sponsored project to increase readiness for major or catastrophic hurricanes in the southern part of Florida.

As a regional loss estimation tool, HAZUS-MH is well suited for modeling potential impacts of scenario South Florida hurricane events on population, essential facilities, high potential loss (HPL) facilities, and transportation and utility lifelines.

One of the products from this initiative is shown below: *Design Level Exceedance – Peak Gust Wind Speeds from Hurricane Ono (by Census Tract)*. This map shows areas where the 3-second wind gusts from hypothetical Hurricane Ono exceeded the American Society of Civil Engineers (ASCE7) building design levels. These levels are displayed by the census tract and are intended areas likely to suffer damage due to design level exceedance.

HAZUS-MH has been increasingly used to support [Long-Term Community Recovery and Mitigation \(ESF 14\)](#). Under the National Response Plan (NRP), ESF 14 provides a coordination mechanism for the Federal government to assess the consequences of major disasters and to coordinate the long-term recovery. Special emphasis is being given to ESF 14 in the Florida Catastrophic Planning Initiative, and the use of HAZUS-MH to carry out analyses.



Design Level Exceedance – Peak Gust Wind Speeds from Hurricane Ono (by Census Tract)

In summary, the state of Florida continues to make progress in adapting HAZUS-MH to support disaster preparedness and response operations. This is due to the following: strong support from FEMA Region IV and FEMA Headquarters; leadership and coordination from the Florida DEM; and the active involvement and technical support from the FLHUG. The HAZUS-MH generated products that emerge from the Florida Catastrophic Planning Initiative will add considerable value to these efforts.

Mitigation and Long-Term Recovery Planning

Florida is among a growing list of states that is using HAZUS-MH for mitigation and long-term recovery planning. In many ways, Florida is far ahead of other states in developing and maintaining a comprehensive inventory of critical facilities, general building stock and high potential loss facilities, which is key to estimating potential exposure and loss from damaging floods, tornadoes, hurricanes and other hazards.

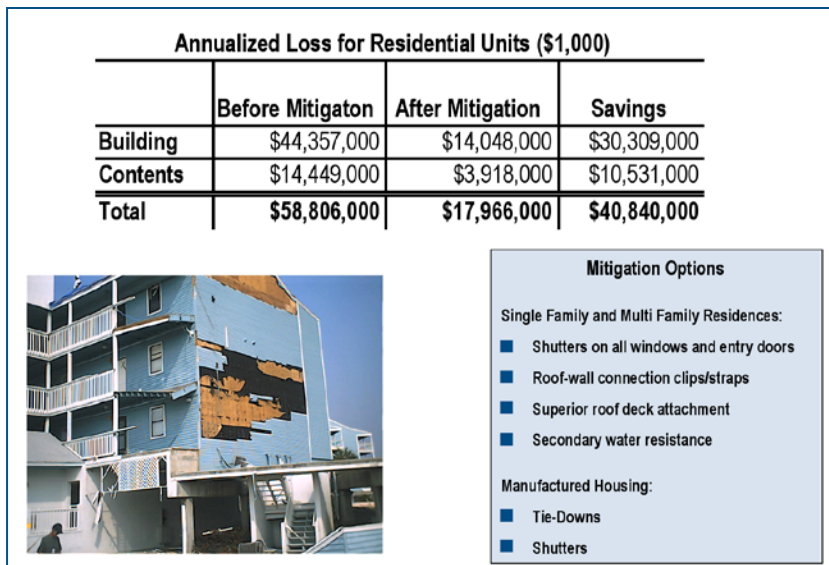
A unique feature of HAZUS-MH is the ability to simulate changes in building practices through mitigation, and then estimate the savings or losses avoided as a result of these mitigation measures. The Hurricane model, for example, enables the user to adopt the following mitigation measures – either individually or in combination – and then estimate the losses avoided from scenario events:

- Roof covering
- Secondary water resistance

- Roof sheathing attachment (e.g., re-nailing with stronger fasteners or tighter spacing)
- Opening protection (e.g., installing impact resistant materials on windows, doors, garages, skylights)

Likewise, the Flood model can be used to estimate potential losses avoided as the result of the implementation of mitigation measures, including:

- Identification of areas at risk to flooding
- Acquisition and relocation or demolition of buildings in floodplain
- Elevation of structures in the floodplain
- Land use planning



HAZUS-MH was used in Charlotte County following Hurricane Charley to estimate annualized loss for residential buildings and contents as a result of the implementation of select mitigation options.

The FLHUG can be the catalyst in new initiatives involving the use of HAZUS-MH for mitigation and long-term recovery planning. The Florida Enhanced Hazard Mitigation Plan (June, 2007) provides a framework for linking pre- and post-disaster mitigation planning in Florida, and can serve as an “overarching” guide and reference for integrating HAZUS-MH into the planning process in Florida. An excellent reference (training course) is [Using HAZUS-MH for Risk Assessment](#) (FEMA 433).

The FLHUG led initiative to promote the use of HAZUS-MH for mitigation and long-term recovery planning might include the following tasks:

- Identification of individual state and local plans in Florida that use HAZUS-MH for mitigation and long-term recovery (Local Mitigation Strategy, Comprehensive Plans).
- Use of exemplary Florida plans in the preparation of “how to” guidance (job aids) for state and local planners in Florida on the use of HAZUS-MH analysis for mitigation and long-term recovery planning.
- Implement a pilot project on Using HAZUS-MH for Mitigation and Long-Term Recovery that is guided by two goals: 1) demonstration of use of HAZUS-MH to support local and regional plans (including Comprehensive Plan, Local Mitigation Strategy); and 2) “how to” guidance on practical steps to integrating HAZUS-MH into local and regional planning process. Hillsborough County is an excellent candidate for a pilot project, led by Chris Zambito, who gave a presentation at the National HAZUS Conference in June, 2007.

In summary, it is anticipated the state of Florida will continue to make significant progress in 2008 in the use of HAZUS-MH for assessment, mitigation, response and recovery planning, at the state and local level. The FLHUG brings together leadership, direction, and a strong core group of GIS professionals from across the state. Equally important, Florida continues to enjoy the strong support from the Florida DEM and FEMA Region IV, which is critical to the success of a coordinated, statewide program.