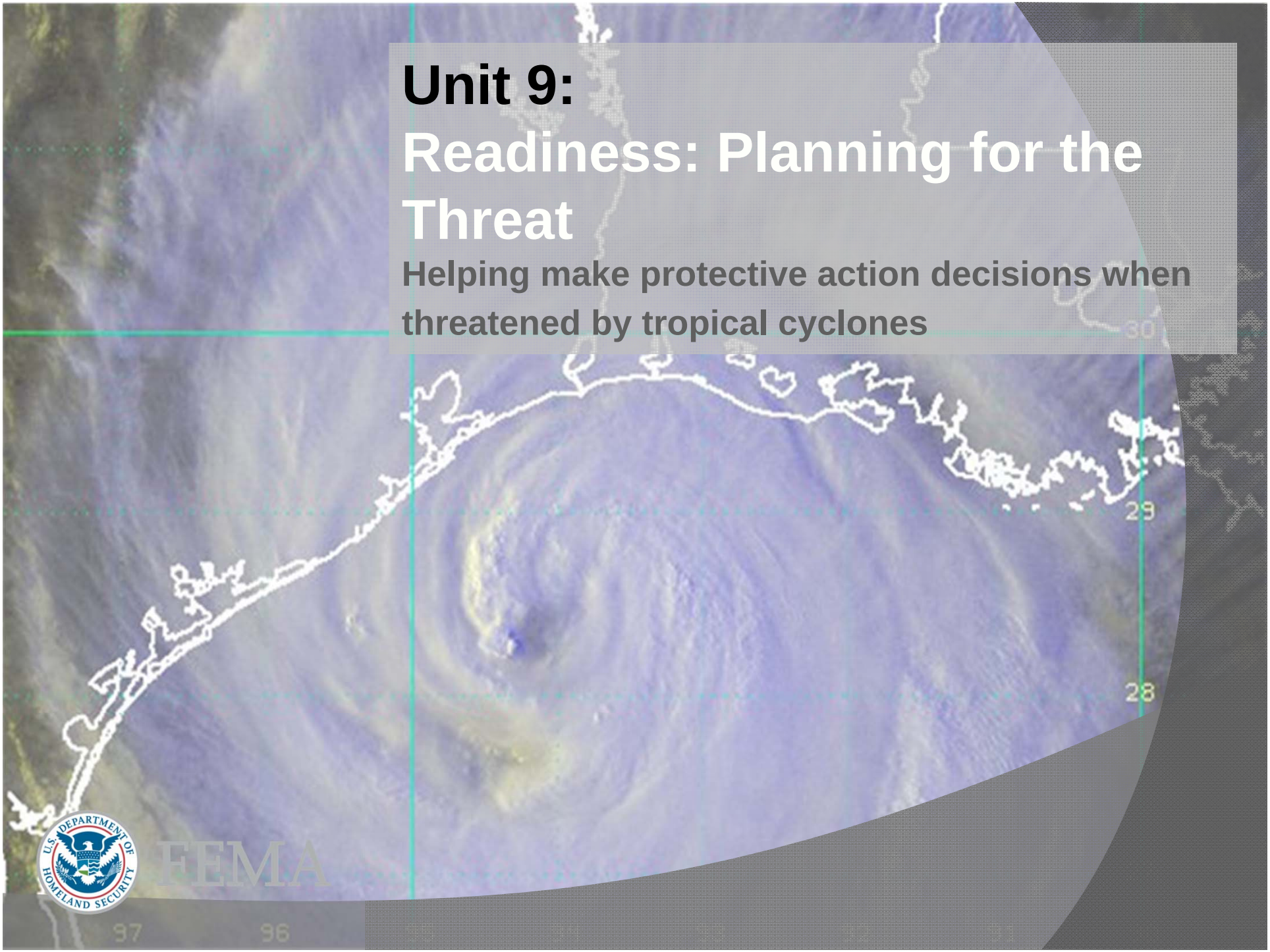
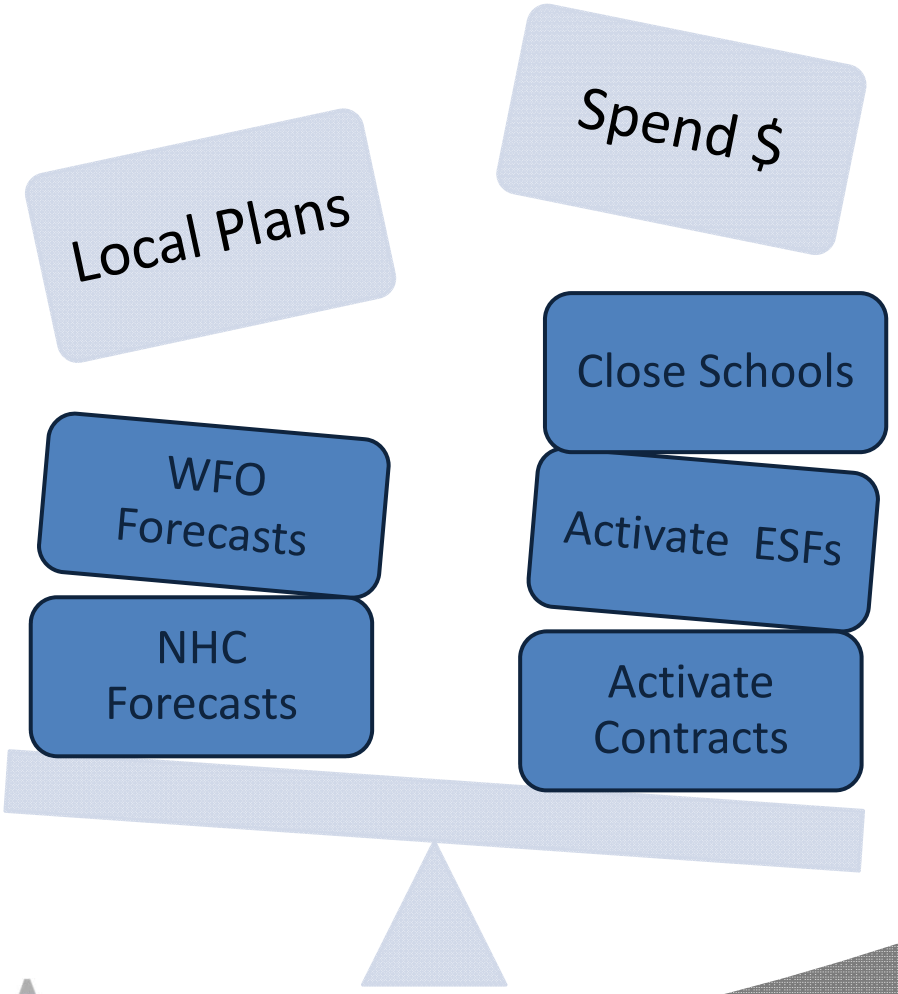


Unit 9:
Readiness: Planning for the Threat

Helping make protective action decisions when threatened by tropical cyclones

Decision Making in a Hurricane



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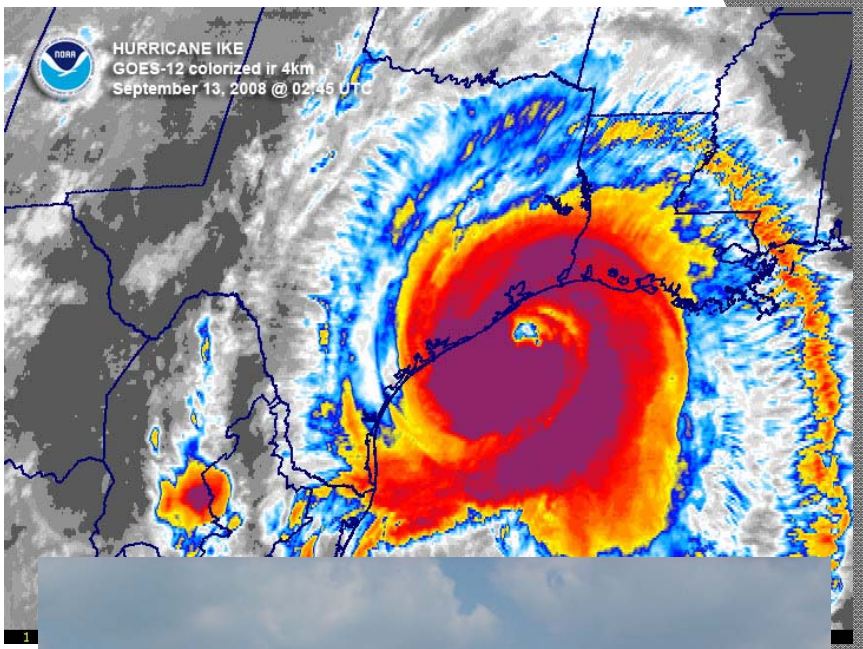
Readiness: Planning for the Threat

- Hurricane Readiness Checklist
- Defining the hazards in a hurricane
- Determining vulnerable populations/communities
- Understanding basic behavioral assumptions
- Importance of transportation analyses
- Evacuation Zone basics
- Real-time Risk



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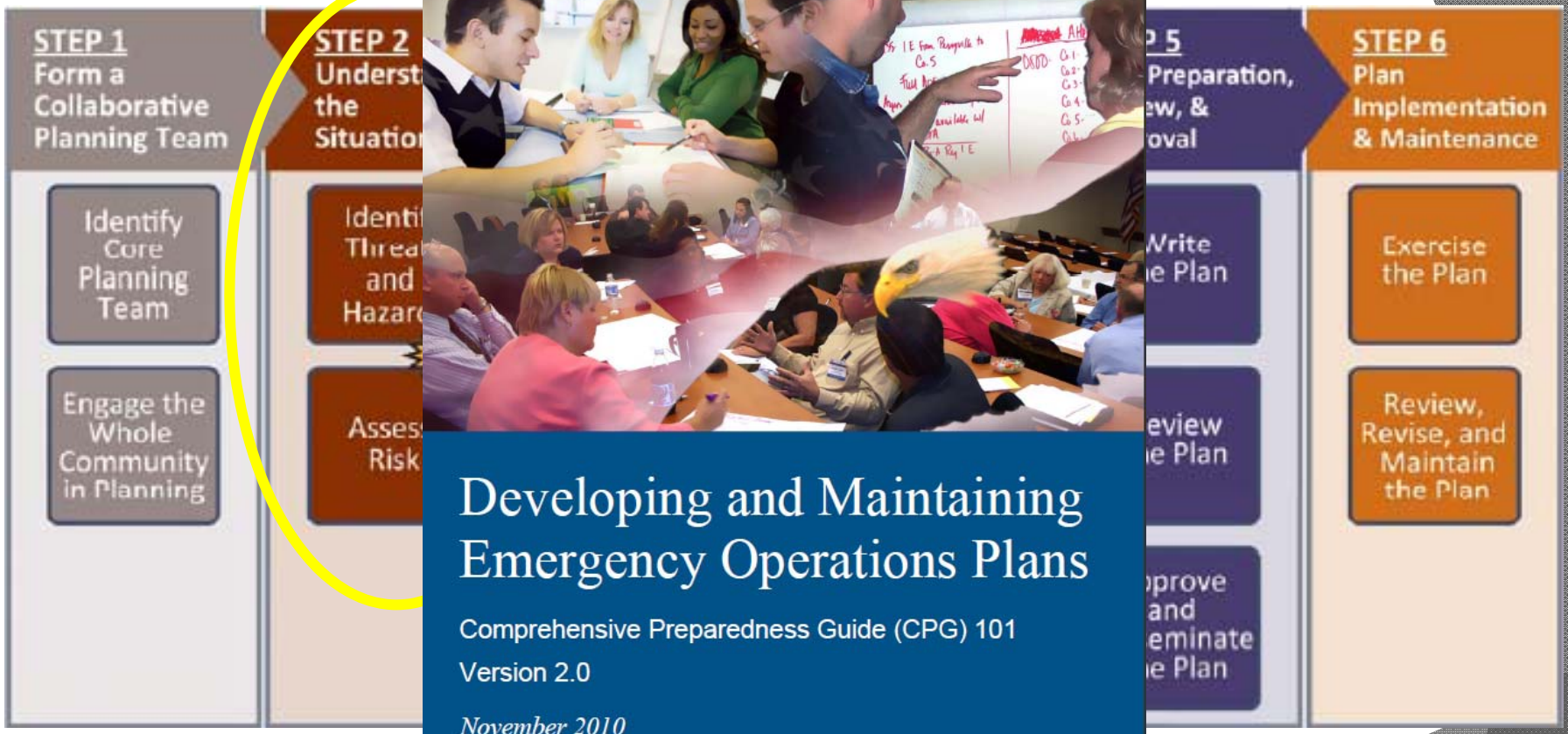
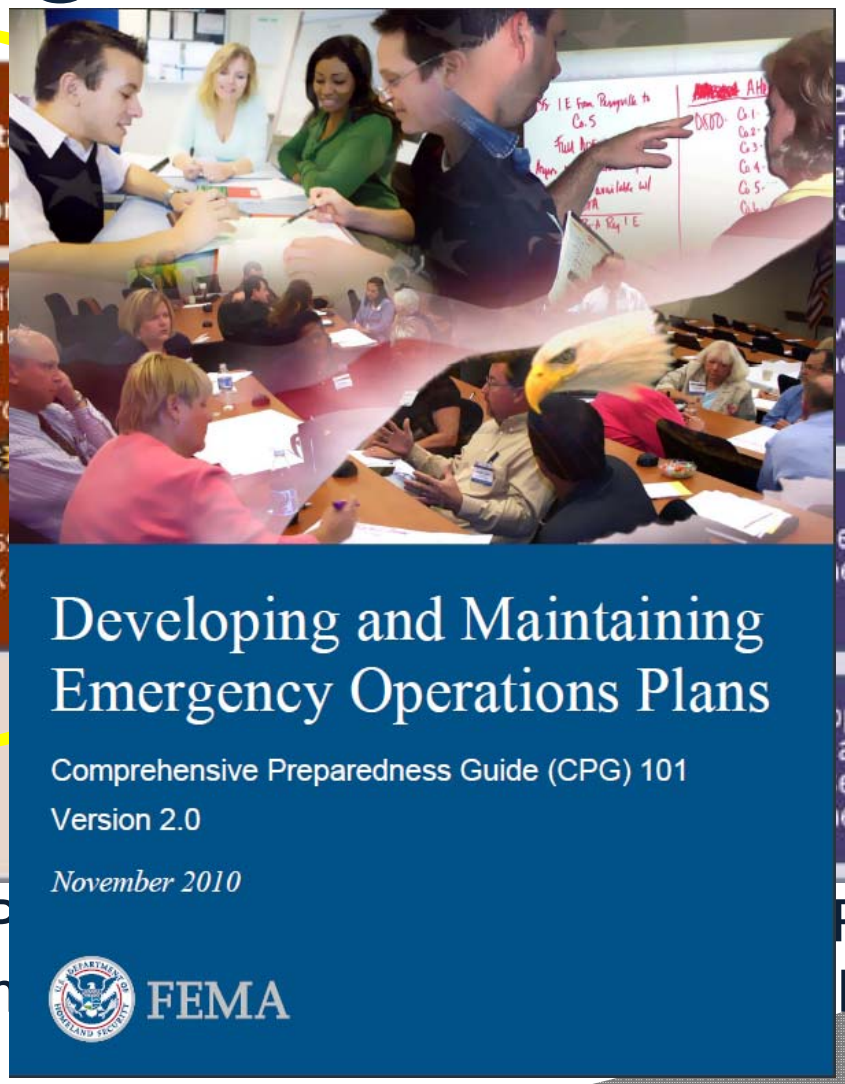
Planning for the Threat





Comprehensive P Planning steps
http://www.fem PG_101_V2.pdf

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Phases of Hurricane Readiness

Hurricane Readiness can be structured around the following phases:

- Pre-season and preparedness
- Monitoring the Storm
- Storm Threat Imminent
- Storm Hazard Impact

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HURRICANE READINESS CHECKLIST

For Inland Emergency Managers

Hurricane preparedness - prior to June 1	PRIORITY LEVEL	PERSONNEL RESPONSIBLE	STATUS OF TASK	DATE/TIME COMPLETED
Hurricane Planning				
*Update local hurricane operation and evacuation plans and resource lists				
*Revise Standard Operating Procedures (SOPs)				
*Review local emergency management ordinances and update				
*Test Hurrevac and other hurricane technology				
*Review Stafford Act Policies with State Emergency Management				
*Mitigate Vulnerable Critical Facilities				
*Solidify and review mutual aid agreements				
*Determine evacuation decision making authority with line of succession				
Emergency Operations Center (EOC)				
*Replenish supplies and check equipment				
*Test communication lines				
*Update activation plans and train staff				
*Update HURREVAC to latest version				
Evacuation Zones				
*Identify Vulnerable populations that may need to be evacuated				
*Review/update evacuation maps and add/change routes				
*Conduct public awareness campaigns to warn public of vulnerability				
*Design an in-county evacuation plan based on easily communicated zones				
Warning Order Communication Planning				
*Test National Oceanic Atmospheric Administration (NOAA) weather radios				
*Exercise county/local Emergency Alert System (EAS)				
*Participate in National Weather Service (NWS) conference calls/meetings				
*Meet with media outlets to discuss evacuation warning order protocols				
*Meet with local NOAA/NWS/RFC entities				
*Define evacuation order authority within the jurisdiciton				
Shelter Status				
Congregate Shelters				
*Review ARC 4496 approved shelter list and update				
*Meet with sheltering and shelter regulatory agencies to identify shortfalls				

Hurricane Readiness Checklist

The Hurricane Readiness Checklist should be community-specific:

- The checklist should be time-sequenced
- Identify responsible agencies or officials for each task
- Evaluate priority of actions to be addressed

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Importance of the HRC

- Prompts for timely action
- Supports decision/action-making accountability
- Structures documentation
- Ensures coordination and communication
- Facilitates Planning

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Pre-Season Considerations

- Revise and update plans
- Train staff, conduct exercises/drills and table-tops
- Conduct pre-season coordination meetings
  - ESF primary/secondary agencies
  - Shelter managers
  - Local and Regional Media

1st Responders take part in "Hurricane Alicia" Full-Scale FEMA exercise drill to test emergency procedures in preparation for the 2006 hurricane season. Marvin Nauman/FEMA photo.

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Pre-Season Considerations
Evaluate Plan

- Review local hurricane plans and annexes with staff and Emergency Support Function agencies
- Assess jurisdictions capability and resources- ensure realistic/executable plan
- Conduct exercises/drills

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Pre-Season Considerations

Conduct Training

- Staff
- Elected officials
- Primary and Secondary ESF personnel
  - Mass care
  - Evacuation/transportation officials
  - Law enforcement
  - Local volunteers

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Pre-Season Considerations
Public Education and Awareness

- Use of Media for Communication
  - Devise a strategy that will be effective in your jurisdiction. For example, you will need to consider:
    - Media effectiveness
    - Language and literacy issues
    - Computer literacy and access
    - Special populations

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Pre-Season Considerations

NWS Coordination

- Meet with Weather Forecast Office (WFO) staff before a storm threatens
- Locate contact information for the National Hurricane Center, River Forecast Centers, other NWS resources
- Understand local WFO operations and advisory products
- Accessing advisory information: websites, conference calls, etc.

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Pre-Season Considerations
Hazard Analysis and Planning

- Pre-season -Must start with Evaluating the Situation
  - Projections of hazards- Pre-event
    - Degree of severity
    - Extent
  - Then use of Actual forecasts -During the event

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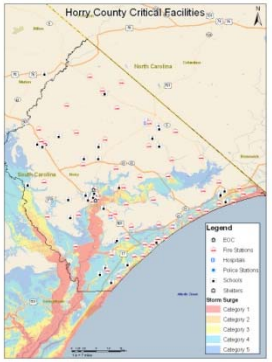
Hurricane Evacuation Studies (HES)

Hazards Analysis

- SLOSH Model development
- Surge MOMS
- **Surge Maps**
- **Evacuation Zones**

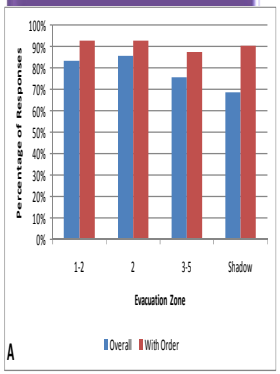
Vulnerability Analysis

- **Identify at risk**
- populations
- infrastructure
- critical facilities
- **Local Planning data**



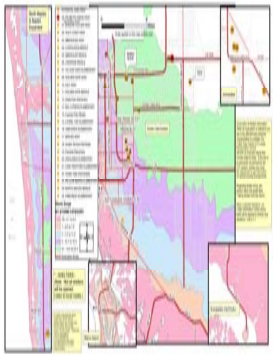
Behavioral Analysis

- Public Survey
- Analysis of Survey responses
- results for input into shelter and trans analysis



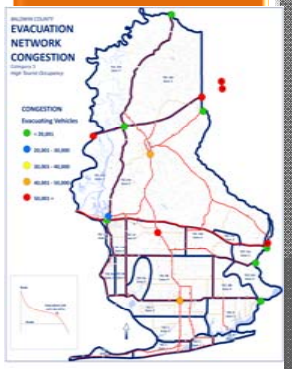
Shelter Analysis

- Determining the shelter need
- estimate number of shelter spaces
- potential vulnerability



Transportation Analysis

- Analysis of traffic volumes, evac routes, and destinations
- Traffic patterns
- **Evacuation Clearance Times**



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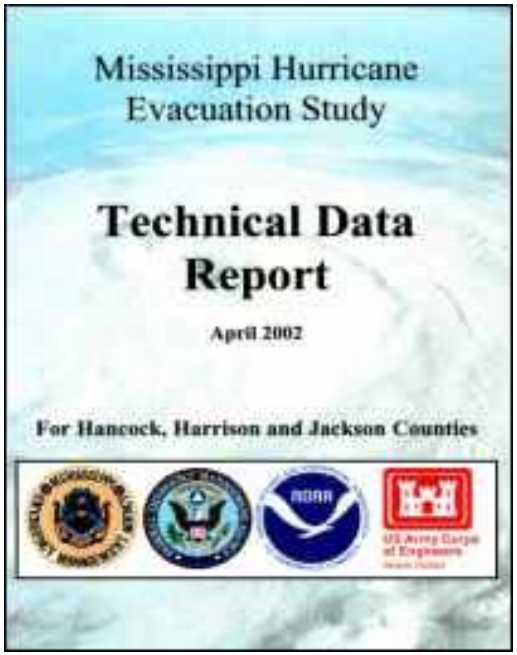
Hurricane Evacuation Study Partnerships

Providing comprehensive technical assistance to decision makers



- Federal Emergency Management Agency
- US Army Corps of Engineers
- NOAA: National Weather Service, National Hurricane Center & Coastal Services Centers
- State & Local Emergency Management Agencies
- Regional Planning Councils
- Volunteer Organizations Active in Disasters
- Other local, state, and federal partners

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Hazards Analysis

Helping coastal decision makers understand the maximum impact associated with the main hurricane hazard- Storm Surge

Wind

Storm Surge

Flooding

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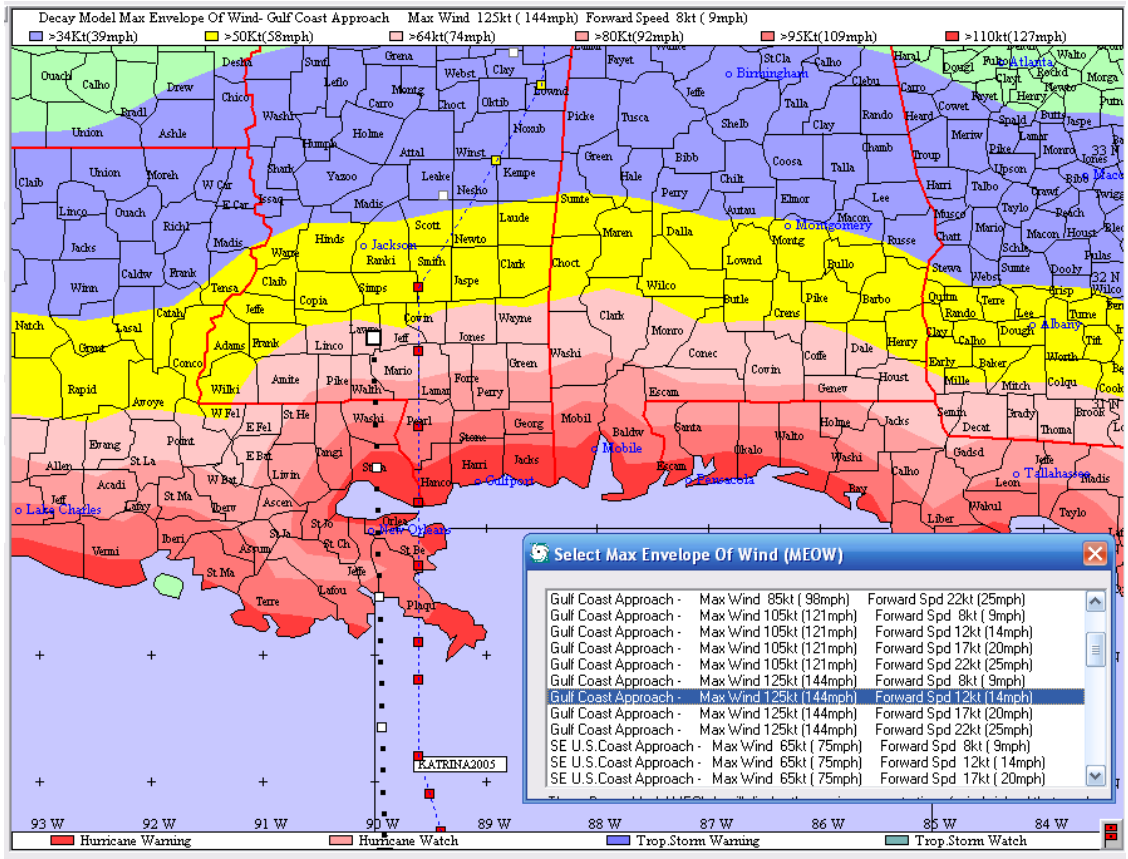
Hazards Analysis

Understanding Hurricane Wind Potential



- **Maximum Envelope of Winds (MEOW)**
- **Wind Decay Modeling**

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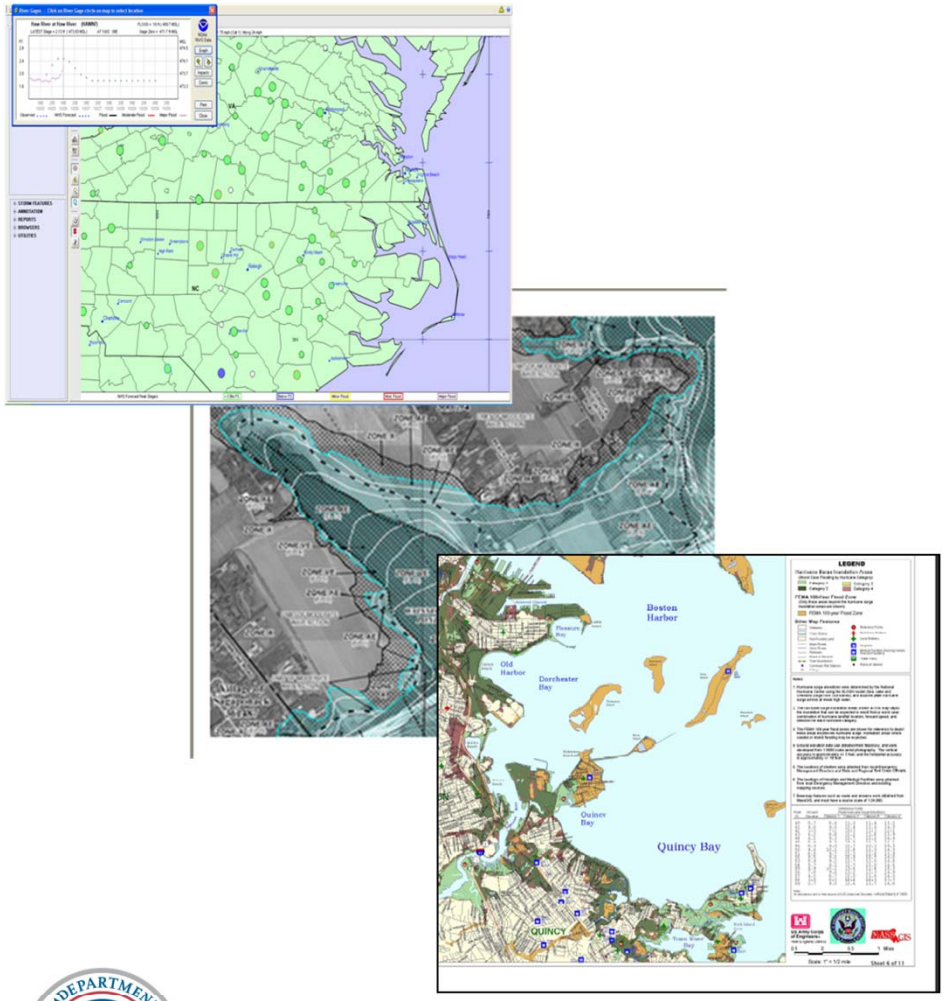
Hazards Analysis

Understanding Tropical Cyclone Flood Potential



- HURREVAC can be used to monitor threat
- Utilize FEMA Mitigation data to identify coastal flood inundation areas (100/500 year zones)
- Designating flood zones in Surge maps

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Hazards Analysis

Understanding Storm Surge Potential

- Storm surge has the highest potential for death and damage
- Storm surge is the main reason we evacuate the coast
- Hurricane Evacuation Studies utilize SLOSH for storm surge estimation

Hurricane Ike Damage, TX. Photo: FEMA

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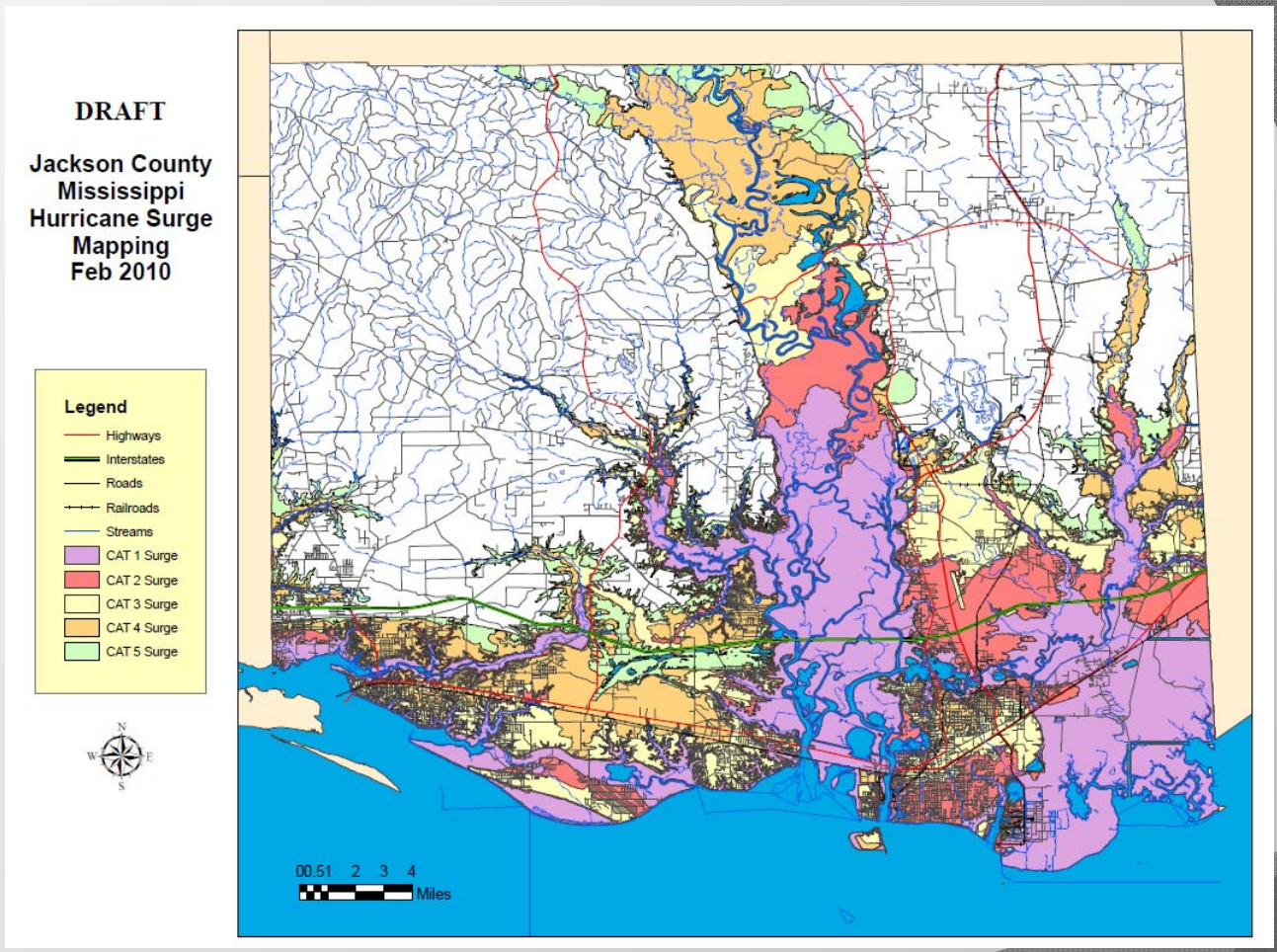
Storm Surge Atlas

Providing a picture of the maximum storm surge vulnerability



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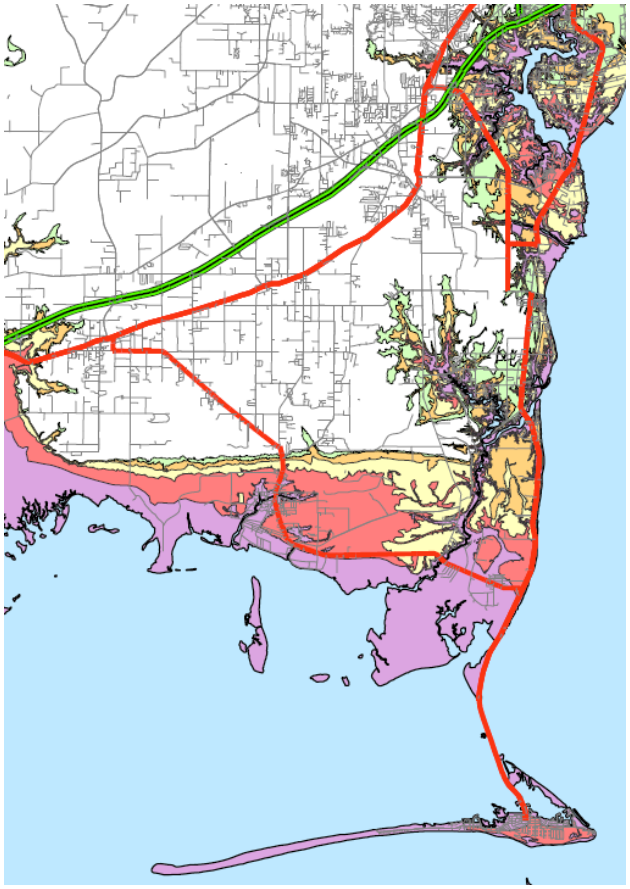
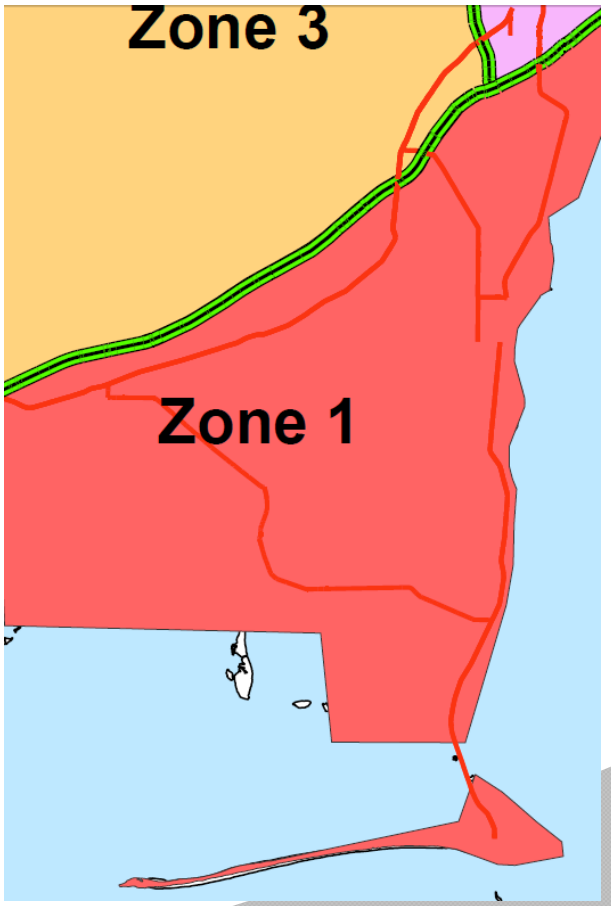
Evacuation Zones

Question: How does an Emergency Manager communicate the MOM storm surge risk to the public?





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Evacuation Zones

Should be designed to effectively communicate the hazard warning order to the public; best practice considerations:

- Created by Local, State, and Federal EMA representatives to move people out of hurricane hazard vulnerable areas.
- Delineated by major geographic features, such as major roads, rivers, political boundaries, etc.
- Mainly designed to get citizens out of storm surge vulnerable areas.
- Designed to improve warning order communication and promotes phased evacuations
- Serve as the foundation for Evacuation Clearance times.

Did you know: Evacuation Zones may include areas that are not vulnerable to Storm Surge. Why is this?

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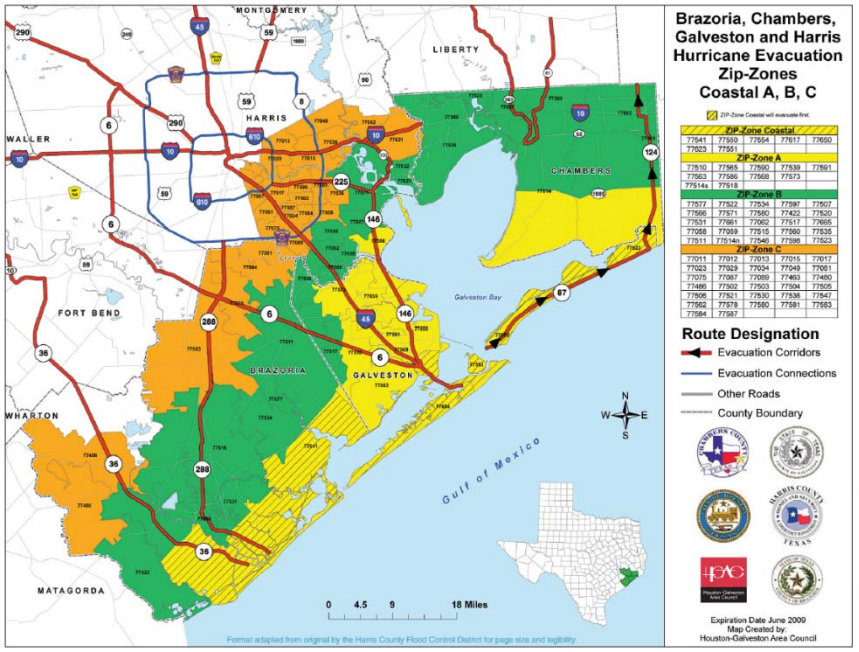
Evacuation Zones

Typical problems and critical life safety issues:

- Zones must be communicated through an extensive public awareness outreach campaign
- Turnover of EM Staff - zones are often forgotten
- In reality, evacuations can be politically driven and not planned
- Zone terms are confused with floodplain terms
- Evacuations may not be based on the official zones



Houston Metro Evacuation Zones

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Vulnerability Analysis

Helping coastal decision makers identify risk and populations that may need to evacuate

Identifies who/what will be affected?

Table 5-1: Critical Facilities Summary Table

Facility Type	Category 1	Category 2	Category 3	Category 4	Category 5
Hancock County					
Casino	2	-	-	-	-
Dam	-	-	-	3	-
EOC	-	-	-	-	1
Fire	2	3	4	1	1
Hazmat	-	4	-	-	-
Hospital	-	-	1	-	-
Hotels	2	2	5	-	-
Marinas/Boat Slips					
Police	-	-	4	-	-
School	1	3	6	1	-
Senior Center	-	-	1	-	-
Shelter	-	-	4	1	-
TOTAL	**7**	**12**	**25**	**6**	**2**

- Citizens residing in surge prone areas
- Critical facilities
- Mobile/Manufactured home communities
- Vulnerable Shelters
- Roadway network, bridges, critical facilities
- Other areas to be considered?

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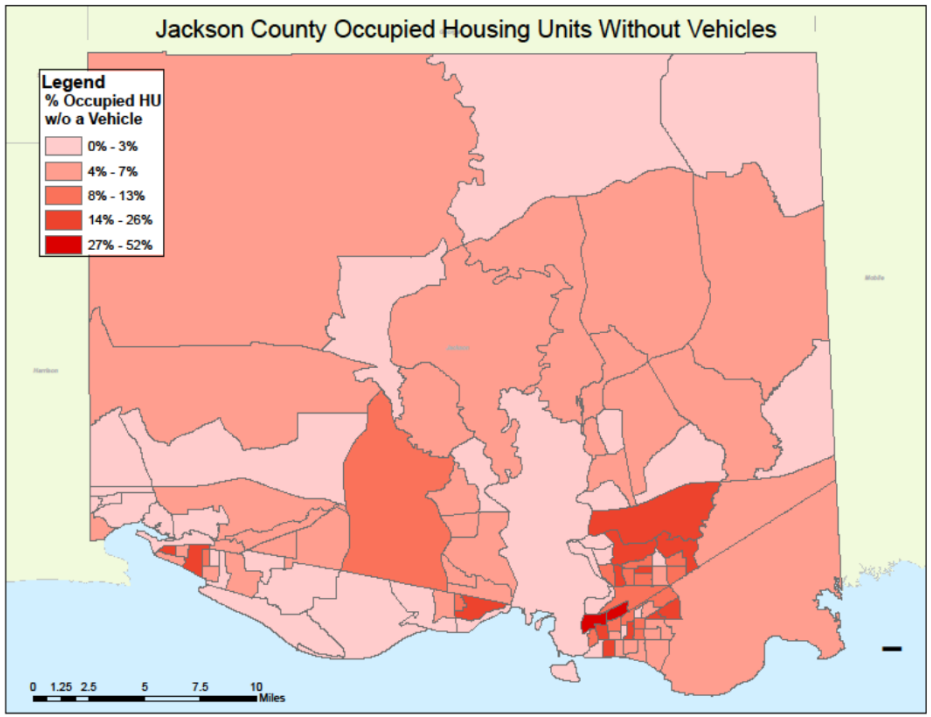
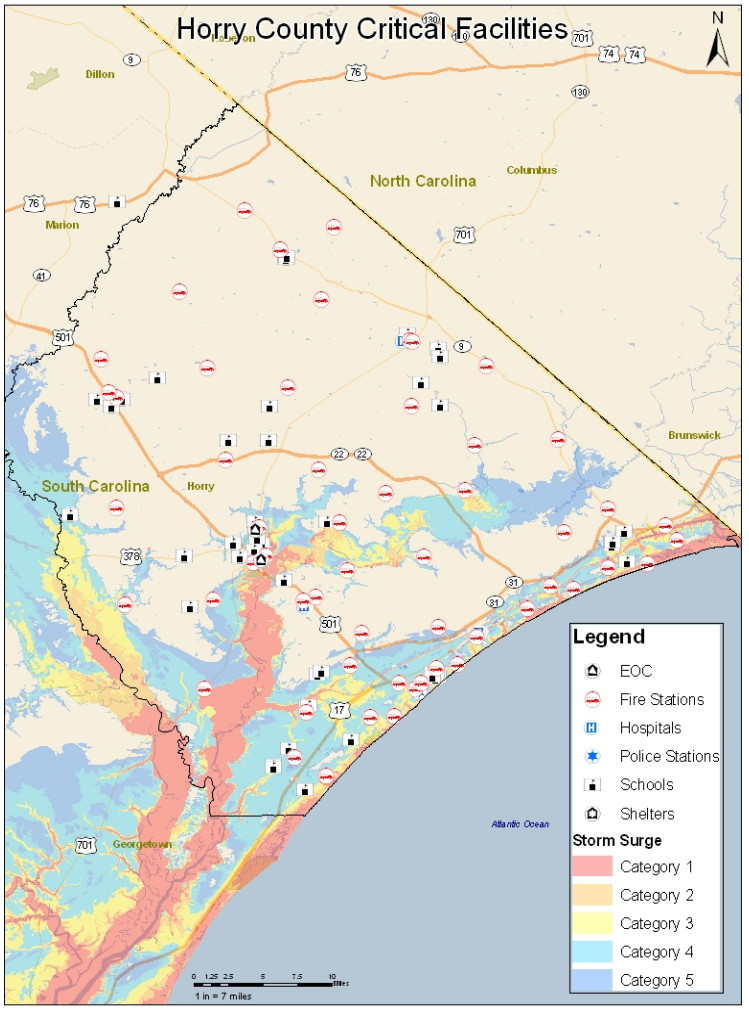
Vulnerability Analysis

Helping coastal decision makers identify populations at risk from hazards





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Vulnerability Analysis

The following table shows the vulnerable population by dwelling unit for the various storm surge zones

County Surge Zones	Population	Mobile Home Population	Permanent Population	100 Percent Tourist Population	High Tourist Population	Low Tourist Population	Vulnerable Population 100 Percent Occ	Vulnerable Population High Occ	Vulnerable Population Low Occ
HANCOCK COUNTY									
COUNTYWIDE	37,384	2,798	34,586	2,422	1,937	969	39,806	39,321	38,353
CATEGORY 1	10,025	233	9,792	899	719	360	13,489	13,309	12,950
CATEGORY 2	18,116	551	17,565	1,218	974	487	21,581	21,337	20,850
CATEGORY 3	26,681	641	26,040	2,346	1,877	938	31,184	30,715	29,776
CATEGORY 4	27,334	719	26,615	2,346	1,877	938	31,759	31,290	30,351
CATEGORY 5	28,112	817	27,295	2,346	1,877	938	32,439	31,970	31,031
OUTSIDE	9,272	1.981	7,291	75	60	30	2,798	2,798	2,798

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HURRICANE BEHAVIORAL ANALYSIS

Providing important information on the population and what their intentions are for evacuations and protective actions

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Some examples of questions in the public survey

- To what extent are you concerned about the threat of a hurricane? Are you very concerned, somewhat concerned, or not concerned?
- How likely do you think it is that your home would every be flooded as a result of a hurricane? Is it very likely, somewhat likely, or not likely at all?
- If a Category 3 or above hurricane was threatening your community, how likely is it that you would leave your home? Is it very likely, somewhat likely, or not likely at all?
- On a scale of 1 to 5, with 5 being the most likely, how likely do you think it is that you will leave If government officials issue a mandatory evacuation order for a hurricane for your area?
- If you had to evacuate how long would it take you and your household to get ready to leave? Would it be less than one day, one day, two days, or three days or more?

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Telephone Interviewing

- **Sample Identification**
  - Landline and Cell
  - Purchase all but last two digits of phone number
    - Random Digit Dialing for those
- **Computer-Assisted Telephone Interviewing**
- **Interviews Monitored**
- **Participation Rate**
  - Depends on salience of the issue and questions
  - Depends on who's doing the survey
  - Depends on skill of interviewers
  - Can be measured different ways

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Simple Percentages

SOME EXAMPLES OF ANALYSIS

Intended Destination and Distance Expect to Travel

How Far Would Go	Public Shelter 10%	Family/Friends Inside Area 17%	Family/Friends Outside Area 47%	Hotel 21%	Other 6%
< 10 Miles	27%	16%	2%	1%	7%
10-50 Miles	30%	41%	11%	18%	19%
50-100 Miles	19%	21%	30%	38%	29%
100-200 Miles	17%	11%	28%	26%	23%
> 200 Miles	6%	11%	30%	17%	22%

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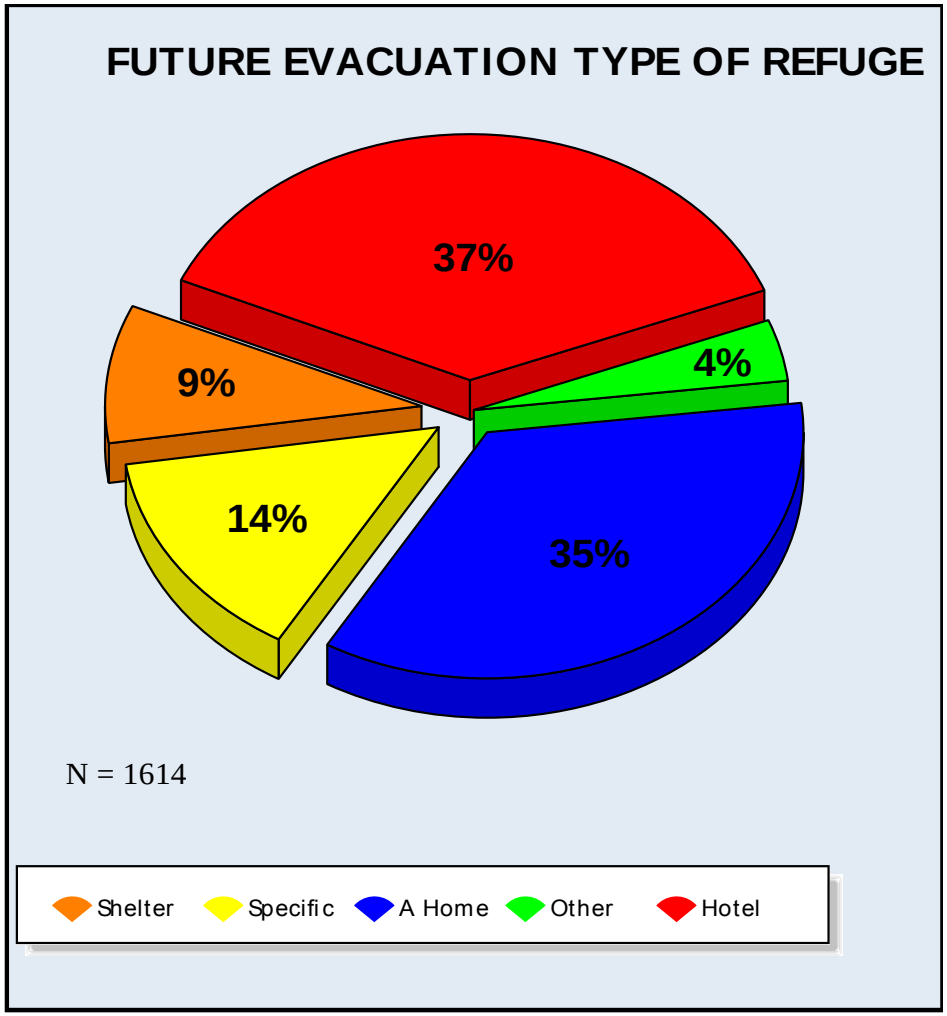
Q16. If you HAD to evacuate outside of your county, where would you MOST likely go? Would you go to a public shelter in a neighboring county, a hotel, or someplace else?



PROJECTED PUBLIC SHELTER USE:

- Bryan 8%
- Camden 6%
- Chatham 9%
- Liberty 10%
- McIntosh 15%
- African Americans more likely to say they would go to a shelter

Of past evacuees, those who said they stayed in shelters ranged from 1% in Bryan to 10% in McIntosh.

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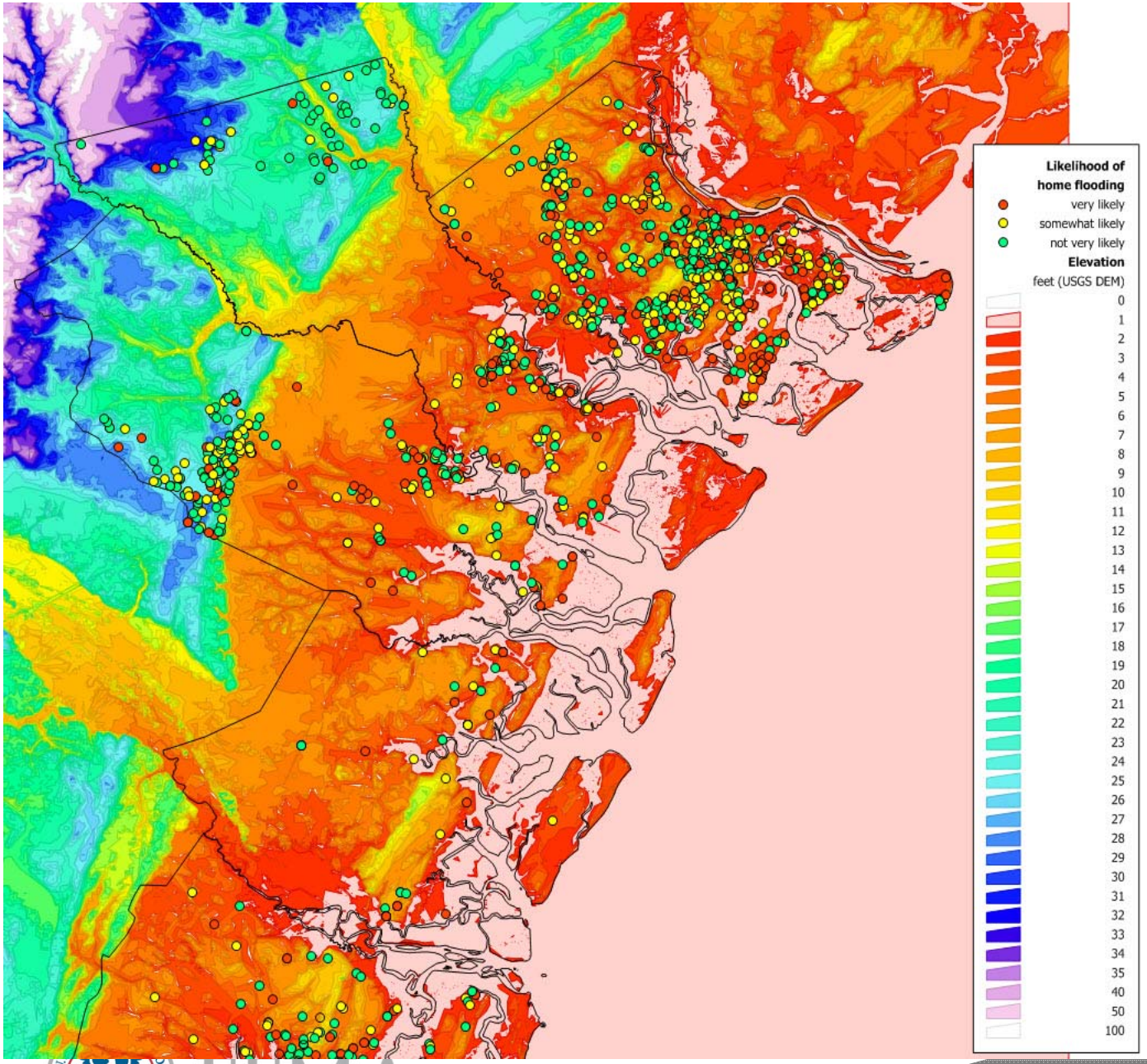
Coastal Georgia Evacuation Study. 2010. Morrow & Gladwin through Dewberry. 2009 for FEMA and USACE.



Each dot = one interview

Likelihood Would Be Flooded in Major Hurricane:

- **Not Very Likely**
- **Somewhat Likely**
- **Very Likely**

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Coastal Georgia Evacuation Study. 2010. Morrow & Gladwin through Dewberry. 2009 for FEMA and USACE.

Some Key Findings

- Serious under-concern about surge
- Evacuation intent over-stated
- Evacuation intent highest (and better predictor of actual behavior)
  - For major storms
  - For mandatory or ordered evacuations
  - For households with children
  - With recent real hurricane experience
- Often get “False Experience” effect

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Shelter Analysis

Understanding Shelter Need

Key Sheltering Issues:

- Location/Identification
- Capacity
- Structural Integrity
- Response Rates
- Official vs. Good Samaritan

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Shelter Analysis Example:

Understanding Shelter Capability in North Carolina

Storm Category/Tourist Occupancy Level	Evacuating People		Evacuating Vehicles		Public Shelter Demand	
	Standard Scenario	Worst Case Scenario	Standard Scenario	Worst Case Scenario	Standard Scenario	Worst Case Scenario
Category 1-2, Low Occ*	25,403	25,403	13,228	13,228	1,198	1,198
Category 1-2, High Occ*	29,021	29,021	14,494	14,494	1,234	1,234
Category 3, Low Occ*	25,403	25,403	13,228	13,228	1,198	1,198
Category 3, High Occ*	29,021	29,021	14,494	14,494	1,234	1,234
Category 4-5, Low Occ*	25,403	25,403	13,228	13,228	1,198	1,198
Category 4-5, High Occ*	29,021	29,021	14,494	14,494	1,234	1,234

Evacuating Area	Local Area Destinations/Percentages			General Out of Area
	Public Shelter	Friends / Relatives	Hotel/Motel	
Category 1-2 Evacuation Zones	5%	50%	5%	40%
Category 3 Evacuation Zones	5%	62%	3%	30%
Category 4-5 Evacuation Zones	2%	67%	1%	30%
Portion of Coastal County Outside Evacuation Zones	15%	60%	0%	25%
Adjacent Inland Counties	15%	65%	0%	20%

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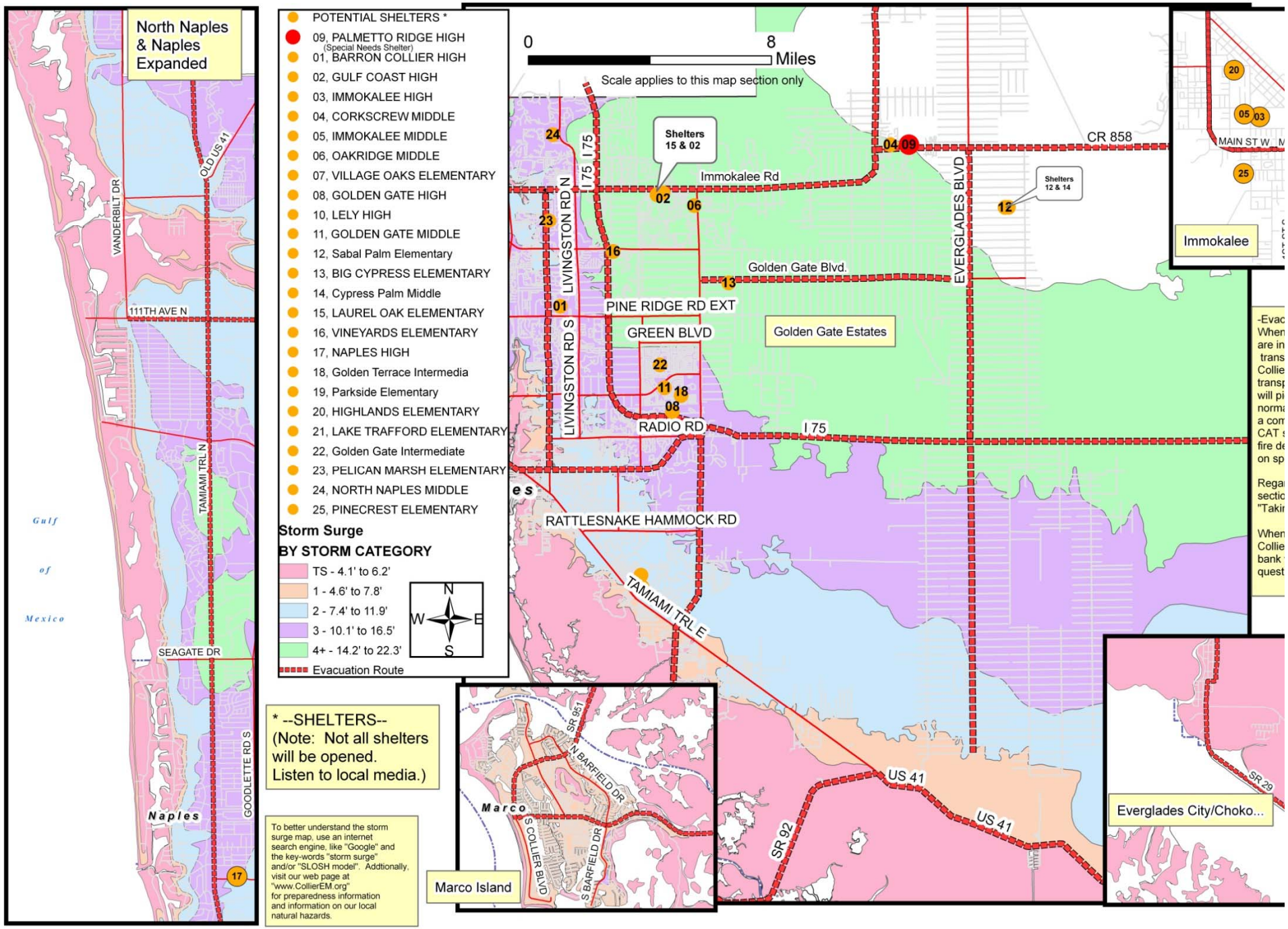
North Naples & Naples Expanded
POTENTIAL SHELTERS *
09, PALMETTO RIDGE HIGH
(Special Needs Shelter)
01, BARRON COLLIER HIGH
02, GULF COAST HIGH
03, IMMOKALEE HIGH
04, CORKSCREW MIDDLE
05, IMMOKALEE MIDDLE
06, OAKRIDGE MIDDLE
07, VILLAGE OAKS ELEMENTARY
08, GOLDEN GATE HIGH
10, LELY HIGH
11, GOLDEN GATE MIDDLE
12, Sabal Palm Elementary
13, BIG CYPRESS ELEMENTARY
14, Cypress Palm Middle
15, LAUREL OAK ELEMENTARY
16, VINEYARDS ELEMENTARY
17, NAPLES HIGH
18, Golden Terrace Intermedia
19, Parkside Elementary
20, HIGHLANDS ELEMENTARY
21, LAKE TRAFFORD ELEMENTARY
22, Golden Gate Intermediate
23, PELICAN MARSH ELEMENTARY
24, NORTH NAPLES MIDDLE
25, PINECREST ELEMENTARY
Storm Surge
BY STORM CATEGORY
TS - 4.1' to 6.2'
1 - 4.6' to 7.8'
2 - 7.4' to 11.9'
3 - 10.1' to 16.5'
4+ - 14.2' to 22.3'
Evacuation Route
N
W
E
S
0
8
Miles
Scale applies to this map section only
Shelters 15 & 02
Shelters 12 & 14
Immokalee Rd
Golden Gate Blvd.
PINE RIDGE RD EXT
GREEN BLVD
RADIO RD
I 75
RATTLESNAKE HAMMOCK RD
TAMIAMI TRL E
CR 858
EVERGLADES BLVD
LIVINGSTON RD N
LIVINGSTON RD S
Golden Gate Estates
Immokalee
MAIN ST W
VANDERBILT DR
OLD US 41
111TH AVE N
TAMIAMI TRL N
SEAGATE DR
GOODLETTE RD S
Naples
Gulf of Mexico
Marco
Marco Island
SR 951
N BARFIELD DR
S BARFIELD DR
S COLLIER BLVD
US 41
SR 92
SR 29
Everglades City/Choko...
* --SHELTERS--
(Note: Not all shelters will be opened. Listen to local media.)
To better understand the storm surge map, use an internet search engine, like "Google" and the key-words "storm surge" and/or "SLOSH model". Addtionally, visit our web page at "www.CollierEM.org" for preparedness information and information on our local natural hazards.

Transportation Analysis

The transportation analysis addresses five primary steps:

- Developing of transportation evacuation zones and scenarios
- Establishing an evacuation roadway network
- Calculating the number of evacuees and vehicles
- Conducting evacuee trip generation and assigning destinations
- Routing evacuees along the evacuation roadway network

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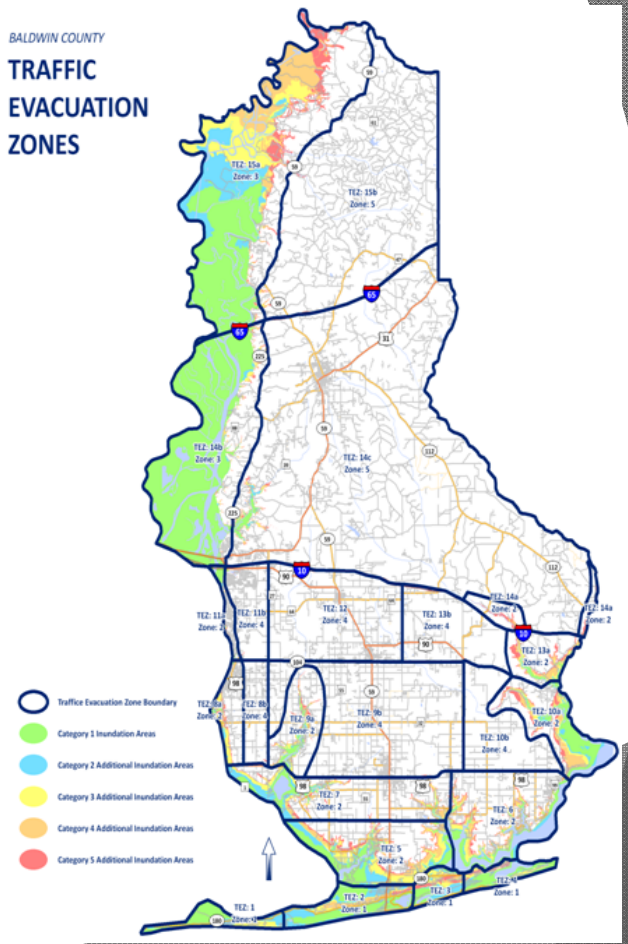
Transportation Analysis

The Transportation Analysis utilizes data produced by the other analysis to determine traffic congestion and clearance times

- Inputs
  - Demographics
  - Behavioral Assumptions
  - Evacuation Routes
  - Levels of Service (Roadway Capacities)
  - Travel Destinations
  - Evacuation Scenarios



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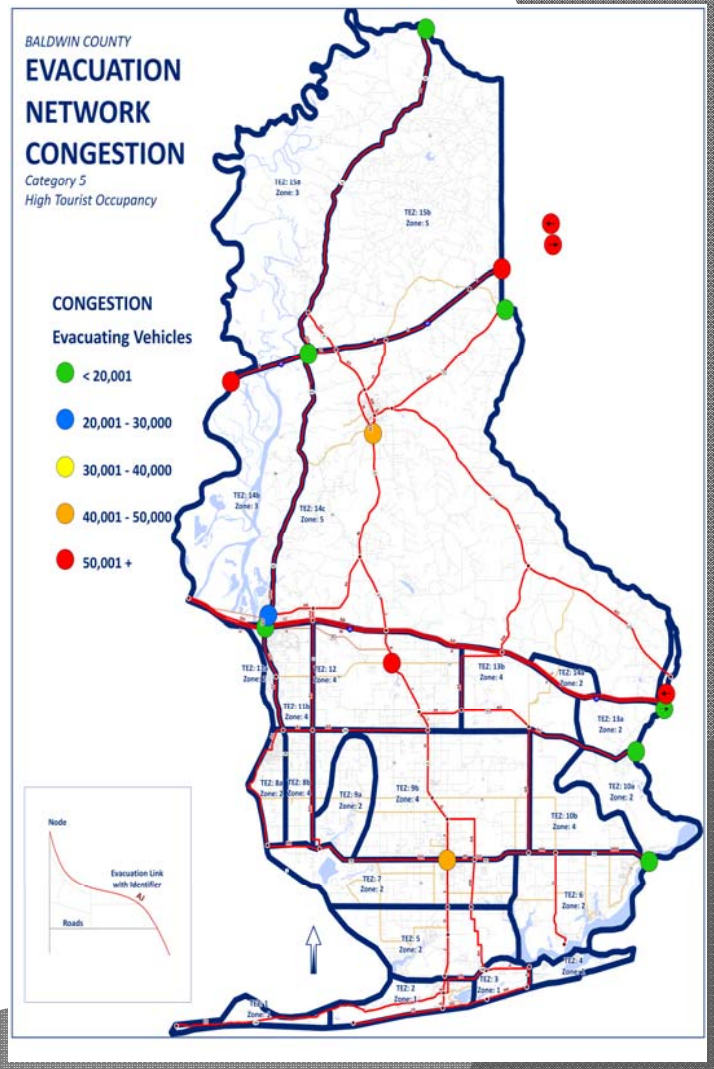
Transportation Analysis

Helping coastal decision makers understand traffic congestion potential based upon evacuation decisions

Products of the Transportation Analysis

- Traffic Patterns (bottle necks)
  - Evacuating Vehicles
- Clearance Time tables
  - Variables of:
    - Response
    - Population
    - Evacuation Scenarios (one way, Multi state)



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Transportation Analysis

A sample of Transportation Output products:

Table 9: Evacuating Vehicle Statistics by Destination

County	Scenario	Evacuating Vehicles				Vehicles to Public Shelters				Vehicles to Friends / Relatives			
		Low Occ	Med Occ	High Occ	Max Occ	Low Occ	Low Occ	Med Occ	High Occ	Max Occ	Low Occ	Low Occ	Med Occ
Chambers	Scenario A Evacuation Zone - Cat 1-2	2,889	3,012	3,155	3,216	205	213	223	227	1,256	1,310	1,373	1,399
	Scenario B Evacuation Zone - Cat 3-4	13,923	14,126	14,364	14,465	995	1,009	1,025	1,032	4,609	4,677	4,756	4,790
	Scenario C Evacuation Zone - Cat 5	15,847	16,050	16,287	16,389	1,226	1,240	1,256	1,263	3,528	3,575	3,630	3,654
	Total	**32,659**	**33,188**	**33,806**	**34,071**	**2,426**	**2,462**	**2,503**	**2,521**	**9,393**	**9,562**	**9,759**	**9,843**
Jefferson	Scenario A Evacuation Zone - Cat 1-2	40,529	41,587	42,822	43,351	2,076	2,139	2,213	2,245	18,189	18,654	19,198	19,431
	Scenario B Evacuation Zone - Cat 3-5	97,339	98,914	100,751	101,538	6,053	6,152	6,268	6,318	18,282	18,576	18,920	19,067
	Total	**137,868**	**140,501**	**143,572**	**144,889**	**8,129**	**8,291**	**8,481**	**8,562**	**36,471**	**37,231**	**38,117**	**38,497**
Orange	Scenario A Evacuation Zone - Cat 1-2	27,460	27,813	28,226	28,403	1,413	1,434	1,458	1,468	12,317	12,473	12,655	12,734
	Scenario B Evacuation Zone - Cat 3-5	37,672	38,163	38,736	38,982	2,128	2,158	2,193	2,208	7,290	7,383	7,491	7,537

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Evacuation Clearance Times

Definition

Begins when the **first evacuating vehicle enters** the road network, ends when the **last vehicle reaches an assumed point of safety**

-Includes travel time and waiting in traffic congestion (does not relate to any one particular vehicle)

-Driven by bottlenecks

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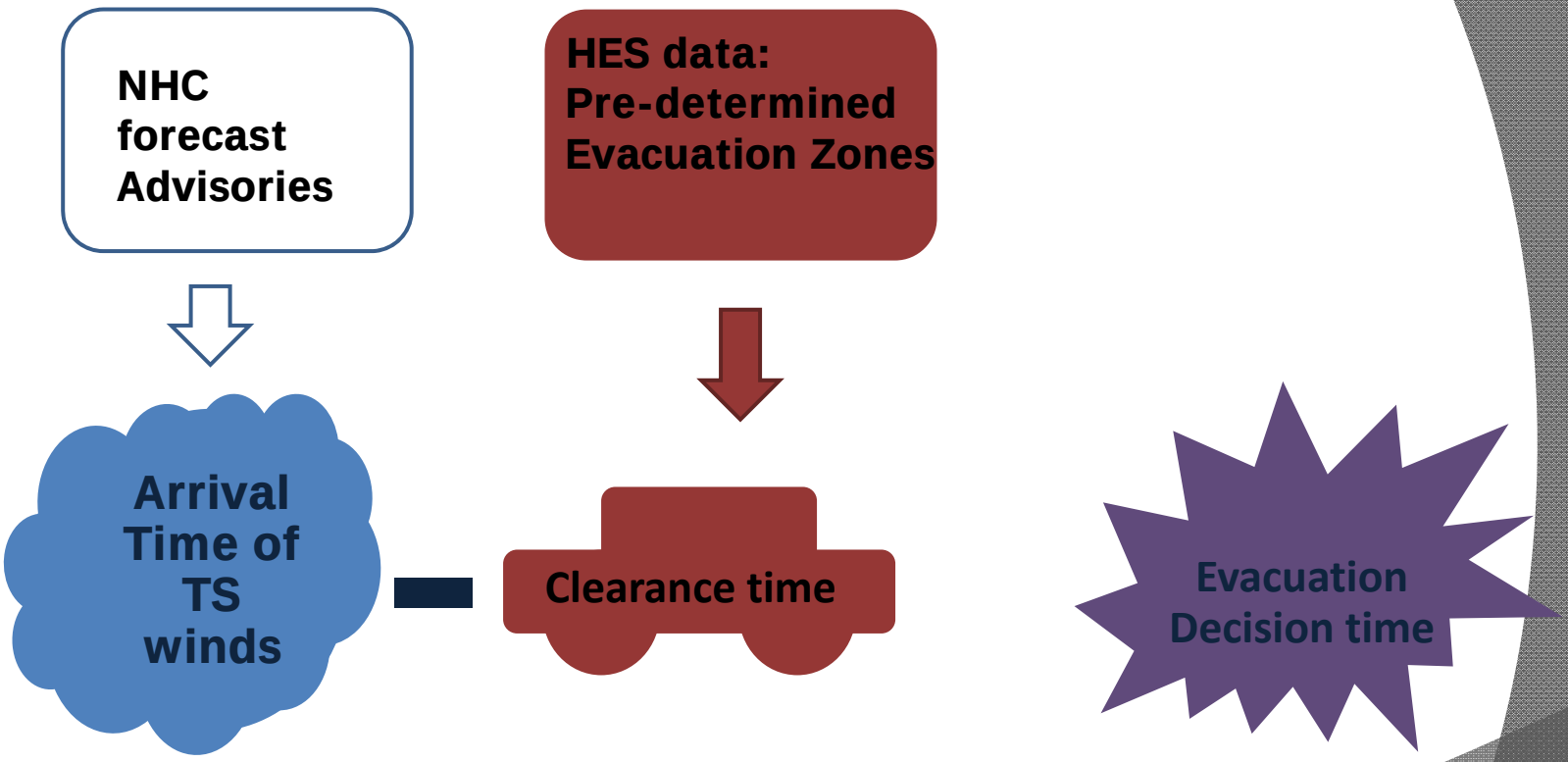
Evacuation Decision Calculation



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Evacuation Clearance Times

		Times				Times				Times			
		Evac Zone A - Cat 1-2				Evac Zone B - Cat 3 (Chambers & Hardin) - Cat 3-5 (all others)				Evac Zone C - Cat 4-5 (Chambers & Hardin) - Cat 3-5 (all others)			
County	Response	Low Occ	Med Occ	High Occ	Max Occ	Low Occ	Med Occ	High Occ	Max Occ	Low Occ	Med Occ	High Occ	Max Occ
Chambers	Slow	9	9	9	9	16	16	16	16	18	18	18	18
	Medium	7	7	7	7	14	14	14	14	16	16	16	16
	Fast	4	4	4	4	11	11	11	11	13	13	13	13
	Immediate	4	4	4	4	11	11	11	11	13	13	13	13
Jefferson	Slow	12	12	12	12	31	31	32	32	31	32	32	32
	Medium	10	10	10	10	29	29	29	30	29	29	30	30
	Fast	7	7	7	7	26	26	27	27	26	27	27	27
	Immediate	7	7	7	7	26	26	27	27	26	27	27	27
Orange	Slow	11	11	11	11	20	20	21	21	20	20	21	21
	Medium	8	8	9	9	18	18	18	19	18	18	18	19
	Fast	6	6	6	6	15	15	16	16	15	15	16	16
	Immediate	6	6	6	6	15	15	16	16	15	15	16	16

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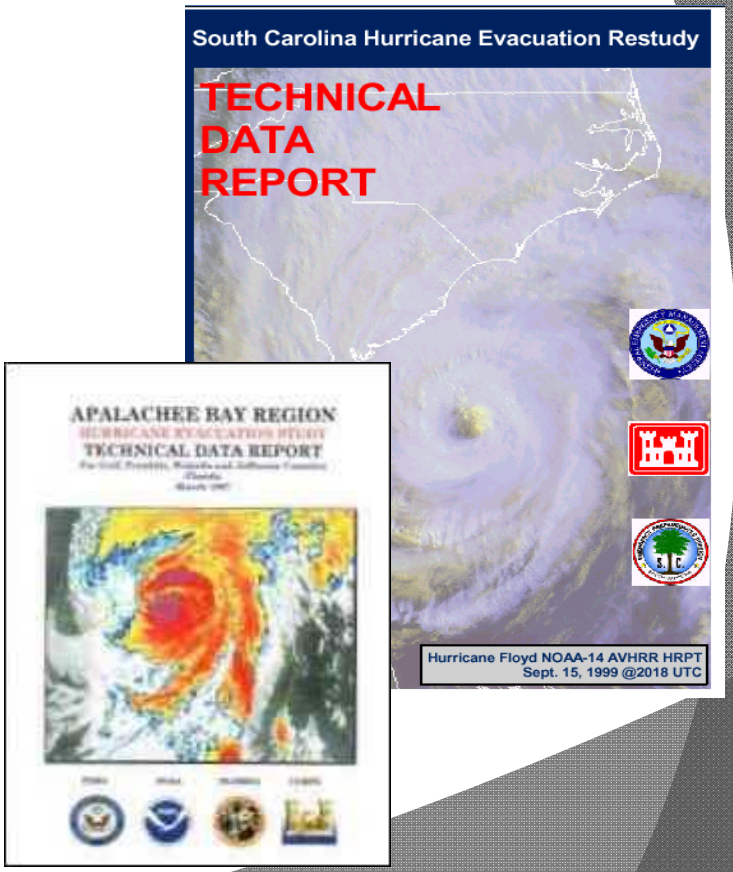
Technical Data Reports

Detailed reports of the following analyses:

- **Hazards Analysis**
- **Vulnerability Analysis**
- **Behavioral Surveys**
- **Shelter Analysis**
- **Transportation Analysis**



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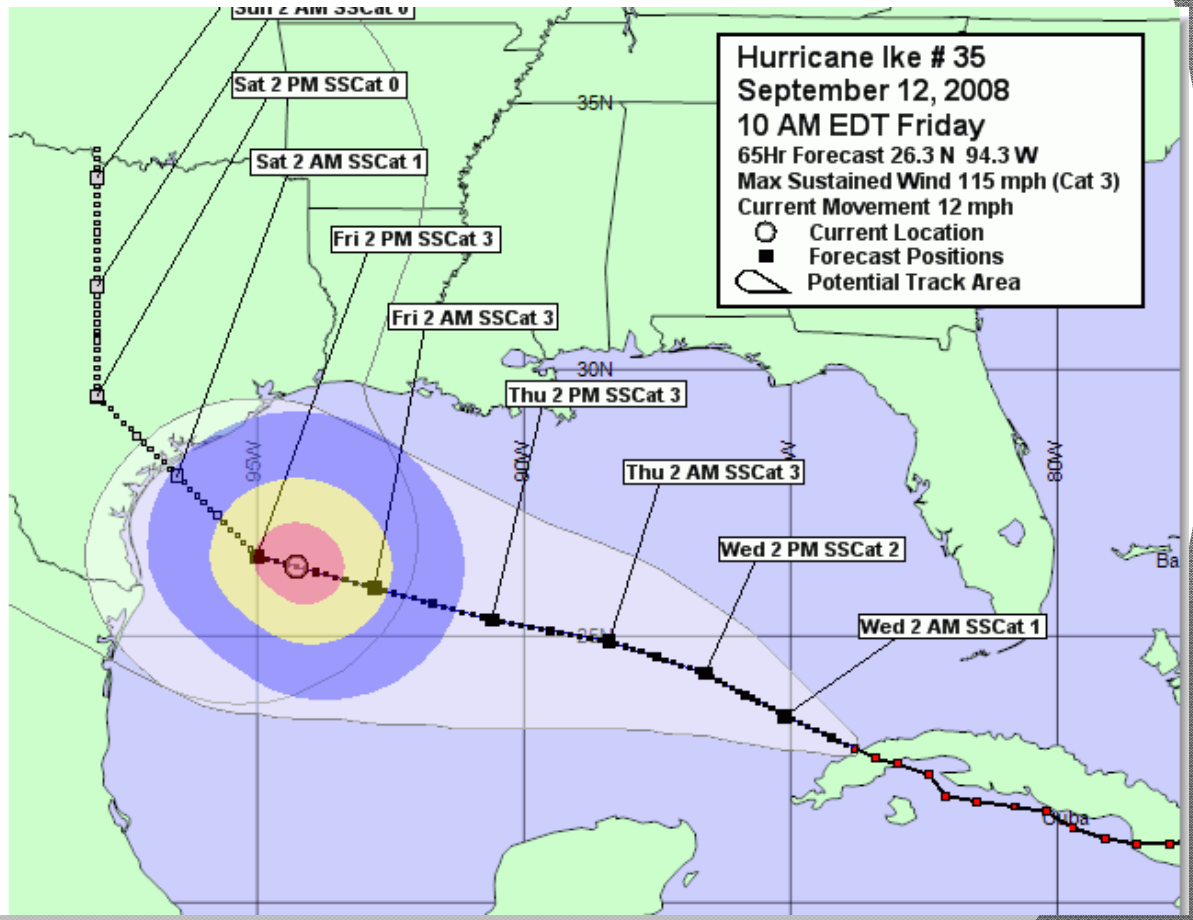
Decision Assistance Tools

Helping coastal decision makers make effective and timely life safety decisions

HURREVAC 2010



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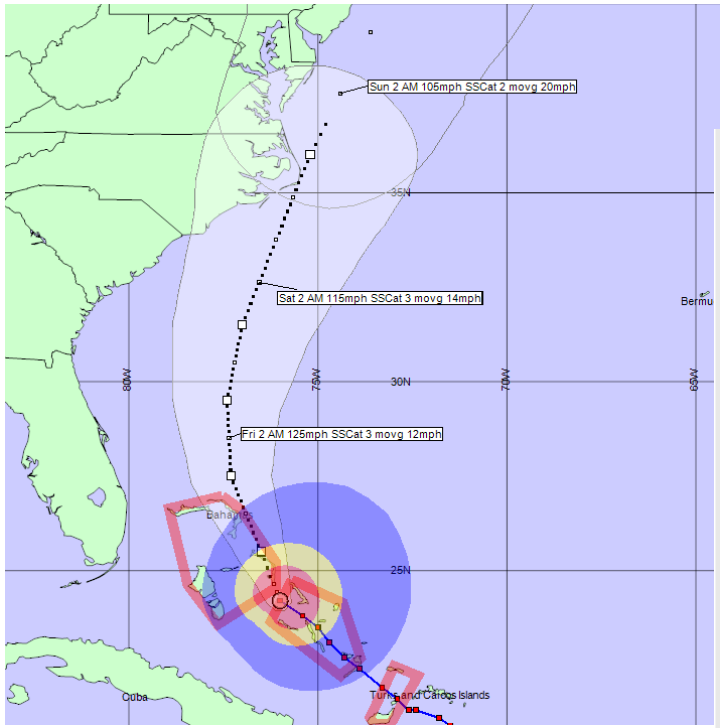
HES in Hurrevac



Report for Hurricane Irene
Based on Advisory 19A Issued 08/25/11 2AM EDT (OLD Advisory)

Evacuation Timing All Areas (407 Items)

Location	Evac. Type	Decide	Dur.	Dark	Cat/Oc/Re	>34kt(39)	>64kt(74)	Eye	Nearest
NC Dare	US158 Only	08/26 04E	18	3	4 / M / M	08/26 22E	08/27 10E	08/27 13E	2 mi.
NC Dare	LgtTrafHES	08/25 21E	25	10	4 / M / M	08/26 22E	08/27 10E	08/27 13E	2 mi.
NC Dare	US158 US64	08/26 06E	16	1	4 / M / M	08/26 22E	08/27 10E	08/27 13E	2 mi.
NC Dare	US64Only	08/25 22E	24	9	4 / M / M	08/26 22E	08/27 10E	08/27 13E	2 mi.
NC Dare	HvyTrafHES	08/25 21E	25	10	4 / M / M	08/26 22E	08/27 10E	08/27 13E	2 mi.
NC Hyde	Ocracoke	08/26 01E	21	6	4 / M / M	08/26 22E	08/27 09E	08/27 13E	11 mi.
NC Hyde	MainIndHvy	08/26 08E	14	1	4 / M / M	08/26 22E	08/27 09E	08/27 13E	11 mi.
NC Hyde	Mainland	08/26 09E	13	1	4 / M / M	08/26 22E	08/27 09E	08/27 13E	11 mi.
NC Carteret	HvyTraffic	08/26 02E	17	4	4 / M / M	08/26 19E	08/27 07E	08/27 10E	24 mi.
NC Carteret	Standard	08/26 04E	15	2	4 / M / M	08/26 19E	08/27 07E	08/27 10E	24 mi.
NC Currituck	HvyTraffic	08/26 02E	25	10	4 / M / M	08/27 03E	08/27 14E	08/27 18E	28 mi.
NC Currituck	LgtTraffic	08/26 02E	25	10	4 / M / M	08/27 03E	08/27 14E	08/27 18E	28 mi.
NC Tyrrell	Standard	08/26 15E	9	3	4 / M / M	08/27 00E	08/27 12E	08/27 16E	34 mi.
NC Tyrrell	US64 Heavy	08/26 02E	22	7	4 / M / M	08/27 00E	08/27 12E	08/27 16E	34 mi.
NC Tyrrell	US64 Light	08/26 03E	21	6	4 / M / M	08/27 00E	08/27 12E	08/27 16E	34 mi.
NC Camden	Standard	08/26 18E	9	6	4 / M / M	08/27 03E	08/27 14E	08/27 18E	41 mi.
NC Camden	US17 Heavy	08/26 00E	27	12	4 / M / M	08/27 03E	08/27 14E	08/27 18E	41 mi.
NC Camden	US17 Light	08/26 01E	26	11	4 / M / M	08/27 03E	08/27 14E	08/27 18E	41 mi.
VA Va Beach	Cat34 RevH	08/25 15E	38	17	4 / M / M	08/27 05E	08/27 16E	08/27 20E	44 mi.
VA Va Beach	I64 Heavy	08/24 17E[Past]	60	22	4 / M / M	08/27 05E	08/27 16E	08/27 20E	44 mi.
VA Va Beach	I64 Light	08/24 20E[Past]	57	22	4 / M / M	08/27 05E	08/27 16E	08/27 20E	44 mi.
VA Va Beach	US58 Light	08/24 23E[Past]	54	22	4 / M / M	08/27 05E	08/27 16E	08/27 20E	44 mi.
VA Va Beach	Cat34 RevL	08/25 17E	36	17	4 / M / M	08/27 05E	08/27 16E	08/27 20E	44 mi.
VA Va Beach	US58 Heavy	08/24 19E[Past]	58	22	4 / M / M	08/27 05E	08/27 16E	08/27 20E	44 mi.
NC Pasquotank	US17 Heavy	08/26 00E	27	12	4 / M / M	08/27 03E	08/27 14E	08/27 18E	46 mi.
NC Pasquotank	Standard	08/26 18E	9	6	4 / M / M	08/27 03E	08/27 14E	08/27 18E	46 mi.
NC Pasquotank	US17 Light	08/26 01E	26	11	4 / M / M	08/27 03E	08/27 14E	08/27 18E	46 mi.
VA Accomack	In County	08/27 04E	6	2	4 / M / M	08/27 10E	08/27 21E	08/27 23E	48 mi.
NC Pamlico	HvyTraffic	08/26 05E	17	2	4 / M / M	08/26 22E	08/27 09E	08/27 13E	48 mi.

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Post Storm Assessment

To understand how HES products are utilized, the following are conducted:

- ✓ High Water Mark Survey
- ✓ High Wind Survey
- ✓ Local/State EMA meetings
- ✓ Behavioral Analysis
- ✓ Transportation Analysis
- ✓ Findings Report
- ✓ Others reports as needed

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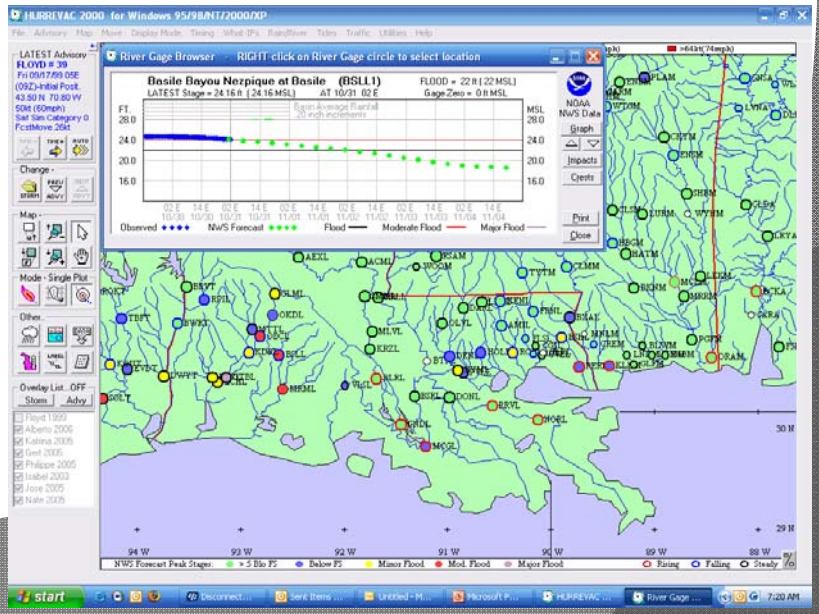
Monitoring the Storm

- Understand pre-existing conditions Hazard related or infrastructure/facilities
- Ensure internal and external communication channels are open
- Realize the operational time frame
  - Anticipate staffing issues/local issues that may impact the activation



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Monitoring the Storm

Shelter and Lodging considerations

- Advocate friends & family outside of evacuation zone
- Motel and Hotel availability
- Public Shelter (American Red Cross and others)
- Know Capacities
- Contact Trained Staff
- Good Samaritan Shelters

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Hurricane Operations-Effective Decisions

Evacuation decisions can make or break careers Understand the impact on your community:

- Politics vs. planned evacuation processes
- Economic impacts
- Decision making authority
- Accountability: can you support your decision?

Members of a Boy Scout Troop as part of a Community Service outreach activity in conjunction with FL State Emergency Response (SERT) perform outreach. Photo: FEMA

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Importance of the HRC in operations

- Prompts for timely action
- Supports decision/action-making accountability
- Structures documentation
- Ensures coordination and communication
- Facilitates Planning

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120 Hours Before Landfall

- Alert Council/Commission Representatives
- Contact Local NWS WFO
- Contact Chamber of Commerce
- Alert Special Needs Entities
- Situational Awareness actions
- Realizing Operational Time frames

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72 Hours Before Landfall

- Storm-monitoring actions
- Conference calls with NWS/STATE
- HURREVAC timing based on forecasts
- Notify response plan agencies and conduct preliminary briefings
- Partially activate EOC, activate phone lines, personnel, stage equipment, etc.
- Conduct preliminary Decision Timing meetings (clearance times)
- Initial protective actions to be taken by Emergency Management

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48–36 Hours Before Landfall

- State conference calls
- Activate EOC fully
- Public awareness considerations
- Issue situation reports/press releases
- Shelter meetings
- Additional evacuation/Traffic Control Coordination Meetings
- Voluntary/mandatory/recommended evacuations
- How does a hurricane watch impact decisions?
- Identify vulnerable populations

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24 Hours Before Landfall

- Evacuation coordination/Decision meetings
- Monitor critical infrastructure
- Finish sheltering ops- Consider refuge of last resort
- Respond to various public awareness, information, and security issues

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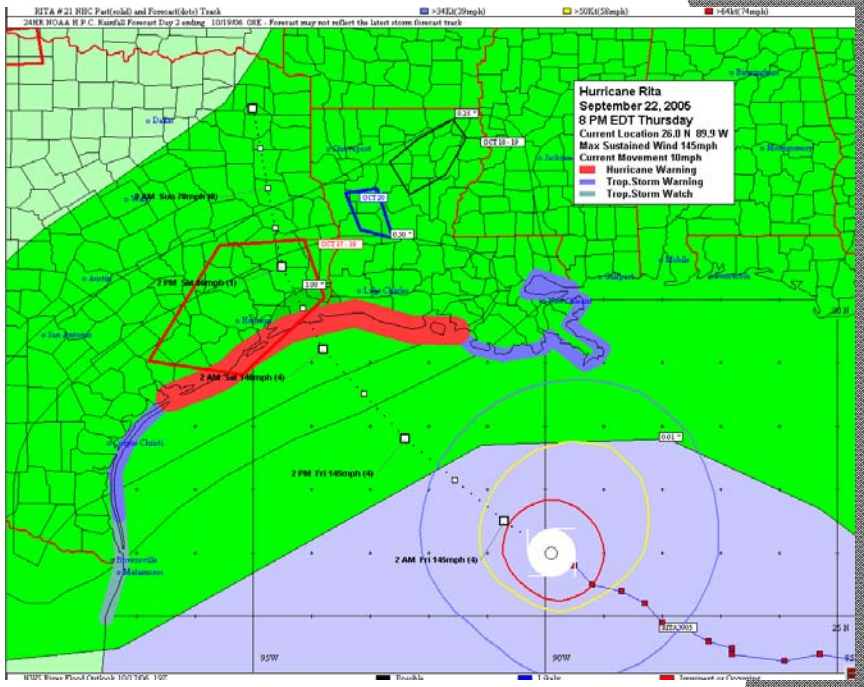
Storm Threat Imminent

Decision Considerations

- Protective action decisions within a jurisdiction are most often made by an elected official
  - Define ultimate authority
  - Consensus from other elected officials
  - Verification by local ordinance or state code



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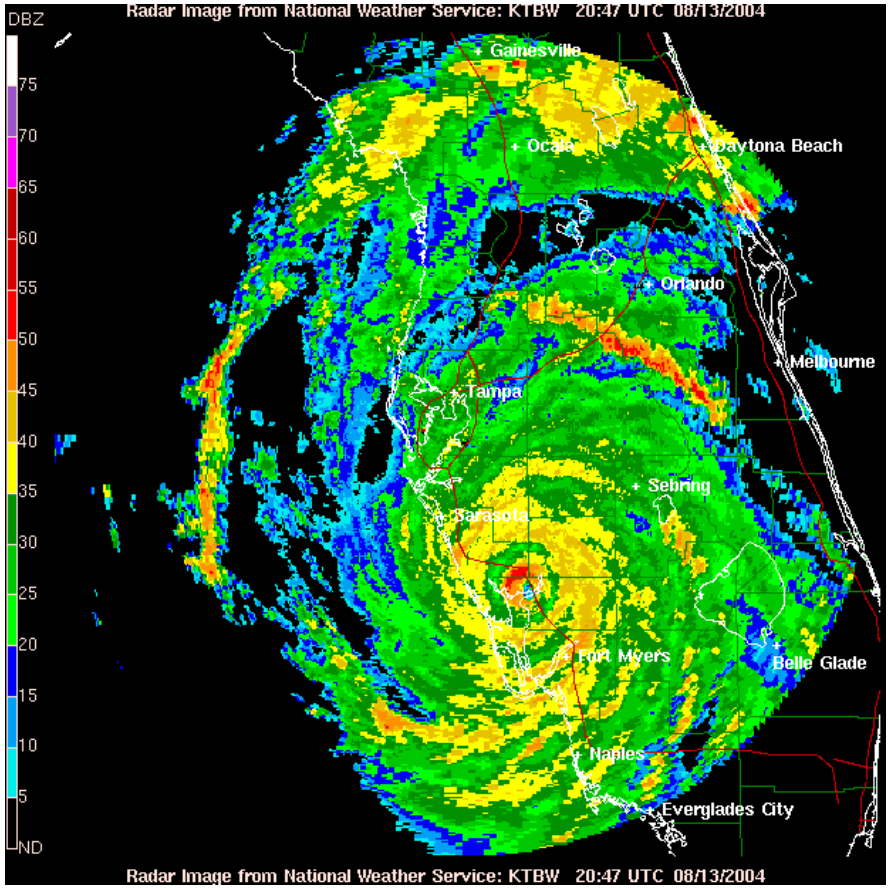
Storm Hazards Impact



- Timing shut down of evacuations and services
- Relocation of emergency work force
- Refuge of last resort implementation

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Storm Hazards Impact

- Begin planning immediate response based on the perceived and experienced impacts:
  - What assets/commodities will need to be available immediately
  - Meeting the immediate needs of the victims
  - Safety of the responders

Workmen ready generators to be placed in communities affected by Hurricane Rita. Bob McMillan / FEMA Photo

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Resources for Hurricane Planning

- **The Internet -** http://www.fema.gov/government/index.shtm
- Comprehensive Preparedness Guide
- Local HES's
- **Mitigation**
  - FEMA Hazard Mitigation Grants
  - State/Local Hazard Mitigation Plans
  - Flood Insurance Rate Maps
  - HAZUS

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Online Hurricane Program Resources

www.iwr.usace.army.mil/nhp/

National Hurricane Program - Resource Center - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.iwr.usace.army.mil/nhp/

National Hurricane Program - Resour...

US Army Corps of Engineers

PCX - Coastal Storm Damage Reduction

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National Planning Center of Expertise for Coastal Storm Damage Reduction

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QUICK LINKS: HES HURREVAC PSA

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Home > Hurricane Evacuation Studies

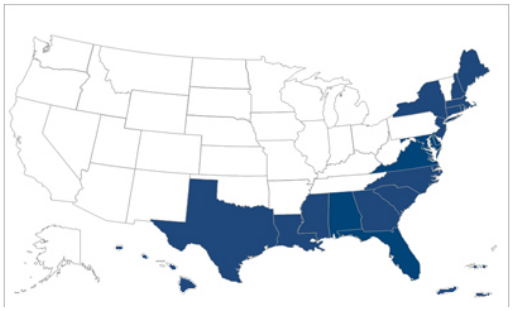
Hurricane Evacuation Studies

The purpose of a Hurricane Evacuation Study (HES) is to provide emergency management officials with information that could assist them in hurricane evacuation decision-making. The technical data can be used by county and state agencies to supplement their hurricane evacuation plans and operational procedures in response to future hurricane threats.

An HES consists of several related analyses that develop technical data concerning hurricane hazards, vulnerability of the population, public response to evacuation advisories, timing of evacuations, and sheltering needs for various hurricane threat situations. Click here to obtain a full description of the analyses.

More information on the preparation of a HES can be found in the Technical Guidelines for Hurricane Evacuation Studies *(pdf, 3.1MB)*.

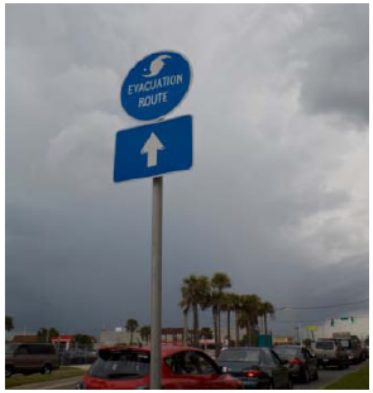
It is important to note that a HES is completed in stages and some parts may still be incomplete. Click on the state below in order to view the most current HES data as well as historic HESs that are available for your area.



Partnering Program with the Federal Emergency Management Agency (FEMA), U.S. Army Corps of Engineers (USACE) and National Oceanic and Atmospheric Administration (NOAA)

HES - Full Description

Ongoing HES Activities



Training Opportunities

- State and Local Emergency Management Offices
- FEMA, Emergency Management Institute (EMI)
  - Independent study courses IS324 IS271
  - Resident courses at EMI http://training.fema.gov/
  - L324 Hurricane Preparedness for Decision Makers
  - NWS JetStream weather school: http://www.srh.noaa.gov/srh/jetstream/
- Other
  - Conferences
  - Higher education institutions
  - Web-based courses

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Other Links

- National Hurricane Center www.nhc.noaa.gov
- River forecasts- http://www.weather.gov/ahps/
- Tide Predictions- http://tidesandcurrents.noaa.gov/curr_pred.html
- Water Level Observation Network- http://storms.nos.noaa.gov/geographic.html
- NOAA Watch - NOAA's All Hazard Monitor- http://www.noaawatch.gov/

- To register for Hurrevac and training- www.hurrevac.com

- Community Hurricane Preparedness http://www.meted.ucar.edu/topics_emt.php

- EMI - http://training.fema.gov/

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Conclusion

Hurricane planning is an ongoing effort.

It requires continuous evaluation and planning to ensure that the community is always prepared, should a hurricane strike.

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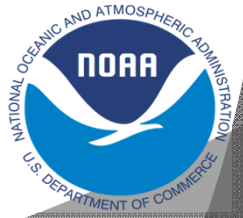
NHP Training Needs Assessment

- “evaluate our current offerings and collect your feedback to and identify new and additional opportunities to better serve you”



NHP Training Needs Assessment

- We have created a brief survey for you to share your experience, feedback, comments, needs and suggestions with us.
- Please access the assessment survey form online on the NHP website:

- **http://www.iwr.usace.army.mil/nhp/trsurv/trainingsurvey.cfml**

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End of Course

Thank you for your active participation!

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Putting the Pieces together

FEMA

7-Day Forecast for Latitude 33.99°N a... | Model Analysis and Guidance: View p... | NHC Graphical Outlook Archive | NWS Enhanced Radar Mosaic: Southe... | CNN.co

www.nhc.noaa.gov/archive/gtwo/atl/201108192358/index.php?basin=atl&current_issuance=201108192358

Google | Models | Weather | Satellite | NHP | NWS | Admin | Radar | News | Travel | FEMA | Personal | Random | Help Desk.url | RIV Homepage.url

Local forecast by "City, St" or "ZIP"

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Latest Advisory
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Breakpoints
Hurricane Hunters
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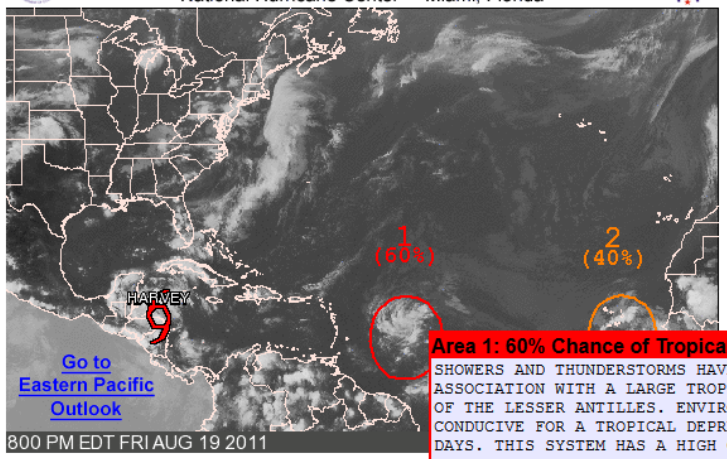
NHC Graphical Outlook Archive

« Earliest Available ‹ Earlier Later › Latest Available »

Place your mouse cursor over areas of interest for more information

Graphical Tropical Weather Outlook

National Hurricane Center Miami, Florida



Outlined areas denote current position of systems
Outlook. Color indicates probability of tropical cycl

Low <30% Medium 30-5

Area 1: 60% Chance of Tropical Cyclone Formation (click to zoom)

SHOWERS AND THUNDERSTORMS HAVE BECOME BETTER ORGANIZED IN ASSOCIATION WITH A LARGE TROPICAL WAVE LOCATED ABOUT 625 MILES EAST OF THE LESSER ANTILLES. ENVIRONMENTAL CONDITIONS ARE EXPECTED TO BE CONDUCIVE FOR A TROPICAL DEPRESSION TO FORM OVER THE NEXT COUPLE OF DAYS. THIS SYSTEM HAS A HIGH CHANCE...60 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS AS IT MOVES GENERALLY WESTWARD AT 20 MPH. INTERESTS IN THE LEEWARD ISLANDS SHOULD MONITOR THE PROGRESS OF THIS DISTURBANCE. LOCALLY HEAVY RAIN AND GUSTY WINDS ARE LIKELY OVER THE LEEWARD ISLANDS LATE SATURDAY INTO SUNDAY.

ZCZC MIATWOAT ALL
TTAA00 KNHC DDHHMM

TROPICAL WEATHER OUTLOOK
NWS NATIONAL HURRICANE CENTER MIAMI FL
800 PM EDT FRI AUG 19 2011

FOR THE NORTH ATLANTIC...CARIBBEAN SEA AND THE GULF OF MEXICO...

THE NATIONAL HURRICANE CENTER IS ISSUING ADVISORIES ON TROPICAL STORM HARVEY...LOCATED ABOUT 130 MILES EAST OF ROATAN HONDURAS.

1. SHOWERS AND THUNDERSTORMS HAVE BECOME BETTER ORGANIZED IN ASSOCIATION WITH A LARGE TROPICAL WAVE LOCATED ABOUT 625 MILES EAST OF THE LESSER ANTILLES. ENVIRONMENTAL CONDITIONS ARE EXPECTED TO BE CONDUCIVE FOR A TROPICAL DEPRESSION TO FORM OVER THE NEXT COUPLE OF DAYS. THIS SYSTEM HAS A HIGH CHANCE...60 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS AS IT MOVES GENERALLY WESTWARD AT 20 MPH. INTERESTS IN THE LEEWARD ISLANDS SHOULD MONITOR THE PROGRESS OF THIS DISTURBANCE. LOCALLY HEAVY RAIN AND GUSTY WINDS ARE LIKELY OVER THE LEEWARD ISLANDS LATE SATURDAY INTO SUNDAY.

2. A LARGE BUT DISORGANIZED LOW PRESSURE SYSTEM IS CENTERED ABOUT 100 MILES SOUTHEAST OF THE CAPE VERDE ISLANDS. ALTHOUGH UPPER-LEVEL WINDS ARE CURRENTLY FAVORABLE FOR SOME DEVELOPMENT...THIS SYSTEM IS EXPECTED TO ENCOUNTER A MORE STABLE ENVIRONMENT WITH DRIER AIR BY SUNDAY. THIS SYSTEM HAS A MEDIUM CHANCE...40 PERCENT...OF BECOMING A TROPICAL CYCLONE DURING THE NEXT 48 HOURS AS IT MOVES TO THE WEST-NORTHWEST AT 10 TO 15 MPH. REGARDLESS OF DEVELOPMENT... LOCALLY HEAVY RAIN AND STRONG GUSTY WINDS ARE POSSIBLE IN THE CAPE VERDE ISLANDS TONIGHT THROUGH SATURDAY.

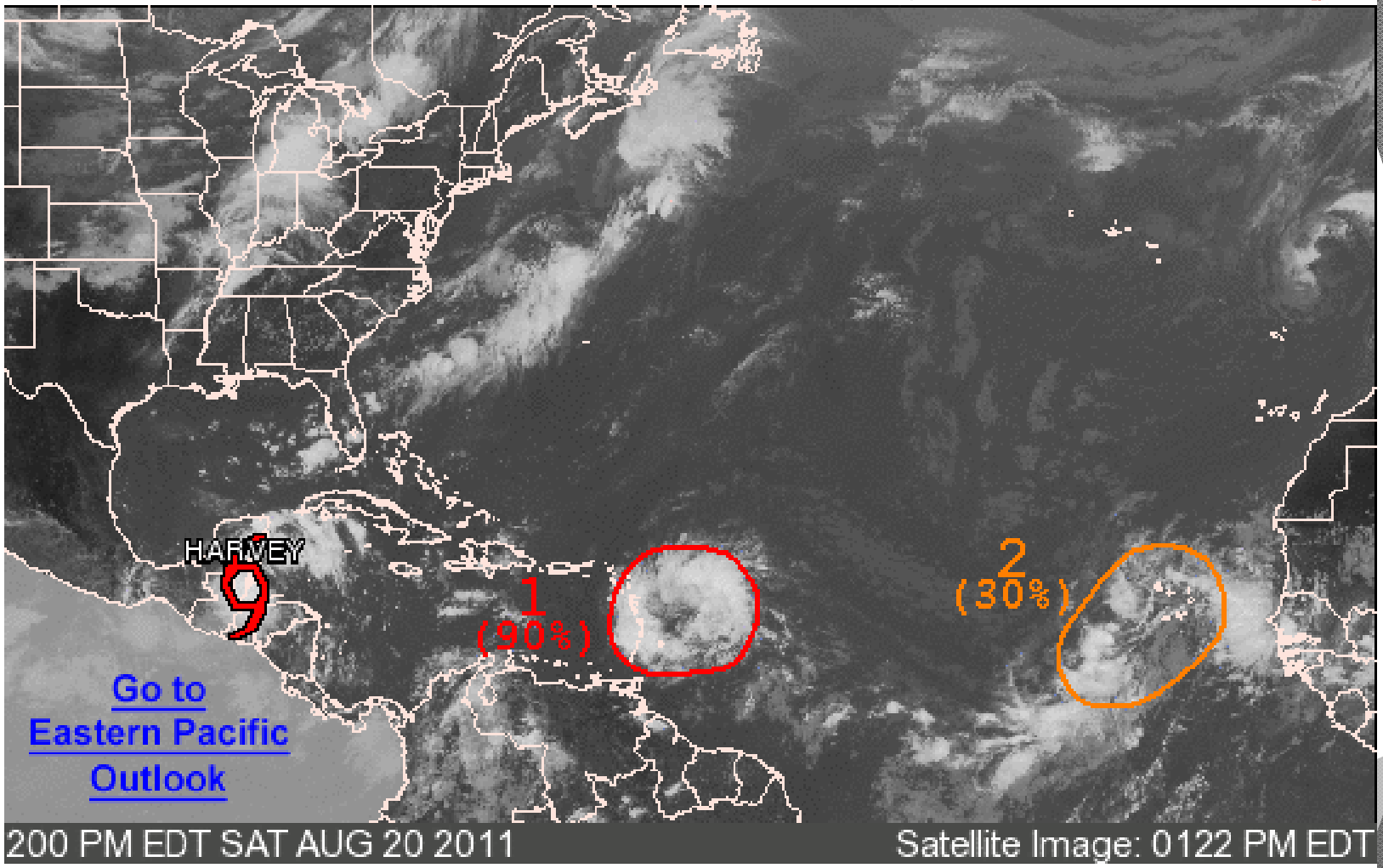
National Weather Service

7-Day Forecast for Latitude 33.99°N a... | Model Analysis and Guidance: View p... | NHC Graphical Outlook Archive | NWS Enhanced Radar Mosaic: Southe...

www.nhc.noaa.gov/archive/gtwo/atl/201108201757/index.php?basin=atl&current_issuance=201108201757

Graphical Tropical Weather Outlook

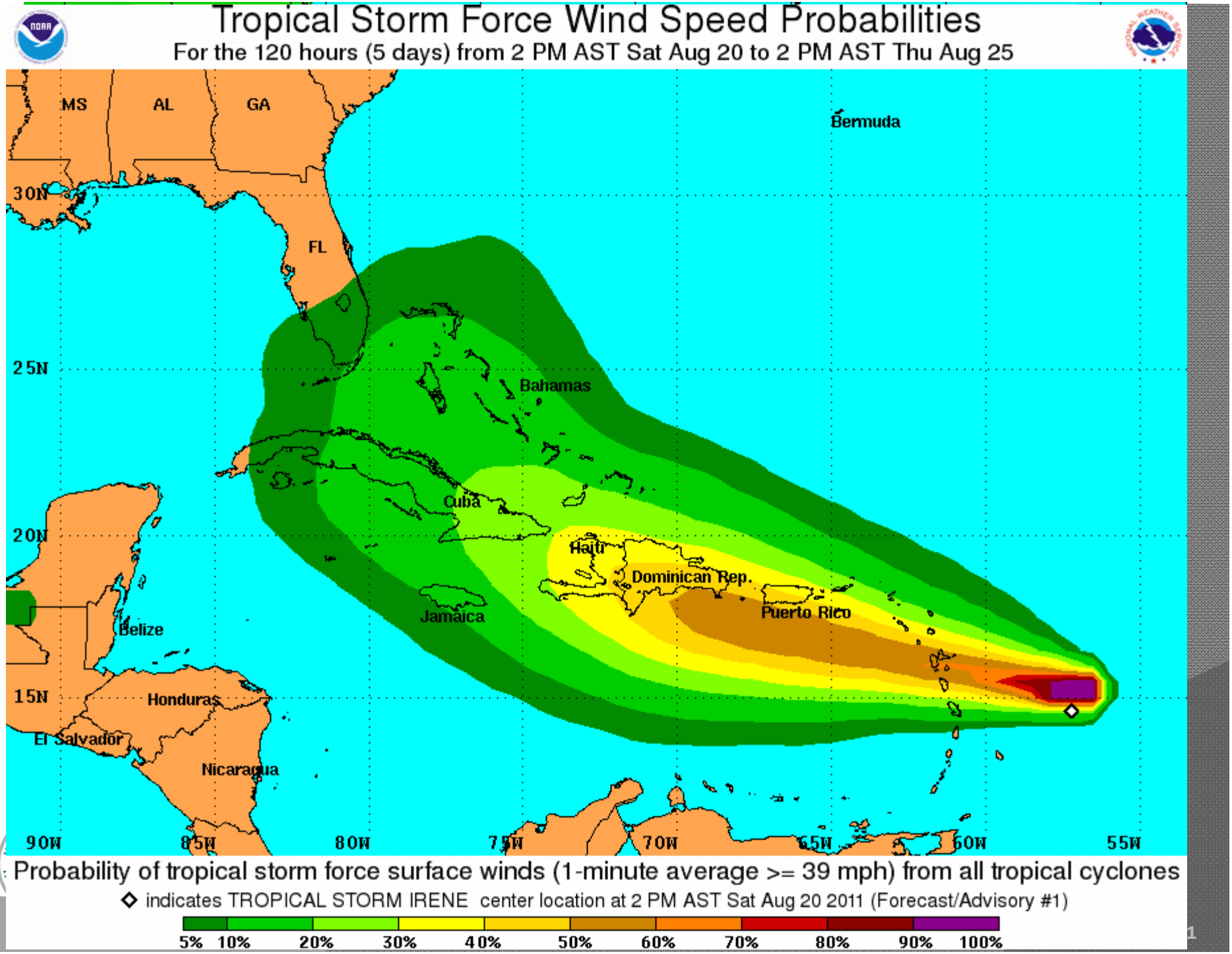
National Hurricane Center Miami, Florida



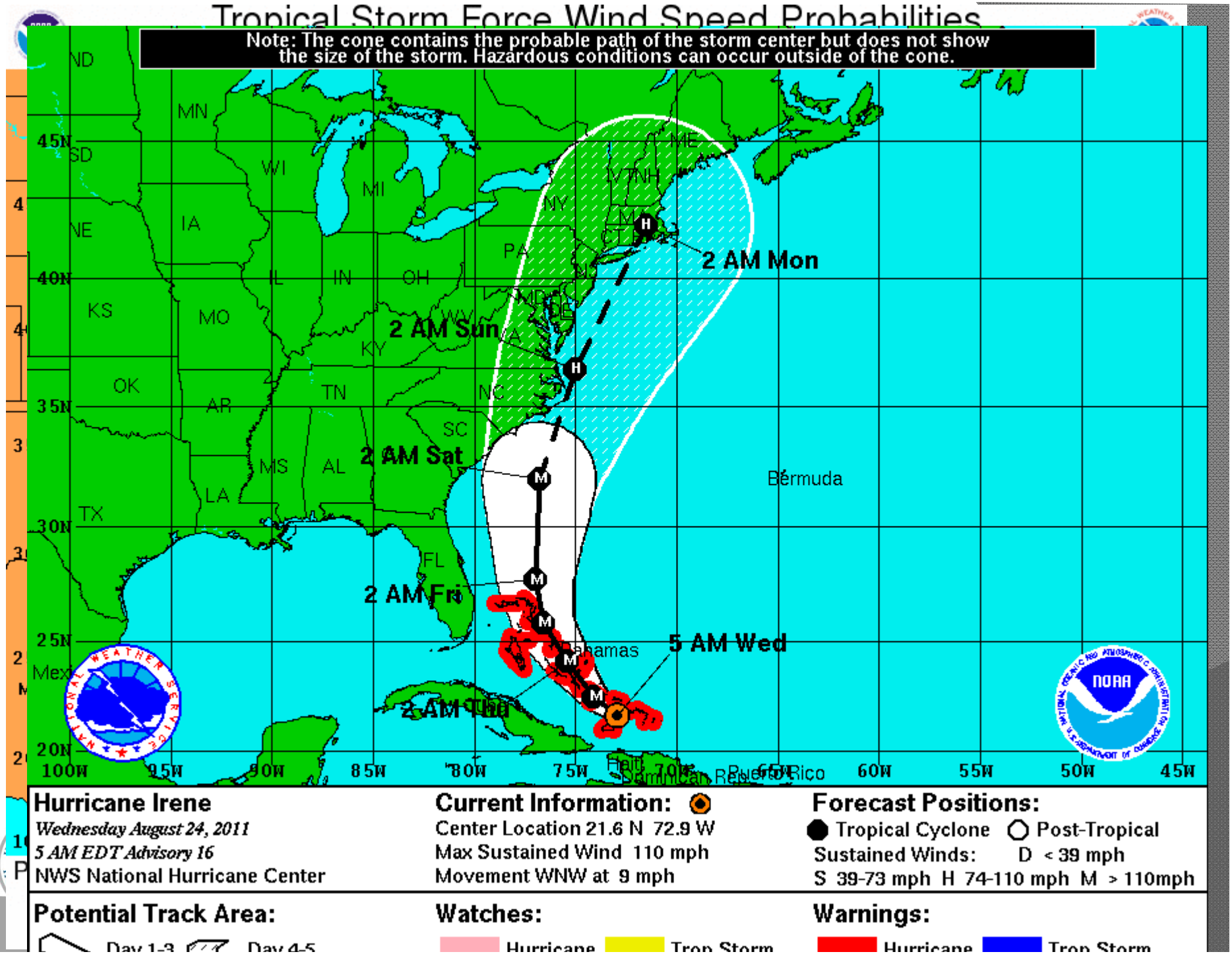
Outlined areas denote current position of systems discussed in the Tropical Weather Outlook. Color indicates probability of tropical cyclone formation within 48 hours.

Low <30% Medium 30-50% High >50%

ISLANDS...PUERTO RICO...AND HISPANIOLA SHOULD MONITOR THE PROGRESS OF THIS DISTURBANCE. LOCALLY HEAVY RAIN AND GUSTY WINDS ARE LIKELY OVER THE LESSER ANTILLES LATER TODAY THROUGH SUNDAY...OVER THE


Tropical Storm Force Wind Speed Probabilities
For the 120 hours (5 days) from 2 PM AST Sat Aug 20 to 2 PM AST Thu Aug 25
MS
AL
GA
FL
Bermuda
30N
25N
20N
15N
Bahamas
Cuba
Haiti
Dominican Rep.
Puerto Rico
Jamaica
Belize
Honduras
El Salvador
Nicaragua
90W
85W
80W
75W
70W
65W
60W
55W
Probability of tropical storm force surface winds (1-minute average >= 39 mph) from all tropical cyclones
indicates TROPICAL STORM IRENE center location at 2 PM AST Sat Aug 20 2011 (Forecast/Advisory #1)
5% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Tropical Storm Force Wind Speed Probabilities



Hurricane Irene
Wednesday August 24, 2011
5 AM EDT Advisory 16
NWS National Hurricane Center

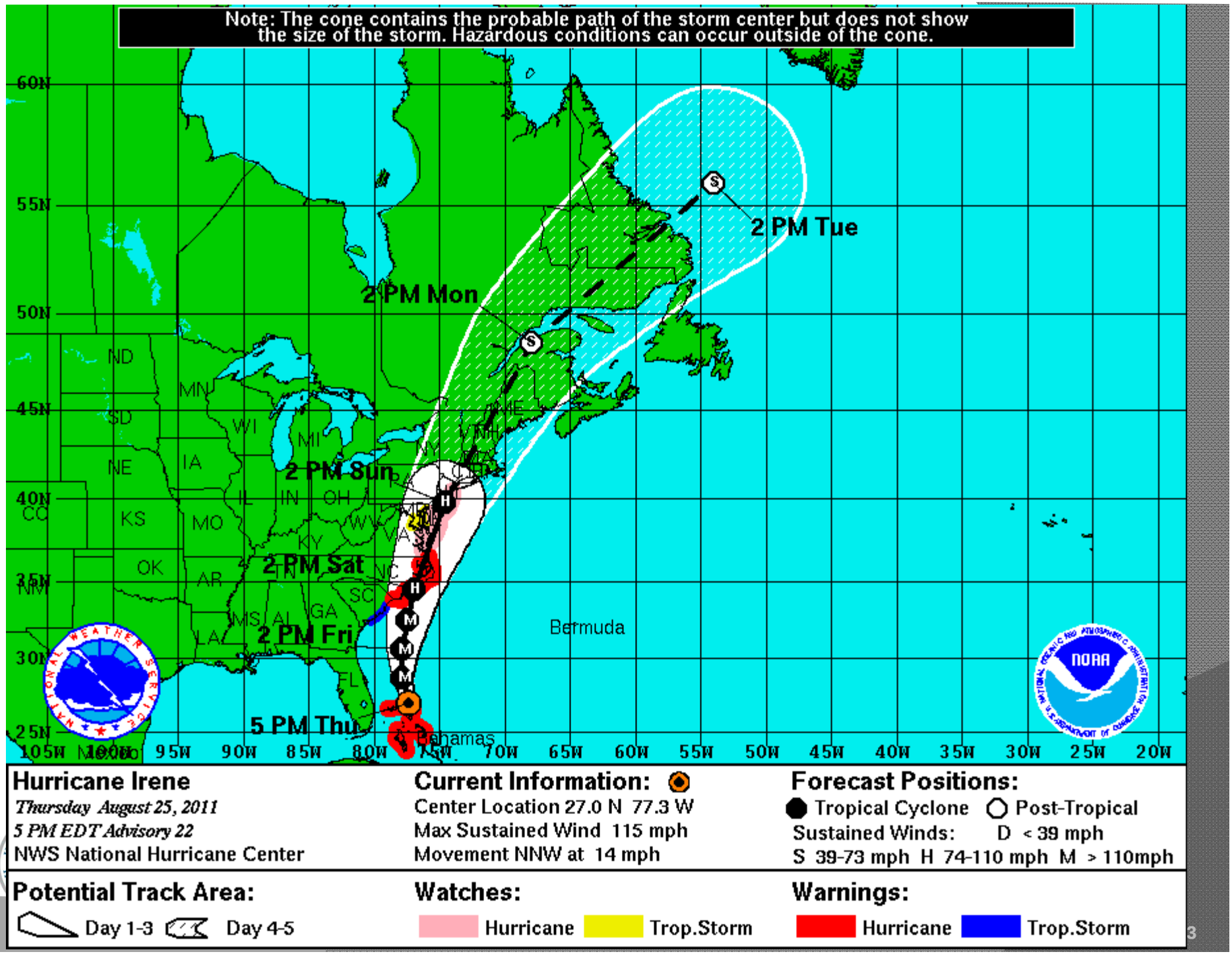
Current Information:
Center Location 21.6 N 72.9 W
Max Sustained Wind 110 mph
Movement WNW at 9 mph

Forecast Positions:
Tropical Cyclone Post-Tropical
Sustained Winds: D < 39 mph
S 39-73 mph H 74-110 mph M > 110mph

Potential Track Area:
Day 1-3 Day 4-5

Watches:
Hurricane Trop Storm

Warnings:
Hurricane Trop Storm


Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.
2 PM Tue
2 PM Mon
2 PM Sun
2 PM Sat
2 PM Fri
5 PM Thu
Bermuda
Bahamas
Hurricane Irene
Thursday August 25, 2011
5 PM EDT Advisory 22
NWS National Hurricane Center
Current Information:
Center Location 27.0 N 77.3 W
Max Sustained Wind 115 mph
Movement NNW at 14 mph
Forecast Positions:
Tropical Cyclone
Post-Tropical
Sustained Winds: D < 39 mph
S 39-73 mph H 74-110 mph M > 110mph
Potential Track Area:
Day 1-3
Day 4-5
Watches:
Hurricane
Trop.Storm
Warnings:
Hurricane
Trop.Storm

NOAA / NWS's Meteorological Development Laboratory

NOAA / NWS's Meteorological Development Laboratory

Probabilistic Hurricane Storm Surge

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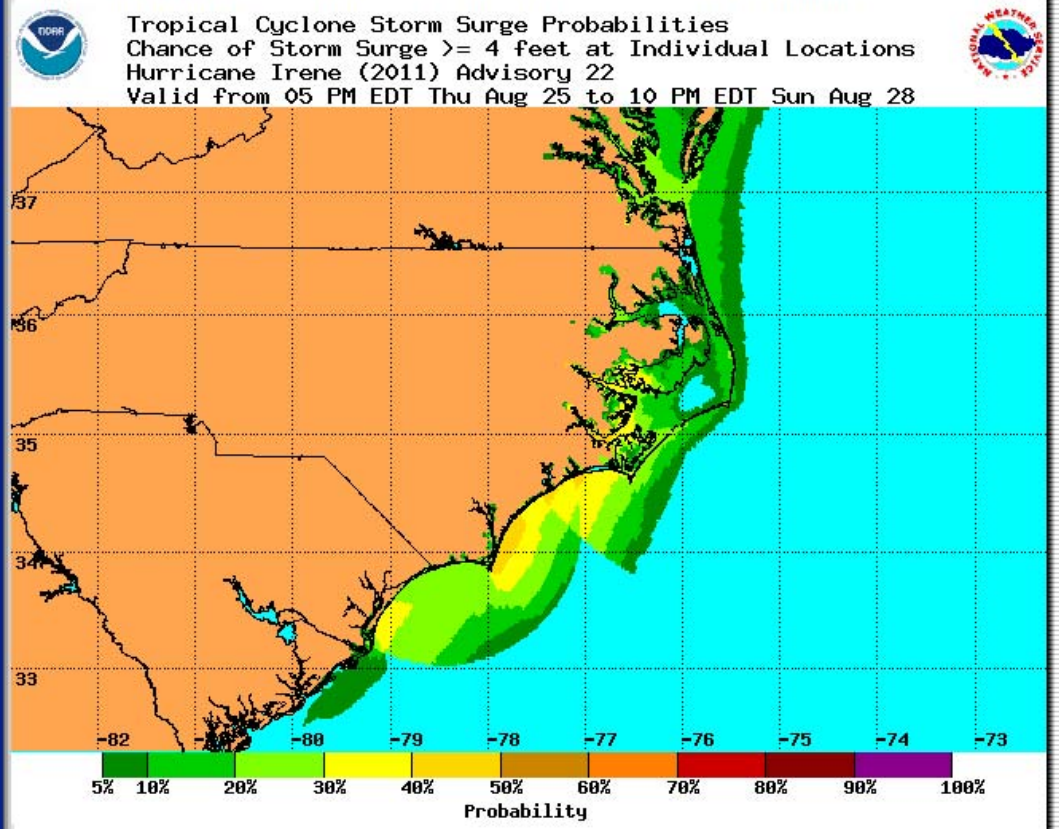
Storm: Irene2011 Adv22 Type: Prob. of surge > 4 feet Zoom Level: Carolinas



Google Map

This graphic shows the overall chance that storm surges will be greater than 4 feet above normal tide levels during the next 3 days. The graphic is based upon an ensemble of Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model runs using the current National Hurricane Center (NHC) official hurricane advisory. Storm surge probabilities depend on the historical accuracy of NHCs

National Weather Service • Since 1870