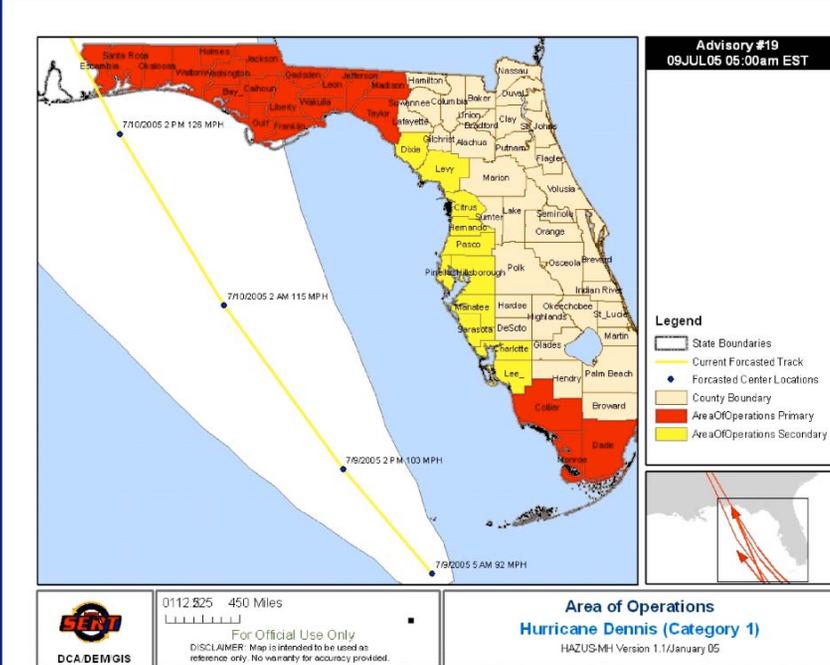


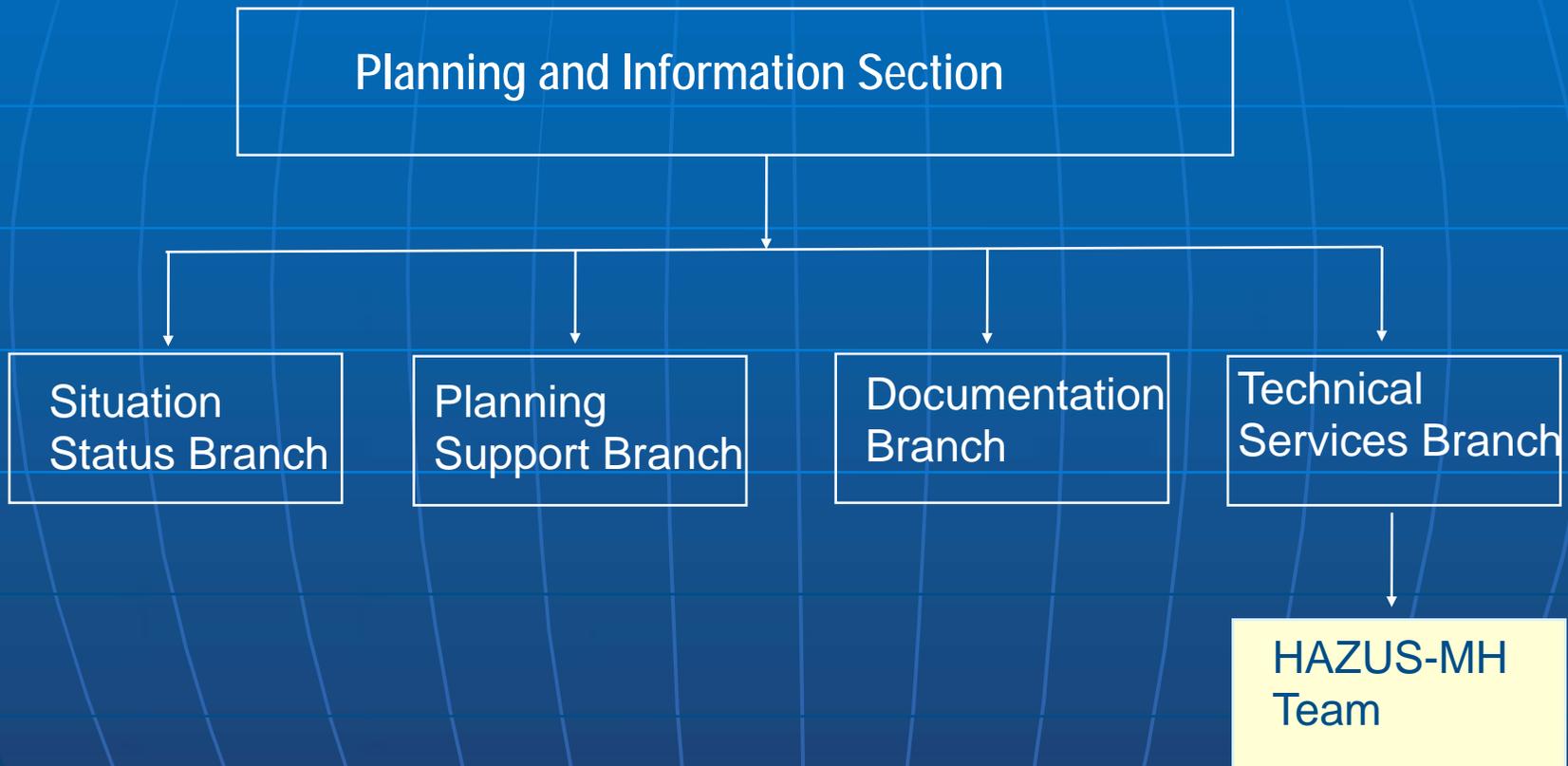
# Application of HAZUS-MH to Support Hurricane Disaster Operations

## Area of Operations



- Organization
- HAZUS Outputs
- Training
- 2007 Season

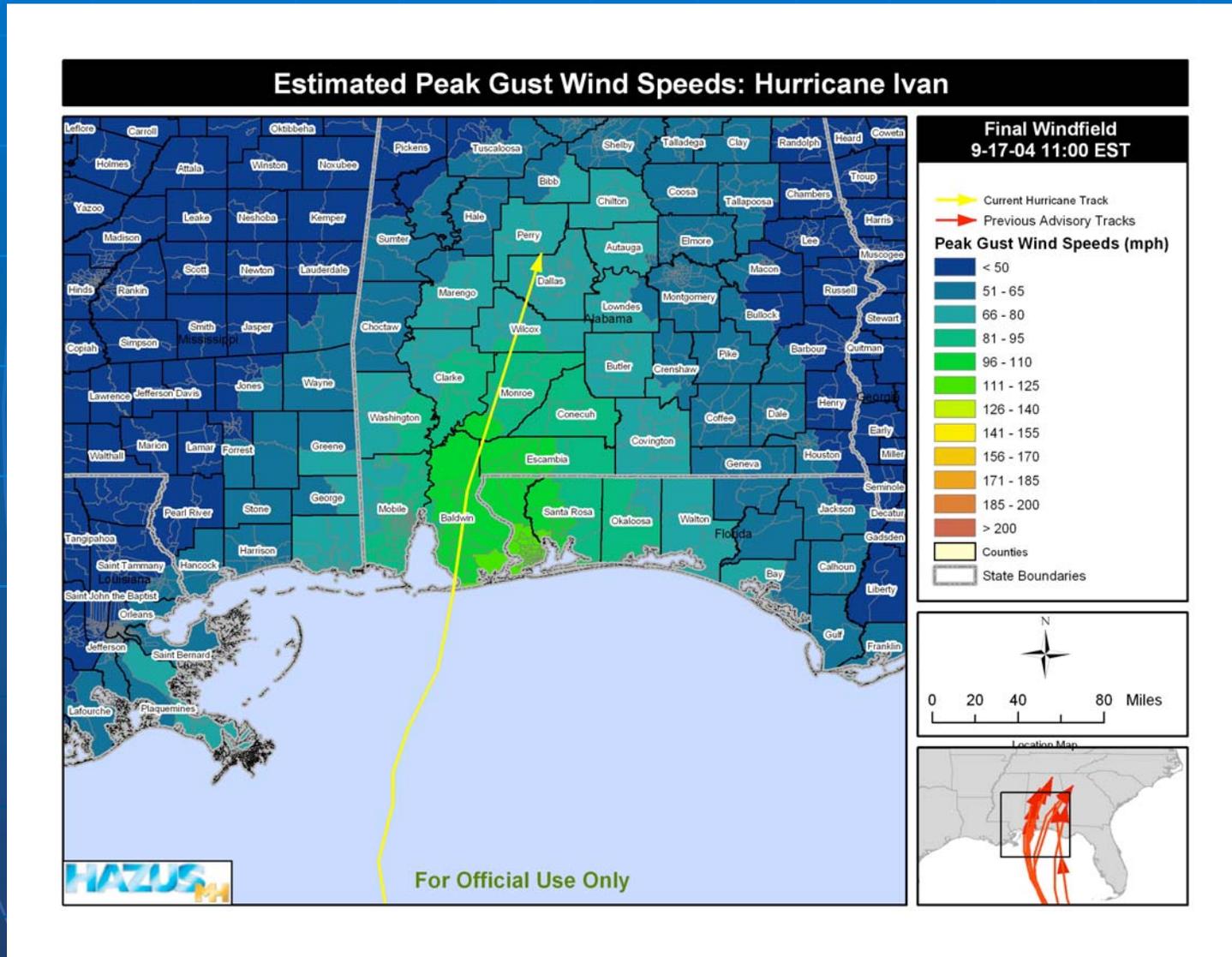
# Integrating HAZUS-MH into Planning Section under ICS



# Categories of HAZUS-MH Analyses

- 1.0 Area of Projected Damage
- 2.0 Population at Risk
- 3.0 Expected Damage to Essential Facilities
- 4.0 Expected Sheltering Requirements
- 5.0 Expected Residential Damage
- 6.0 Debris Generated
- 7.0 Mitigation Operations

# Area of Impact: Hurricane Wind



# Color Coded Matrix (used by FEMA and Florida DEM)



Least Capacity:  
Needs External  
Support

Marginal Capacity:  
Supplemental Aid  
Only

Marginal Capacity:  
Supplemental Aid  
Only

What is the capacity of State  
and local governments to respond?

# Population at Risk

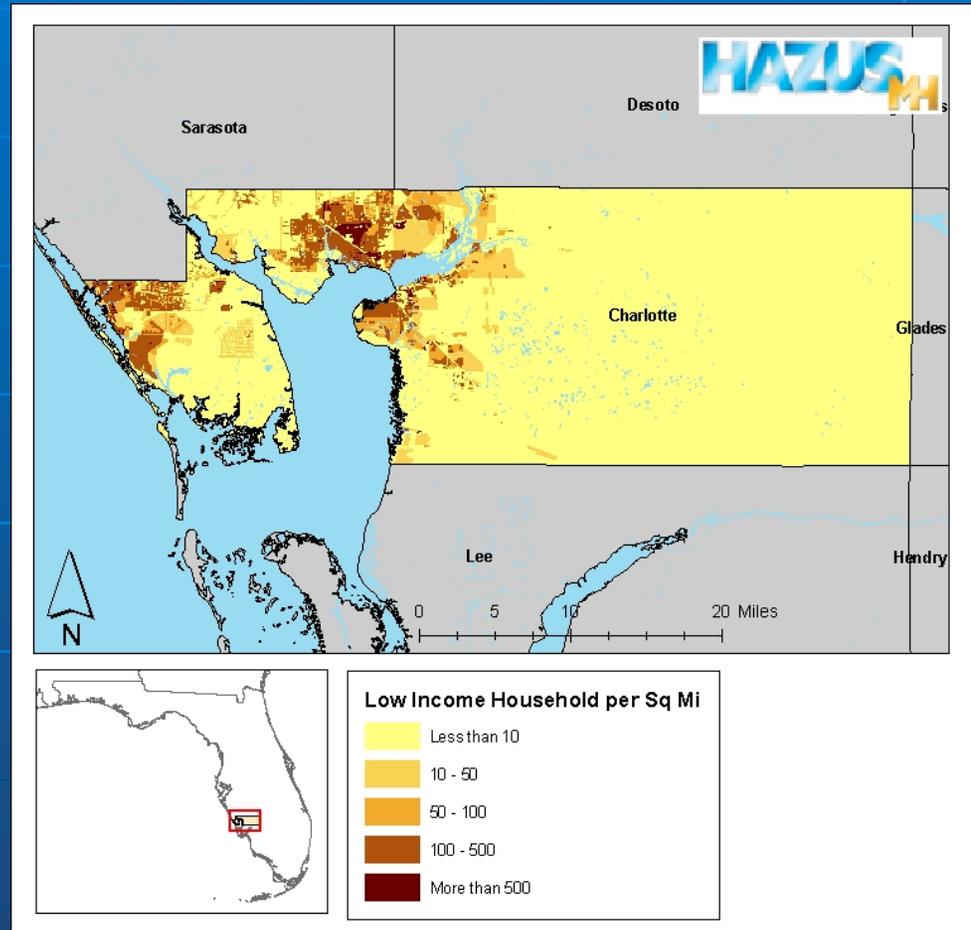
## Pre-Event Actions:

Identify and map vulnerable populations

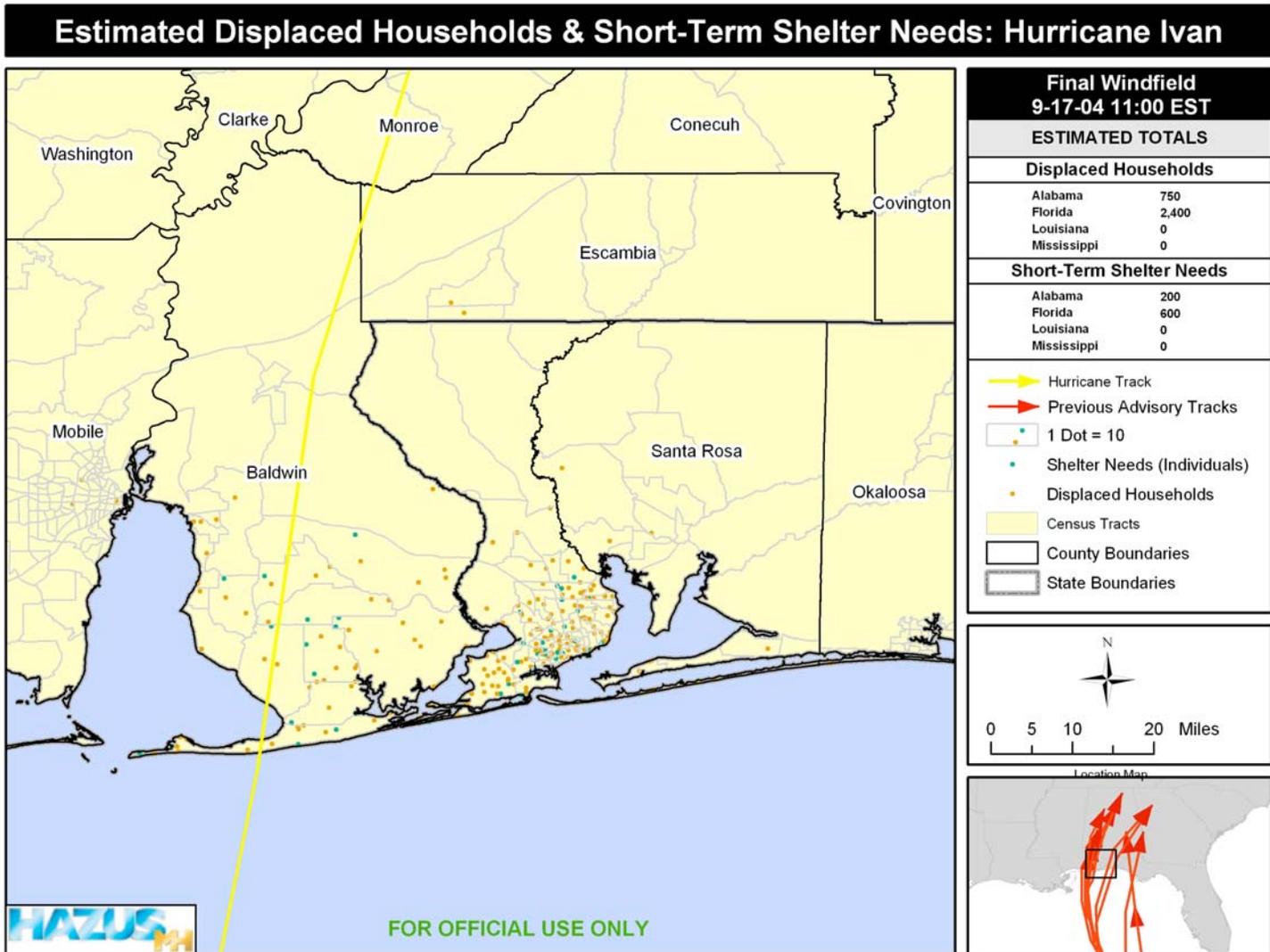
- Elderly
- Low-Income
- Nursing Home Residents

## Post-Event Applications:

- Estimates of number of people requiring ice, water and food.



# Estimated Shelter Requirements



# Post-Disaster Validation of HAZUS-MH Shelter Estimates

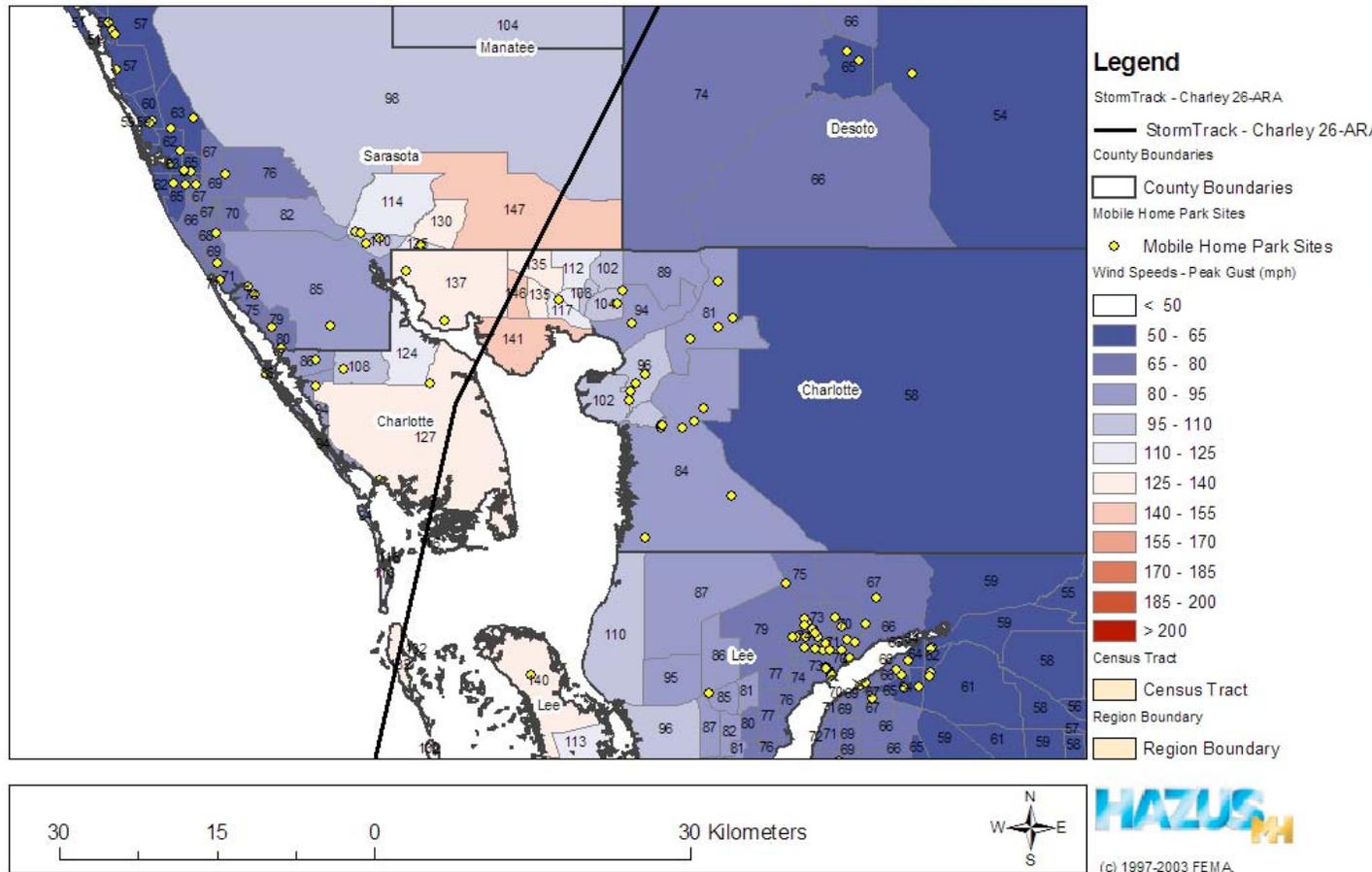
## Hurricane Charley

Estimated Number of Shelters: 4,500  
(NHC Advisory 22)

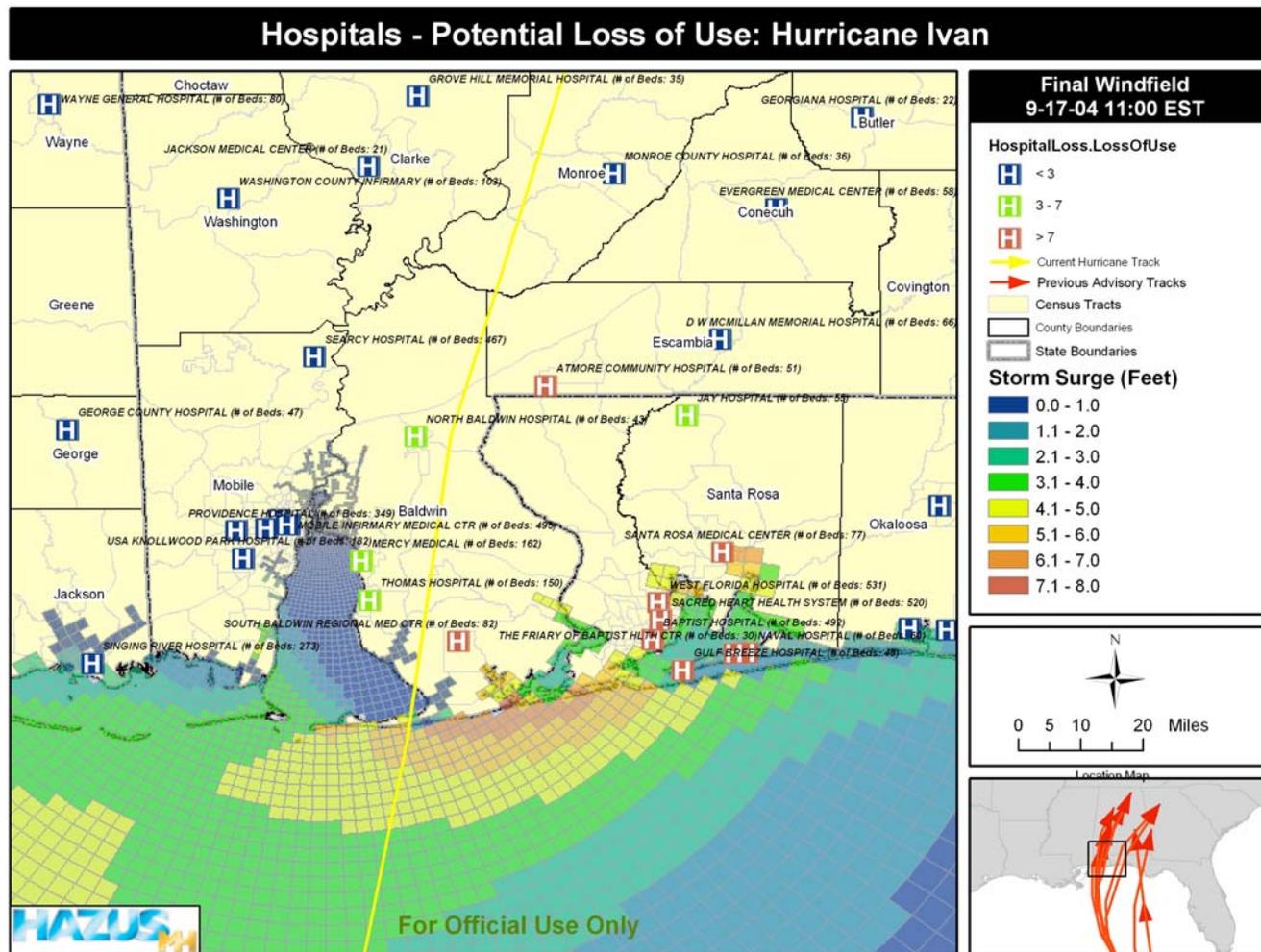
Actual Number of Shelters: 5,300  
(American Red Cross)

# Exposure of Manufactured Housing to Wind – Hurricane Charley

Study Region: Charley Multi-State Region  
Current Scenario: User defined; Name: H-Wind Charley Data



# Hospitals – Potential Loss of Use



# Hospital Loss of Use: Applications

- Hospital Patient Evacuation Planning  
{National Disaster Medical System/NDMS/  
ESF #8}

# Categories of HAZUS-MH Analyses

- 1.0 Area of Projected Damage
- 2.0 Population at Risk
- 3.0 Expected Damage to Essential Facilities
- 4.0 Expected Sheltering Requirements
- 5.0 Expected Residential Damage
- 6.0 Debris Generated
- 7.0 Mitigation Operations

# County Residential Loss Ratios

- HAZUS-MH Output that Measures Residential Loss as % of **Total** Residential Building Value
- A Very Useful Predictor of Community's Ability to Recover/Need for Disaster Assistance

# Interpreting Residential Loss Ratios

A Loss Ratio of **> 5%** signifies that a community's inventory of housing suffered major damage (as % of total building value), which has important implications for community recovery, and the need for recovery aid.



# SOPs and Training

- FEMA SOPs for HAZUS (May, 2007)
- Using HAZUS-MH for Disaster Operations (E179)
- Catastrophic Planning
- Exercises

# Role of HAZUS-MH in Geospatial Preparedness

Tom Durham, Moderator

Richard Eisner, Consultant

Dan Cotter, Chief Technology Officer  
Department of Homeland  
Security

# HAZUS-MH Model

Estimates damages and losses from hurricanes and other hazards, including:

- Area of damage
- Population at risk
- Damage to essential facilities
- Shelter requirements
- Residential damage
- Debris generated
- Economic losses

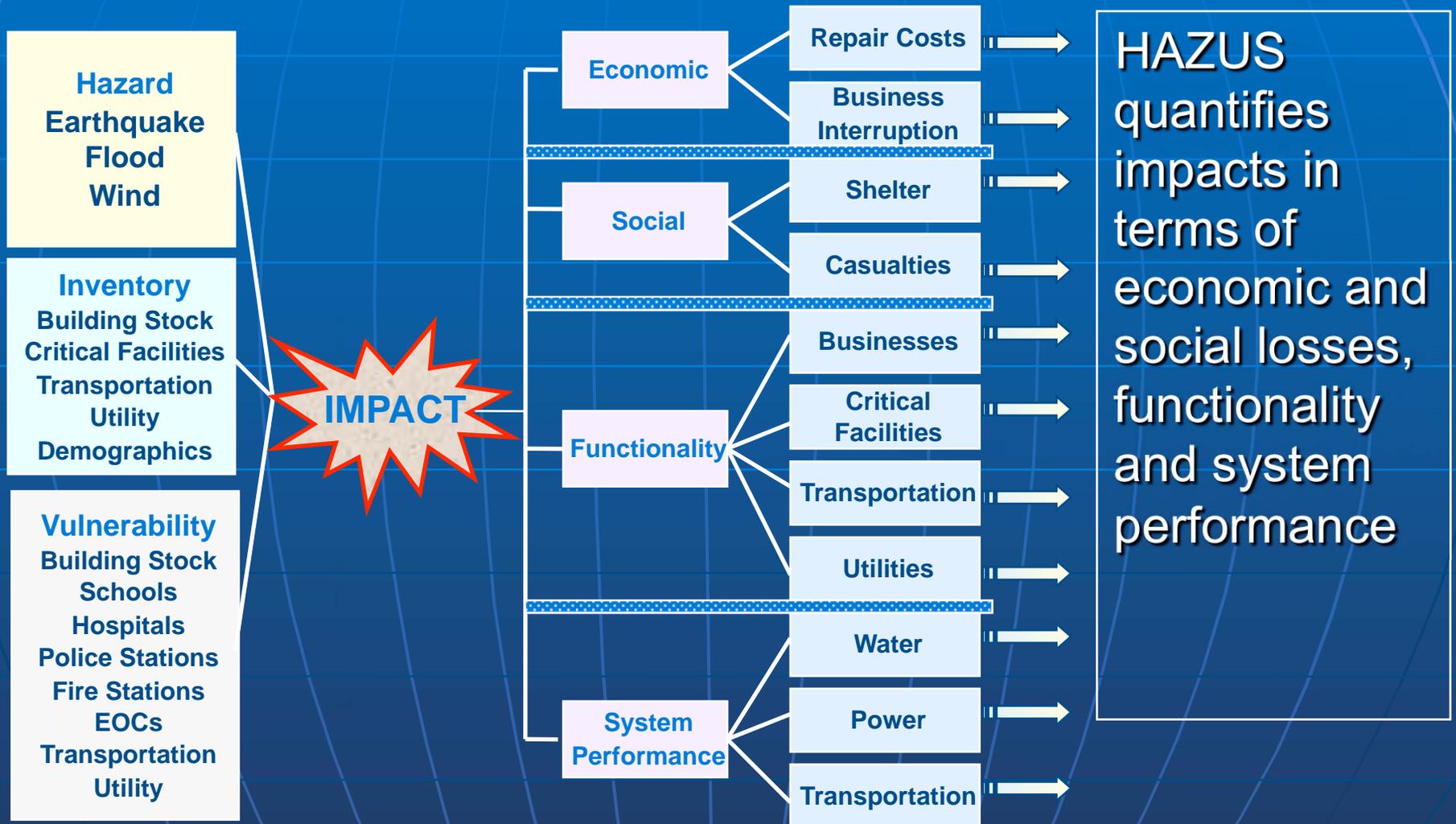
# SW Florida Pilot Project: Capitalizing on Unique Opportunities

- Build on and utilize local data and resident GIS expertise.
- Identify practical ways to use HAZUS to support risk and emergency management decisions.
- Develop a sustainable program that leads to results.

# SW Florida Pilot Project

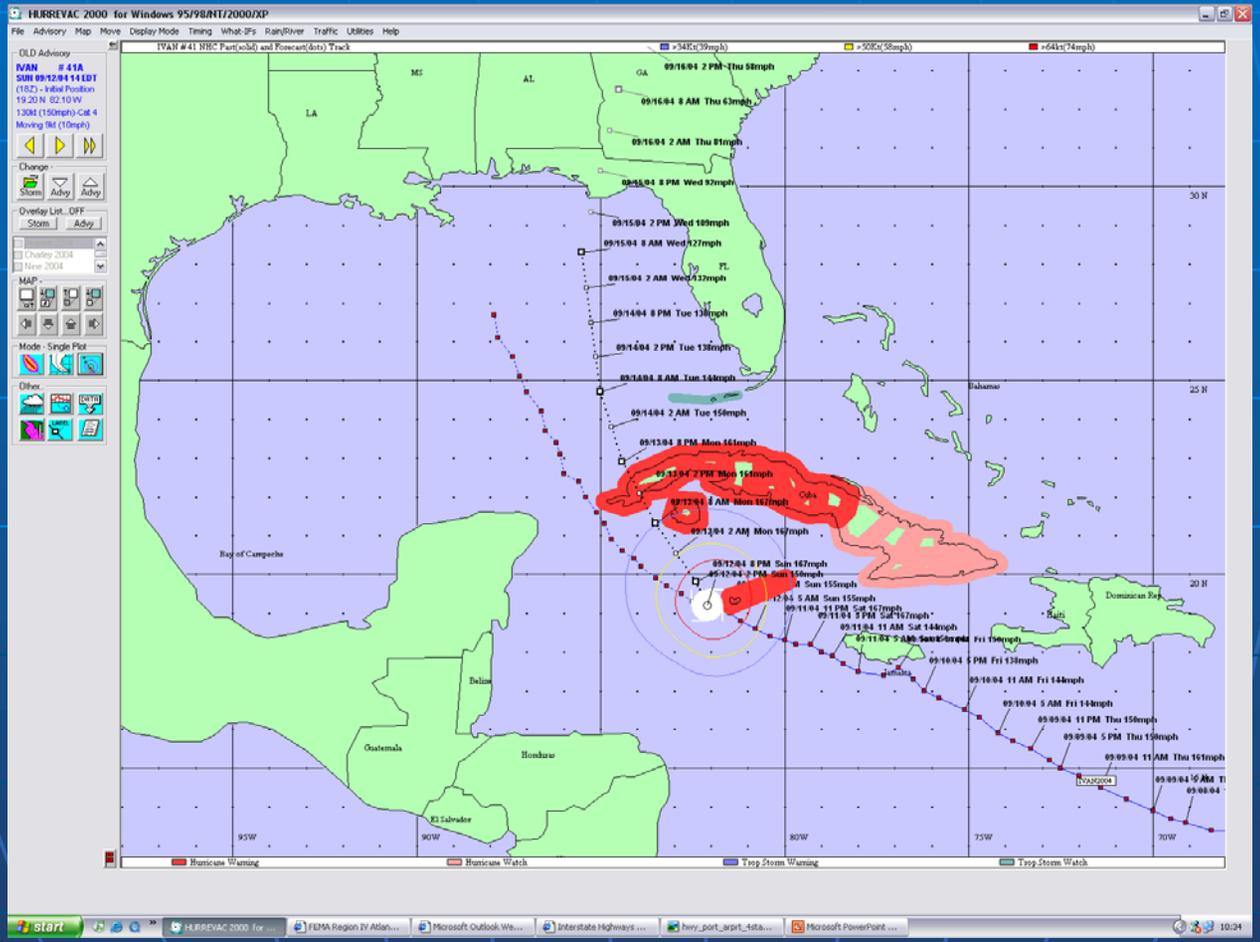
- Opportunity to demonstrate model use
- Data (following Hurricane Charley)

# Role of HAZUS-MH in Geospatial Preparedness



# Mitigation Options in HAZUS-MH

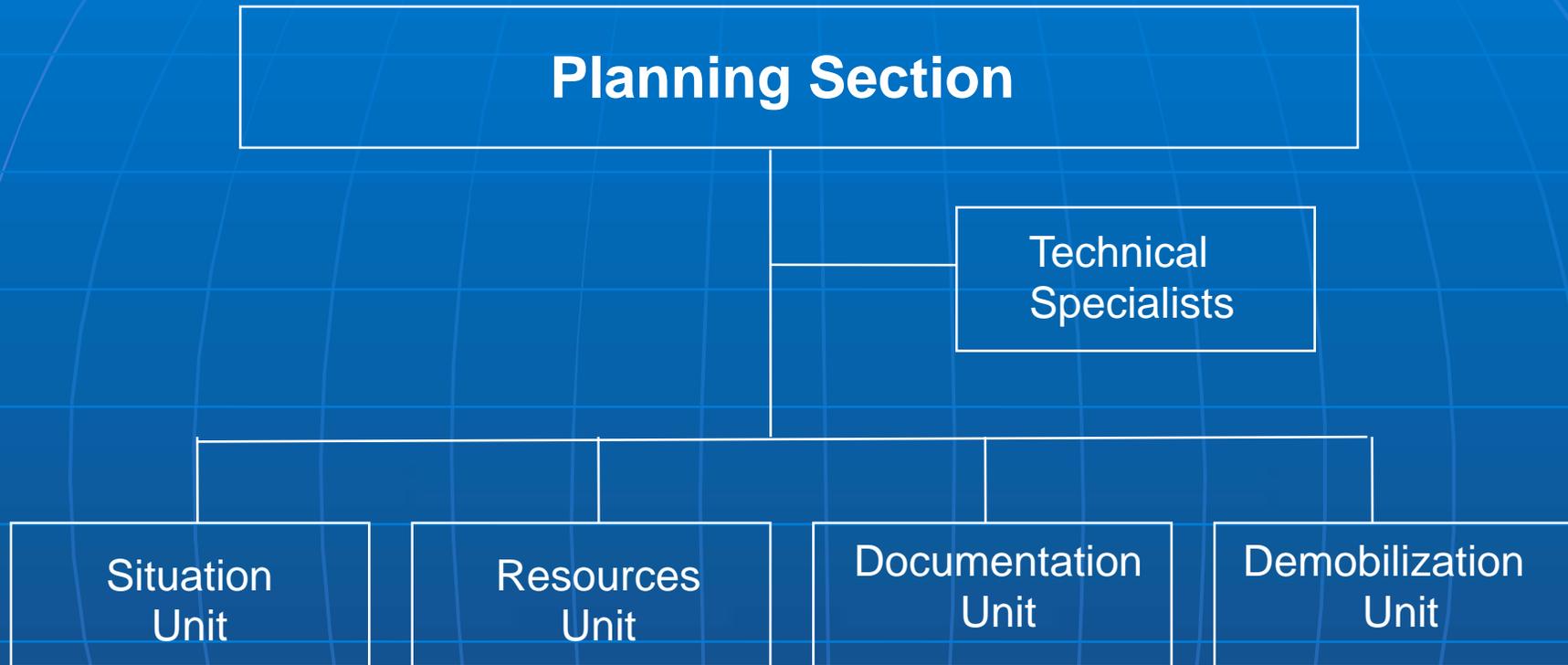
- Mitigation options for Single Family Residential
  - Roof covering
  - Secondary water resistance
  - Roof sheathing attachment
  - Roof framing attachment
  - Opening protection
- Mitigation options for Manufactured Homes
  - Tie-Downs
  - Shutters on all windows and entry doors



# Application of Demographic Analysis

- Identification of Population at Risk  
{ESF #5}
- Identification of most vulnerable population (low-income, elderly, manufactured housing)  
{Human Services}

# HAZUS-MH



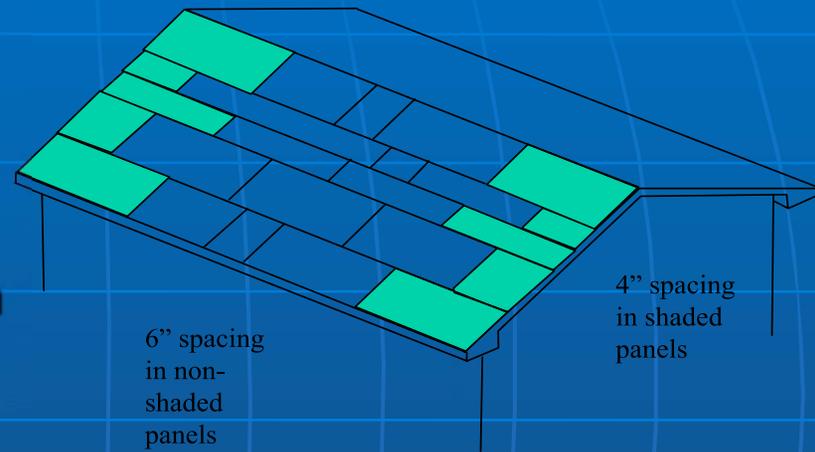
# Mitigation – Secondary Water Resistance

- Applied on all plywood joints

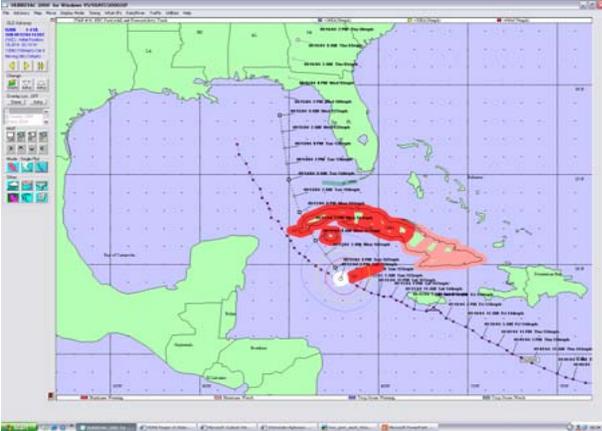


# Mitigation – Roof Sheathing Attachment

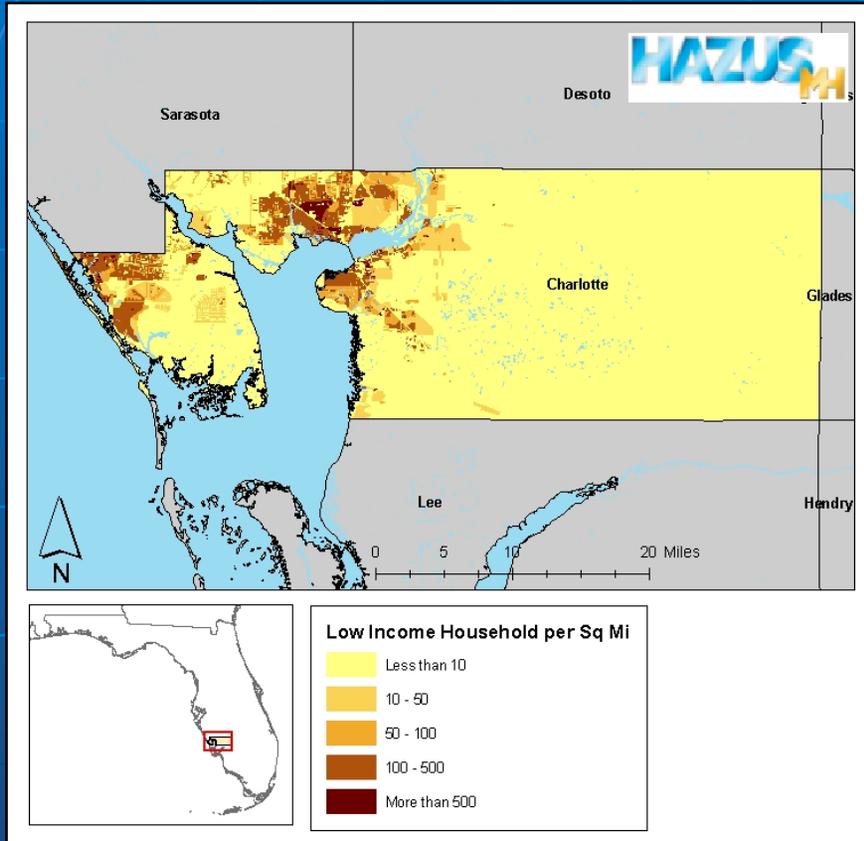
- **Re-nail with tighter nail spacing**
  - SSTD 10-99: Latest code requirements are 6”/6” spacing in high wind areas
  - Re-nail during re-roofing option
- **Re-nail with stronger fasteners**
  - Larger nails
  - Ring shank nails
  - Screws
- **Not good option for expensive roof coverings such as tile or slate**



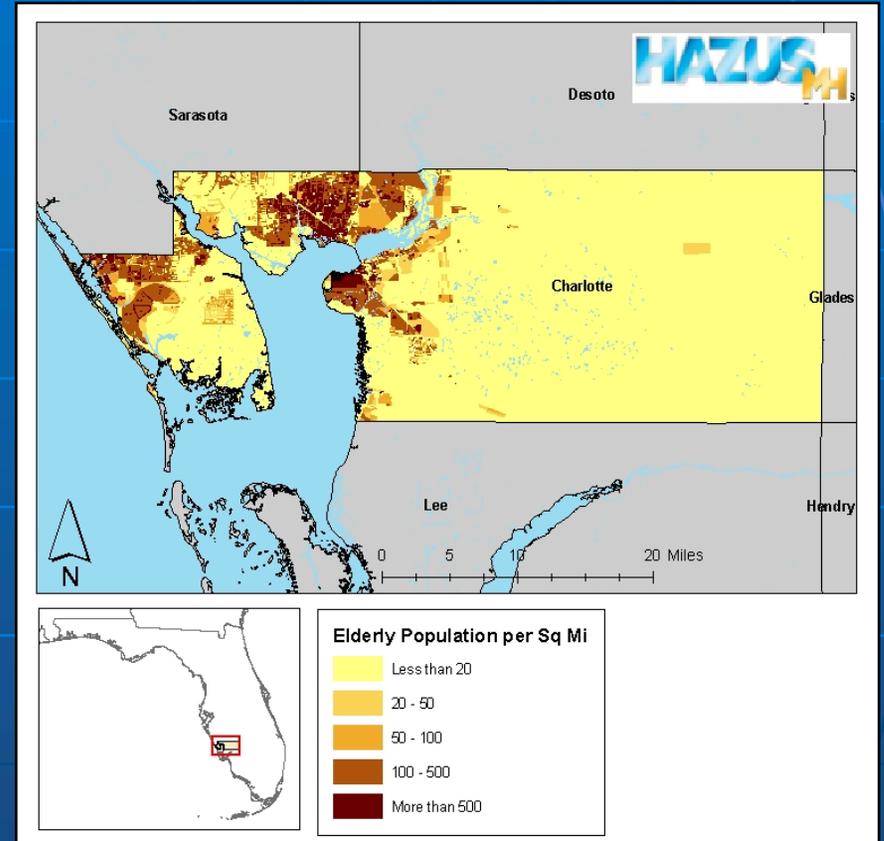
# Activation of the HAZUS-MH Team

<p>Storm Status <b>September 12</b></p>	<p>ROC Activity</p>	<p>HAZUS-MH Analyses</p>
	<p><b>HAZUS-MH Team Activated:</b></p> <p><b>Joe Rachel, FEMA</b> <b>Doug Bausch, FEMA</b> <b>Rich Hansen, FEMA</b> <b>Tom Durham, PBS&amp;J</b> <b>Eduardo Escalona, PBS&amp;J</b></p>	<p><b>Following each advisory:</b></p> <ul style="list-style-type: none"><li>· <b>Map of Estimated Peak Wind Gust Speeds (following NHC advisories)</b></li><li>· <b>Quick Assessment Reports</b></li></ul>

# Demographic Analysis



Low Income  
(Per Sq Mile)



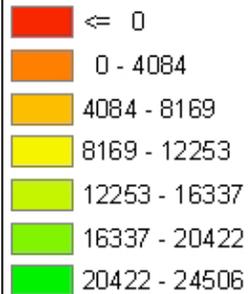
Elderly Population

# Demographic Analysis

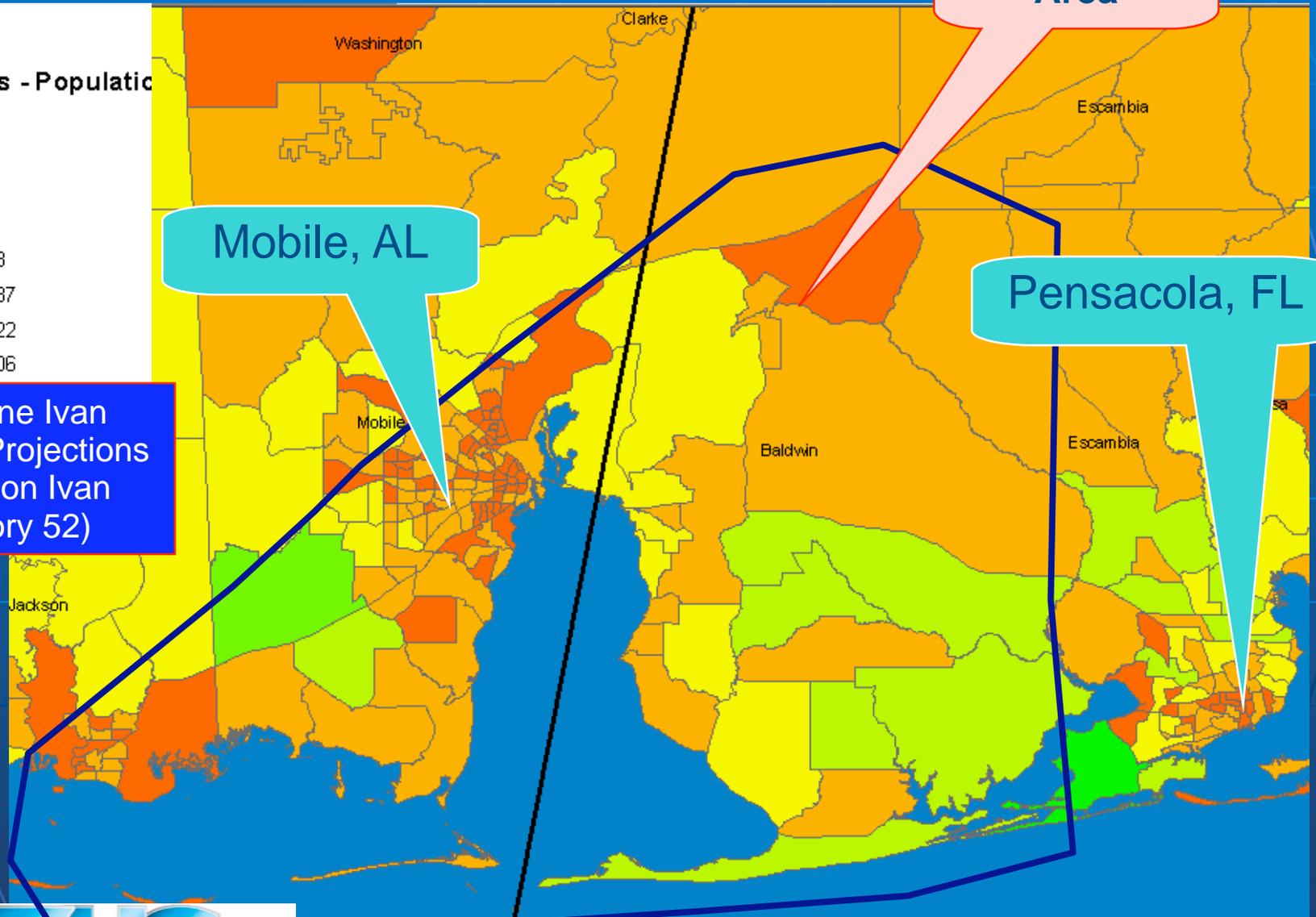
## Legend

### Demographics - Population

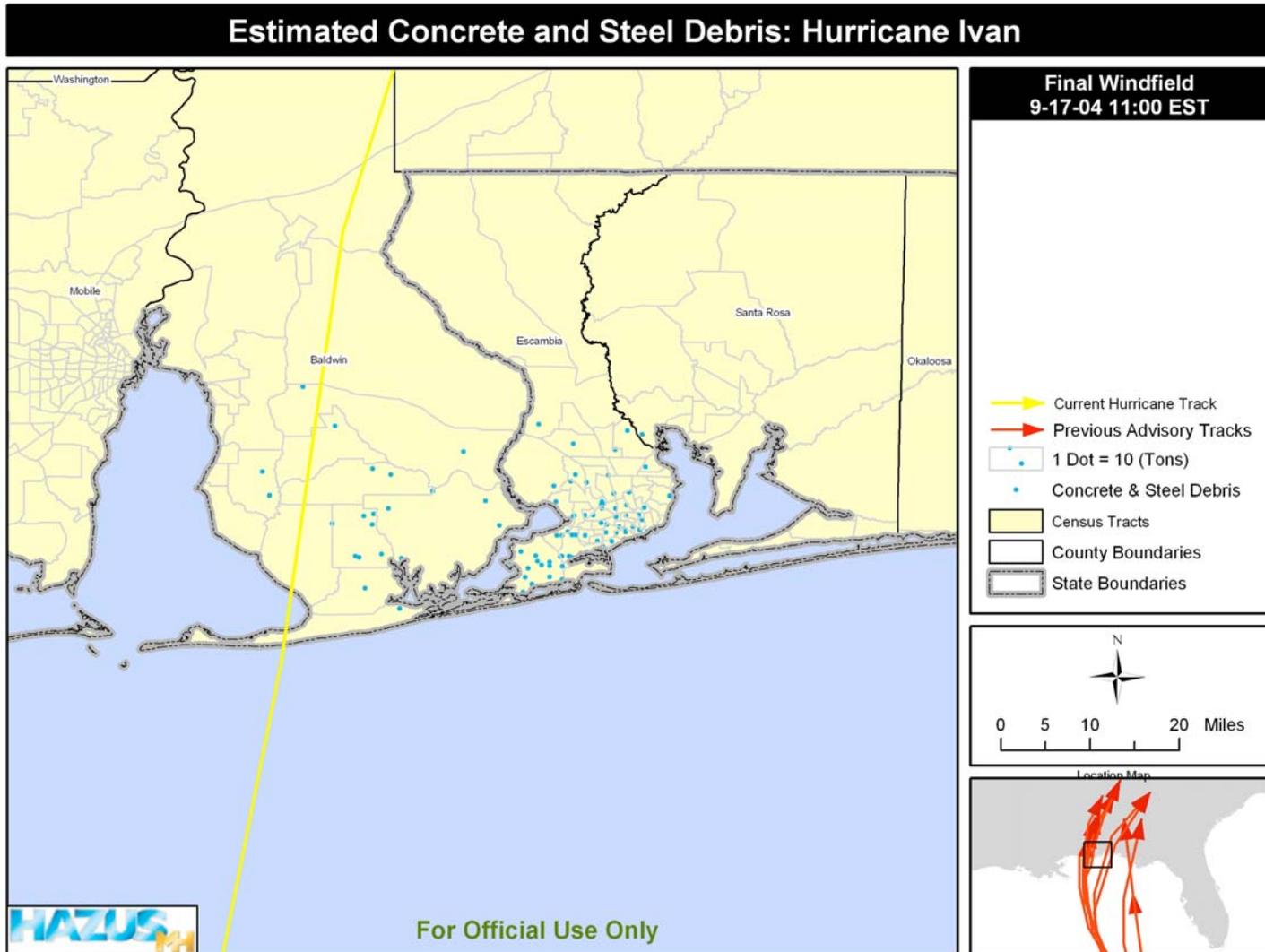
#### Population



Hurricane Ivan  
Damage Projections  
(Based on Ivan  
Advisory 52)



# Debris Generated



# Application of Debris Estimates (Steel and Concrete)

- Identification of disaster sites with high probability of urban search and rescue requirements  
{ESF # 9}

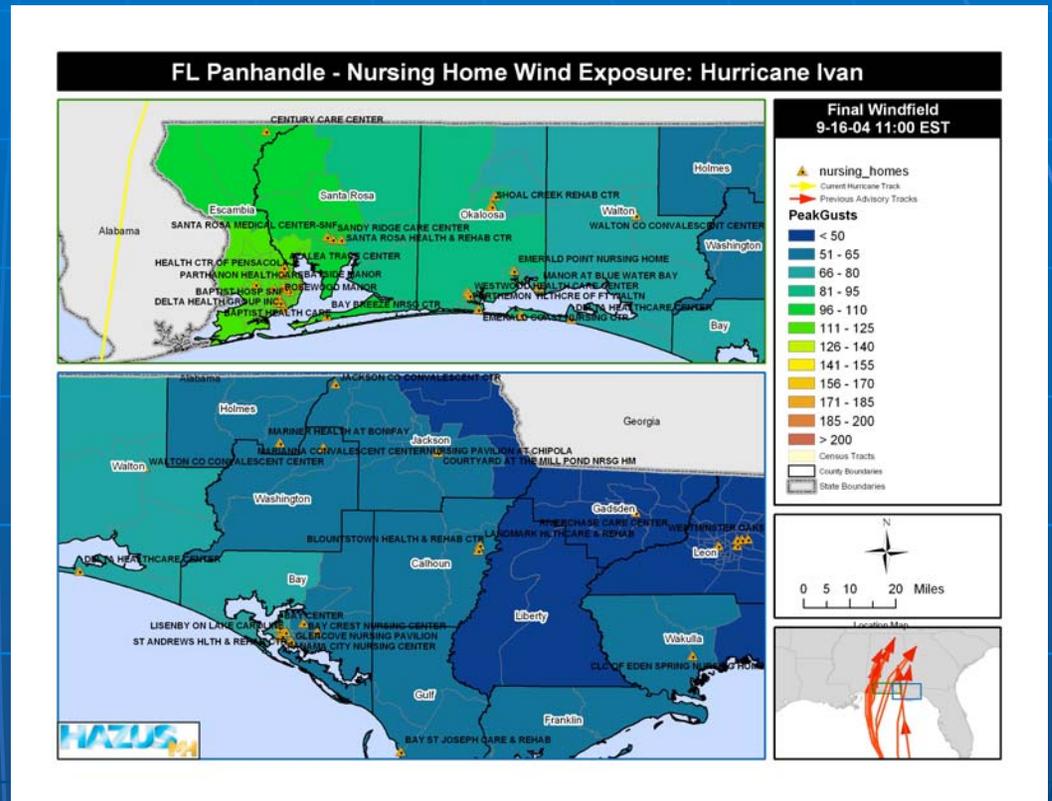
# Situation Status

## Pre-Event Actions:

Identify and map nursing homes

## Post-Event Applications:

- Estimates of the number of people requiring ice, water, MRE, and tarps
- Estimates of the number of residents in nursing homes impacted by high winds and storm surge

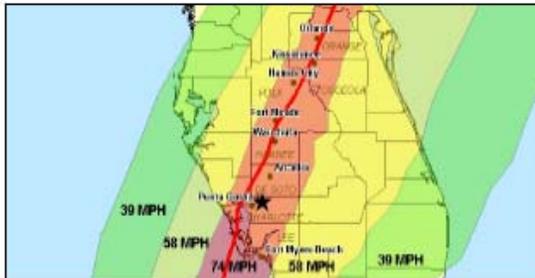


# Post-Disaster HAZUS-MH Validation

## 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<sup>MH</sup> DAMAGE ESTIMATES

- 35% probability of moderate damage to facility

### ACTUAL DAMAGE

- Major damage to roof
- Water damage to control room

# Categories of HAZUS-MH Analyses

## Regional Operations Center – 2004

- 1.0 Area of Projected Damage
- 2.0 Population at Risk
- 3.0 Expected Damage to Essential Facilities
- 4.0 Expected Sheltering Requirements
- 5.0 Expected Residential Damage
- 6.0 Debris Generated
- 7.0 Mitigation Operations**

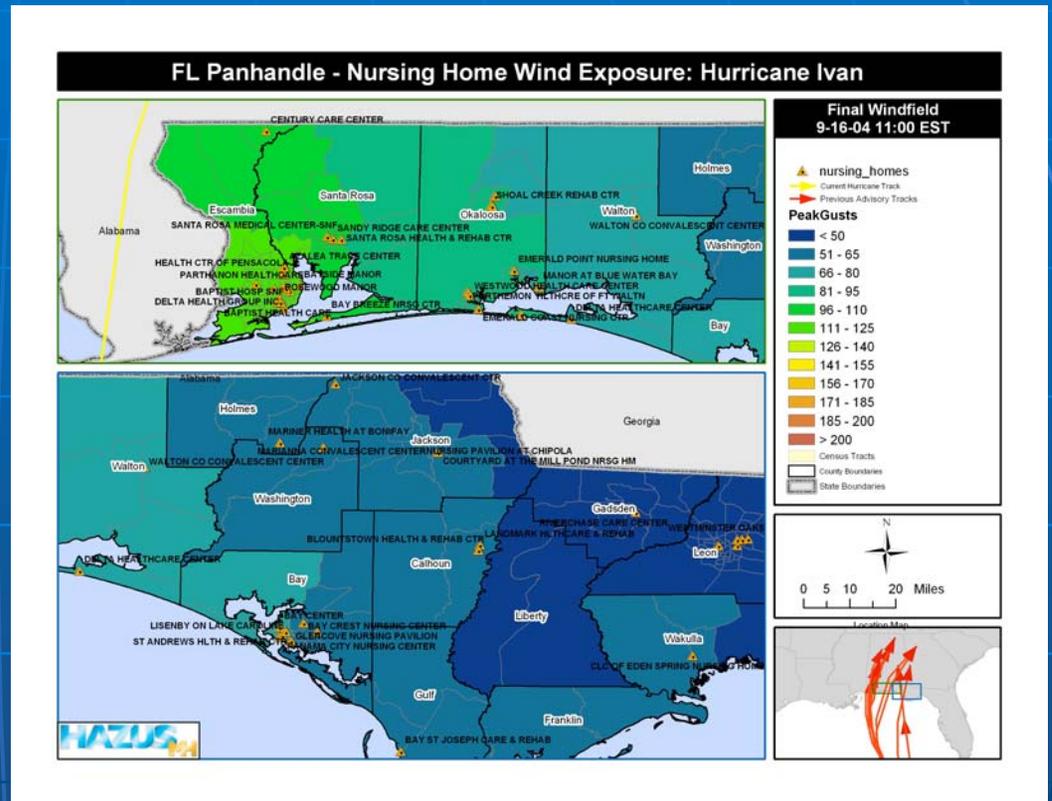
# Situation Status

## Pre-Event Actions:

Identify and map nursing homes

## Post-Event Applications:

- Estimates of the number of people requiring ice, water, MRE, and tarps
- Estimates of the number of residents in nursing homes impacted by high winds and storm surge



# Next Steps

- Fully integrate HAZUS-MH into ESF 5 operations:
  - ✓ Standardization of outputs
  - ✓ Training (HAZUS-MH operators and HAZUS-MH users of analysis)
  - ✓ Use of HAZUS-MH in ESF 5 (e.g., Response Capability Matrix)

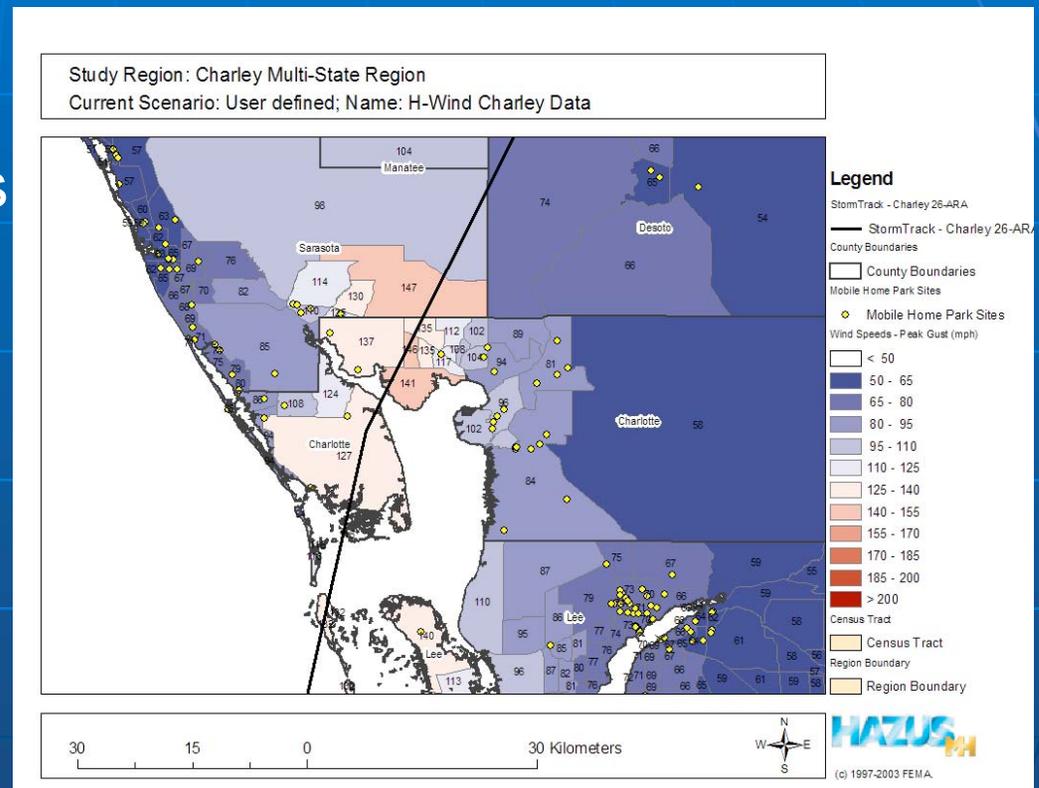
# Situation Status

## Pre-Event Actions:

Identify and map manufactured housing parks

## Post-Event Applications:

- Estimates of the number of people requiring ice, water, MRE, and tarps
- Estimates of the number of households in most vulnerable housing.



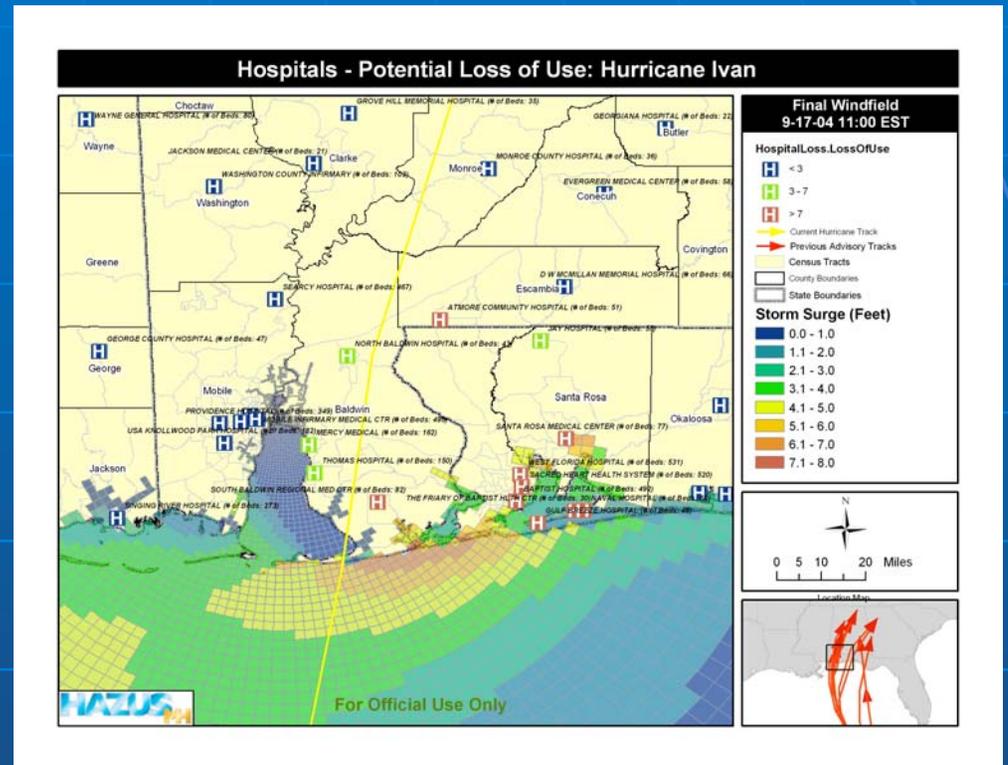
# Hospitals: Potential Loss of Use

## Pre-Event Actions:

- Identify and map hospitals and medical facilities.
- Develop hospital attribute database (e.g., bed capacity, surge capacity, services provided, ability to withstand Category 4 and 5 storms)

## Post-Event Applications:

- Estimates of damage and loss of functionality
- Coordinate HAZUS analysis with remote sensing imagery to identify areas and hospitals most impacted by winds and surge



## Primary Indicators of Disaster Response

Current Status		Red	Yellow	Green
	<b>Energy</b>	90% or less service restoration	90% - 98% restoration	Greater than 98% restoration
	<b>Schools – Public K-12</b>	Schools not open/classes not in session	Schools open/ not all students in classes	Normal
	<b>Emergency Services</b>	Requiring external services – mutual aid	Operating under Emergency Plans	Normal operations
	<b>Health Care</b>	Primary health care systems and DMATs	Primary health care systems/no DMATs	Primary health care systems
	<b>Debris</b>	Emergency Debris Clearance	Emergency Debris Removal	Debris Management Plan implemented
	<b>Water</b>	No pressure/low pressure/boiling water order	Normal pressure/boiling water orders	Normal
	<b>Communications</b>	Not operational	Emergency systems up	Normal
	<b>Search and Rescue</b>	Primary Complete	Secondary Complete	All clear

# Primary Indicators of Disaster Response

Current Status		Red	Yellow	Green
	<b>Short – Term Shelter Needs</b>	<b>Shelter Deficiency</b>	<b>Shelters Operational</b>	<b>Shelters Closed</b>
	<b>Capability to Care for Most Vulnerable Populations</b>	<b>Requiring External Services and Sustained Support</b>	<b>Operating With Existing Human Services Capabilities</b>	<b>Ongoing Operations</b>

# SW Florida HAZUS-MH Pilot Project

## Goals:

- 1) To develop a technical capacity in SW Florida to use HAZUS-MH
- 2) To identify, prioritize, collect, and enter data into HAZUS-MH to enable Level 2 analyses  
{Data Acquisition and Stewardship Work Group}

# SW Florida HAZUS-MH Pilot Project

## Goals:

- 3) To promote the use of HAZUS-MH in Florida to analyze options and prepare mitigation strategies. {Mitigation and Recovery Work Group}
- 4) To promote the use of HAZUS-MH in Florida to support preparedness and response, including the CEMP. {Preparedness and Response Work Group}

# Summary

Work Group approach emphasizes:

- Linkage of GIS/HAZUS-MH operators and HAZUS-MH users of analysis
- Integration of Federal, state, and local officials in a functional approach to HAZUS applications
- Use of Work Plans that lay out specific objectives, tasks, and timelines.