HURRICANE READINESS
L-311

FEMA

UNIT FOUR
Making Better Decisions

MAKING BETTER DECISIONS
What have we learned today?

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MAKING BETTER DECISIONS
What are best practices?

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BETTER INFORMATION
Locally Informed Data and Analyses

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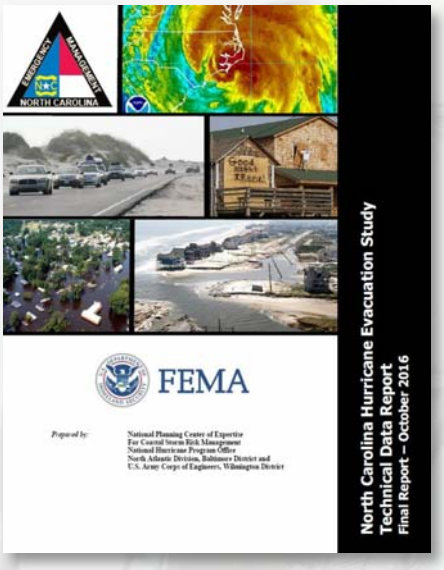

INFORMED PLANS
It's not the Plan, it's the Process.

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Step 1 Form a Collaborative Planning Team

Step 2 Understand the Situation

Step 3 Determine Goals and Objectives

Step 4 Plan Development

Step 5 Plan Preparation, Review & Approval

Step 6 Plan Implementation & Maintenance

INFORMED DECISIONS
Right Tools. Right Time. Right Reason.

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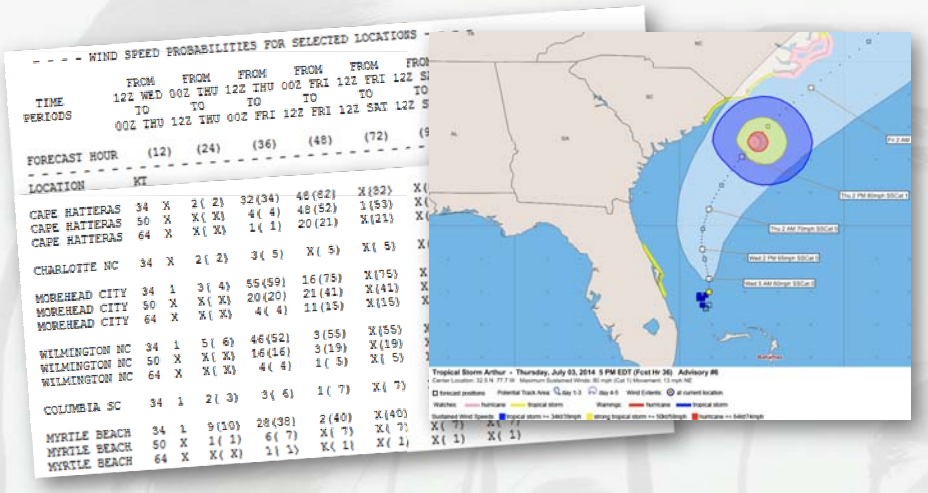

- - - - WIND SPEED PROBABILITIES FOR SELECTED LOCATIONS - -

TIME PERIODS		FROM 12Z WED TO 00Z THU	FROM 00Z THU TO 12Z THU	FROM 12Z THU TO 00Z FRI	FROM 00Z FRI TO 12Z FRI	FROM 12Z FRI TO 12Z SAT	FROM 12Z SA TO 12Z S
FORECAST HOUR		(12)	(24)	(36)	(48)	(72)	(
LOCATION	KT						
CAPE HATTERAS	34 X	2(2)	32(34)	48(82)	X(82)	X(	
CAPE HATTERAS	50 X	X(X)	4(4)	48(52)	1(53)	X(	
CAPE HATTERAS	64 X	X(X)	1(1)	20(21)	X(21)	X(	
CHARLOTTE NC	34 X	2(2)	3(5)	X(5)	X(5)	X(	
MOREHEAD CITY	34 1	3(4)	55(59)	16(75)	X(75)	X	
MOREHEAD CITY	50 X	X(X)	20(20)	21(41)	X(41)	X	
MOREHEAD CITY	64 X	X(X)	4(4)	11(15)	X(15)	X	
WILMINGTON NC	34 1	5(6)	46(52)	3(55)	X(55)	X	
WILMINGTON NC	50 X	X(X)	16(16)	3(19)	X(19)	X	
WILMINGTON NC	64 X	X(X)	4(4)	1(5)	X(5)	X	
COLUMBIA SC	34 1	2(3)	3(6)	1(7)	X(7)	X	
MYRTLE BEACH	34 1	9(10)	28(38)	2(40)	X(40)	X	
MYRTLE BEACH	50 X	1(1)	6(7)	X(7)	X(7)	X	
MYRTLE BEACH	64 X	X(X)	1(1)	X(1)	X(1)	X(1)	X(1)

MAKING BETTER DECISIONS
Study. Plan. Execute.

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MAKING BETTER DECISIONS
Study. Plan. Execute.

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BETTER INFORMATION
What is useful information?

FEMA

" We're not that much smarter than we used to be, even though we have *much more* information.

...that means the real skill now is learning how to pick out the *useful* information..."

The Signal and the Noise
- Nate Silver

BETTER INFORMATION
How do the hazards affect you?

FEMA

RESOURCES

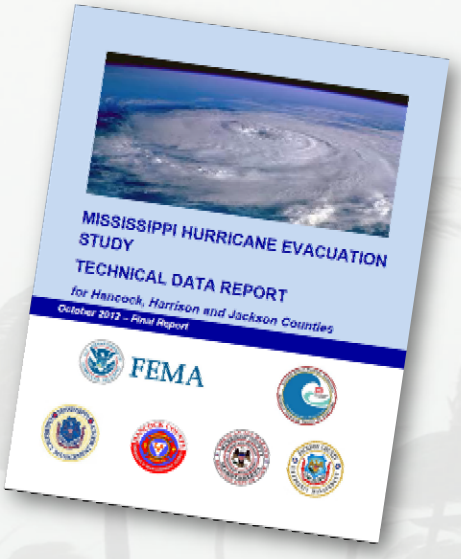
- **Hurricane Evacuation Study**
- **THIRA** *Threat and Hazard Identification and Risk Assessment*
- Flood Risk Maps
- HAZUS Modeling
- Historical events
- **Local Knowledge**

BETTER INFORMATION
Hurricane Evacuation Study

FEMA

HES COMPONENTS

- **Hazard Analysis**
  What will be wet and what stays dry?
- **Vulnerability Analysis**
  Who/what will be affected in your community?
- **Behavioral Analysis**
  What is the Public thinking?
- **Shelter Analysis**
  What are your shelter needs?
- **Transportation Analysis**
  Where is traffic going to back up?



BETTER INFORMATION
Hurricane Evacuation Study

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FAQs

- What will be wet? Dry?
- How high will the water get?
- How far inland?

- **Hazard Analysis**

HAZARD ANALYSIS
SLOSH. GIS Mapping. Surge Maps.

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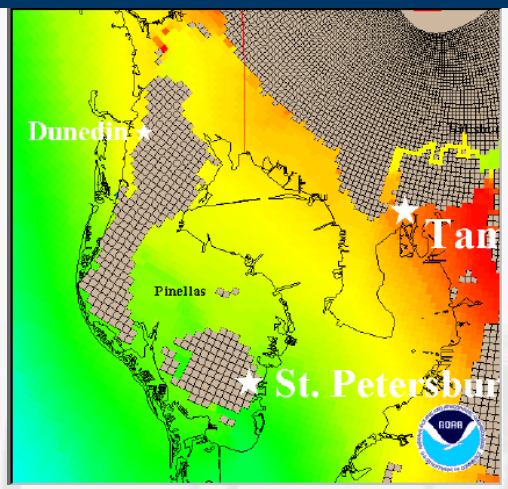
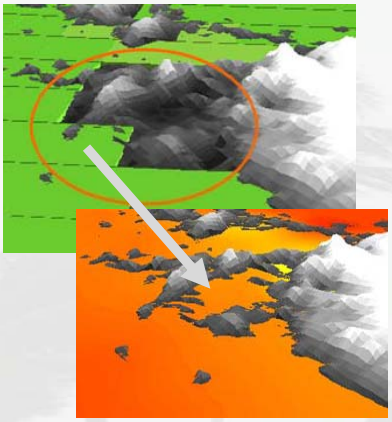
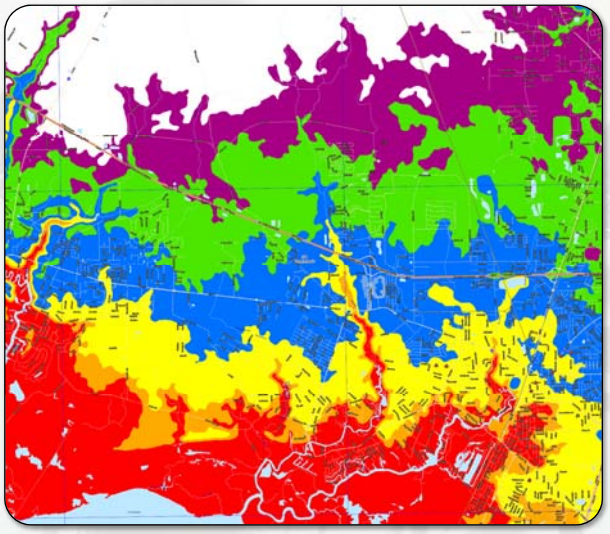




SLOSH Output by category, overlaid on a Digital Elevation Model

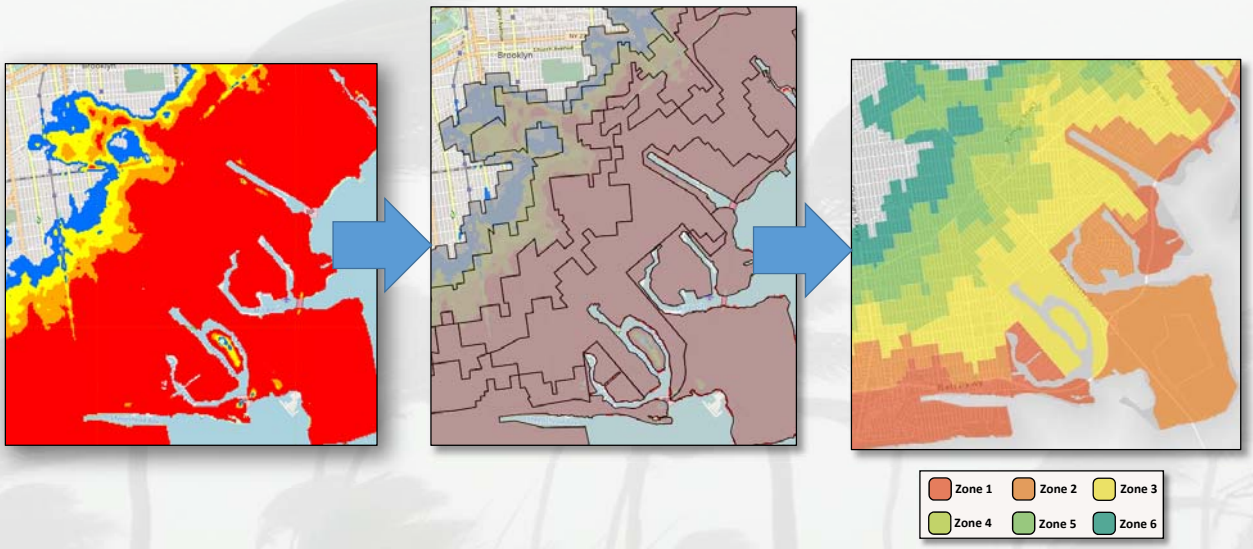
HAZARD ANALYSIS
What's wet and what's dry?

FEMA



HAZARD ANALYSIS
Building evacuation zones with MOMs

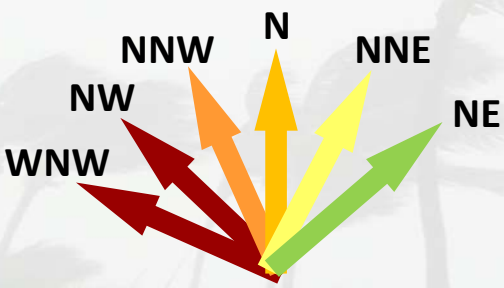
FEMA



HAZARD ANALYSIS
NYC Surge heights by bearing (MEOWS)

FEMA

	WNW	NW	NNW	N	NNE	NE
Category 1	12.6	12.1	10.7	8.8	6.6	5
Category 2	20.9	20	20.1	16.5	11.4	8.1
Category 3	26.6	27.6	27.4	23.4	17	11.3
Category 4	32.4	33.9	33.9	30.6	21.7	14.6



HAZARD ANALYSIS
NYC evacuation zones

FEMA

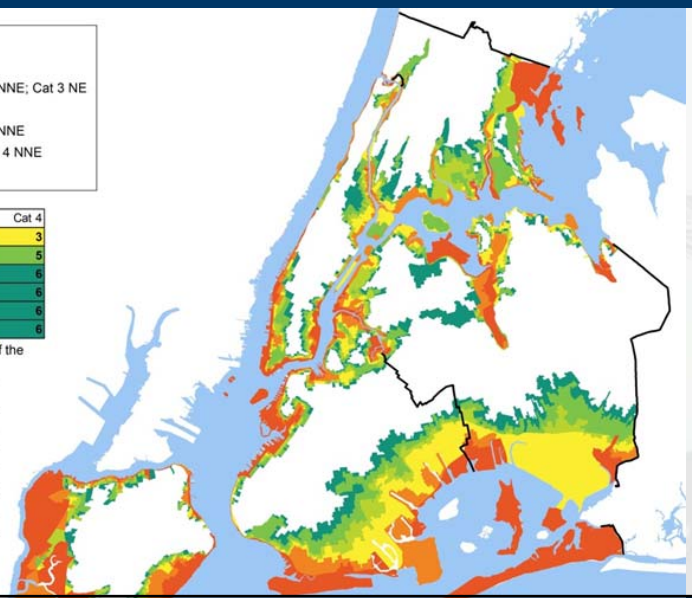
Hurricane evacuation zones

- 1 - Cat 1 NE, NNE, N; Cat 2 NE
- 2 - Cat 1 NNW, NW, WNW; Cat 2 NNE; Cat 3 NE
- 3 - Cat 2 N; Cat 4 NE
- 4 - Cat 2 NNW, NW, WNW; Cat 3 NNE
- 5 - Cat 3 N, NNW, NW, WNW; Cat 4 NNE
- 6 - Cat 4 N, NNW, NW, WNW

	Cat 1	Cat 2	Cat 3	Cat 4
NE	1	1	2	3
NNE	1	2	4	5
N	1	4	5	6
NNW	2	4	5	6
NW	2	4	5	6
WNW	2	4	5	6

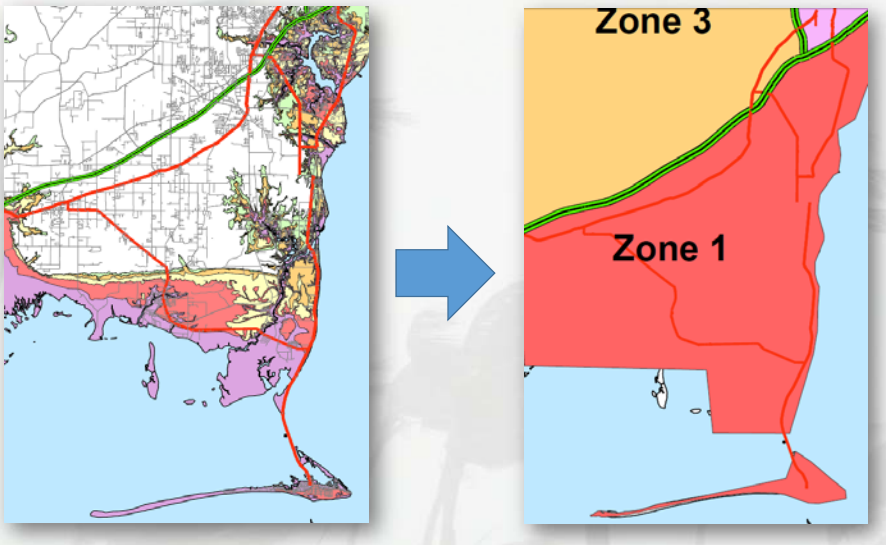
* For storms that exceed the parameters of the model, go up one zone

2010 Population	
Zone 1	370,000
Zone 1+2	620,000
Zone 1+2+3	1,020,000
Zone 1+2+3+4	1,470,000
Zone 1+2+3+4+5	2,230,000
Zone 1+2+3+4+5+6	2,990,000



HAZARD ANALYSIS
Building evacuation zones

FEMA



BETTER INFORMATION
Hurricane Evacuation Study

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FAQs

- Who will be affected?
- What critical facilities are at risk?

- **Vulnerability Analysis**

VULNERABILITY ANALYSIS
Who's at risk from storm surge?

FEMA

Hancock County, MS						
County Surge Area	Permanent Residential Structures	Non-Permanent Residential Structures	Total Residential Structures	Commercial Structures	Industrial Structures	Tourist Structures
CATEGORY 1	2,281	0	2,281	89	0	1
CATEGORY 2	5,007	253	5,330	209	4	2
CATEGORY 3	9,059	338	9,397	520	7	9
CATEGORY 4	9,480	380	9,860	525	7	9
CATEGORY 5	10,020	437	10,457	544	7	9
Non-Surge Area	5,518	682	6,200	99	0	1

Table 3-7: Vulnerable Structures by Storm Surge Area
Mississippi Hurricane Evacuation Study – Technical Data Report – 2012

VULNERABILITY ANALYSIS
What facilities are at risk?

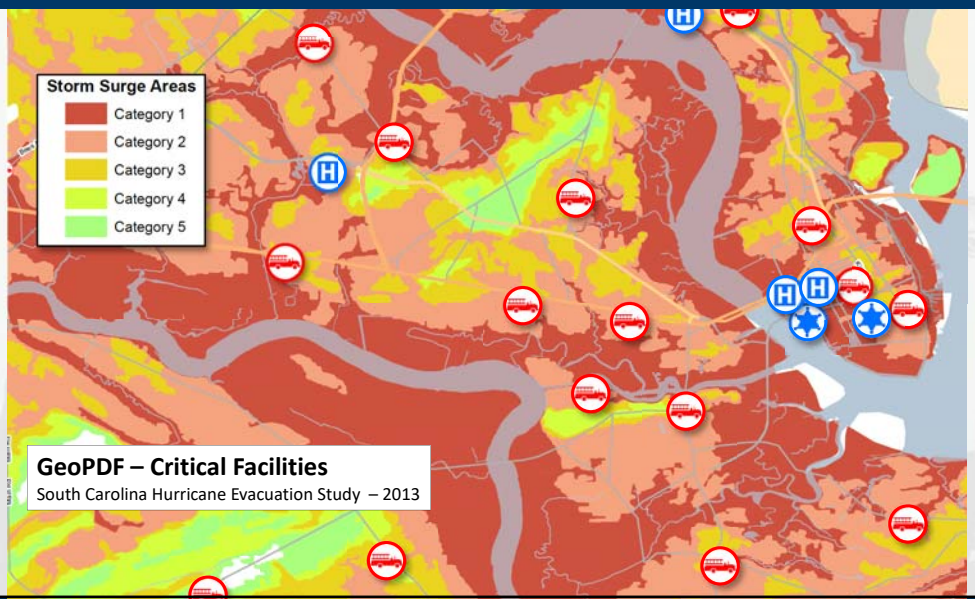
FEMA

Hancock County, MS						
Facility Type	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5	None
Casino	2	-	-	-	-	-
Dam	-	-	-	3	-	19
EOC	-	-	-	-	1	-
Fire	3	2	4	1	1	4
Hazmat	-	4	-	-	-	1
Hospital	-	-	1	-	-	-
Hotels	2	2	5	-	-	1
Police	-	-	4	-	-	-
School	1	3	6	1	-	1
Senior Center	-	-	1	-	-	-
Shelter	-	-	-	-	-	5
TOTAL	7	12	25	6	2	32

Table 3-9: Critical Facilities Summary Table
Mississippi Hurricane Evacuation Study – Technical Data Report – 2012

VULNERABILITY ANALYSIS
What facilities are at risk (GIS)?

FEMA



GeoPDF – Critical Facilities
South Carolina Hurricane Evacuation Study – 2013

BETTER INFORMATION
Hurricane Evacuation Study

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FAQs

- Will the Public evacuate?
- Where will they go? How? When?
- Do they understand the threat?

- **Behavioral Analysis**

BEHAVIORAL ANALYSIS
What are people thinking?

FEMA

SURVEY RESULTS

- Serious under-concern about surge
- Evacuation intent often overstated
- Evacuation intent highest for:
  - Major Hurricanes
  - Mandatory/Ordered Evacuations
  - Households with children
  - People with recent real hurricane experience
- Often get 'False Experience' effect

BEHAVIORAL ANALYSIS
Will the Public evacuate?

FEMA

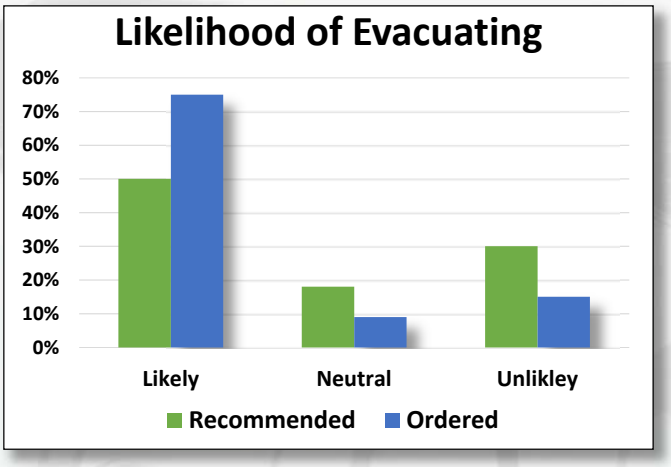
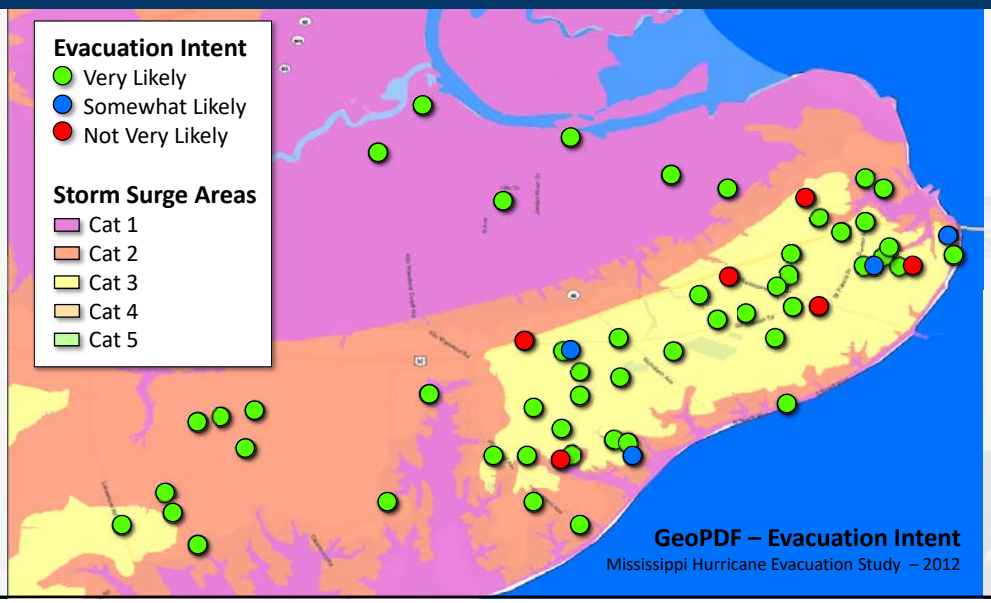


Figure 4-7: Cat 1-2 Hurricane and Likelihood of Leaving if Recommended or Ordered
South Carolina Hurricane Evacuation Study – Technical Data Report – 2013

BEHAVIORAL ANALYSIS
Where should I focus my outreach?

FEMA



GeoPDF – Evacuation Intent
Mississippi Hurricane Evacuation Study – 2012

BEHAVIORAL ANALYSIS
Bottom Line

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WHY DO PEOPLE EVACUATE?

- They understand their vulnerability/risk
- They were told to evacuate

BETTER INFORMATION
Hurricane Evacuation Study

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FAQs

- Who will seek public shelter?
- How many shelter spaces are needed?
- In-county? Out-of-county?

- **Shelter Analysis**

SHELTER ANALYSIS
How many shelter spaces are needed?

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SHELTER ANALYSIS

- **Shelter Locations**, with respect to Evacuation Zones and Storm Surge flood risk areas
- **Potential Demand**
- **Identification of Deficits**
- **Shelter usage rates** (planning purposes)
  - 3-8% Coastal
  - 10% Inland

SHELTER ANALYSIS
How many shelter spaces are needed?

FEMA

Baldwin County, AL							
Evacuation Scenario	Total Evacuating People		Public Shelter Demand		Sheltering Capacity	Surplus/Deficit	
	Low Occupancy	High Occupancy	Low Occupancy	High Occupancy		Low Occupancy	High Occupancy
Category 1	60,660	101,821	1,576	1,990	8,239	6,663	6,249
Category 2	103,871	151,069	2,909	3,384	7,469	4,560	4,085
Category 3	113,773	162,005	3,567	4,052	7,469	3,902	3,417
Category 4	184,748	234,032	8,528	9,025	2,818	-5,710	-6,207
Category 5	211,125	260,502	10,898	11,295	0	-10,898	-11,395

Table 5-4: Evacuating Population and Public Sheltering Demand – Baldwin County

Alabama Hurricane Evacuation Study – Technical Data Report – 2012

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SHELTER ANALYSIS
Resources for evacuating populations

FEMA

SHELTER DEMAND	POTENTIAL EVACUEES	REGULAR CAPACITY 7,953 Additional Needed	EMERGENCY CAPACITY 15,906 Additional Needed	ASSESSMENT OF CAPACITY
1%	1,533	0	0	Regular Shelter Capacity Can Support Demand
2%	3,065	0	0	
3%	4,598	0	0	
4%	6,131	0	0	
5%	7,633	0	0	
6%	9,196	1,243	0	Emergency Shelter Capacity Can Support Demand
7%	10,728	2,775	0	
8%	12,261	4,308	0	
9%	13,794	5,841	0	
10%	15,326	7,373	0	
13%	19,924	11,971	4,018	Over Capacity
15%	22,990	15,037	7,084	
20%	30,653	22,700	14,747	

Table 6: Population Seeking Shelter and Capacity in Zone 1
Puerto Rico Hurricane Evacuation Study – Shelter Analysis Report – 2015

BETTER INFORMATION
Hurricane Evacuation Study

FEMA

FAQs
- Where will traffic backup?
- What is the road capacity?
- How long will it take to evacuate?

- **Transportation Analysis**

TRANSPORTATION ANALYSIS
How long will it take to evacuate?

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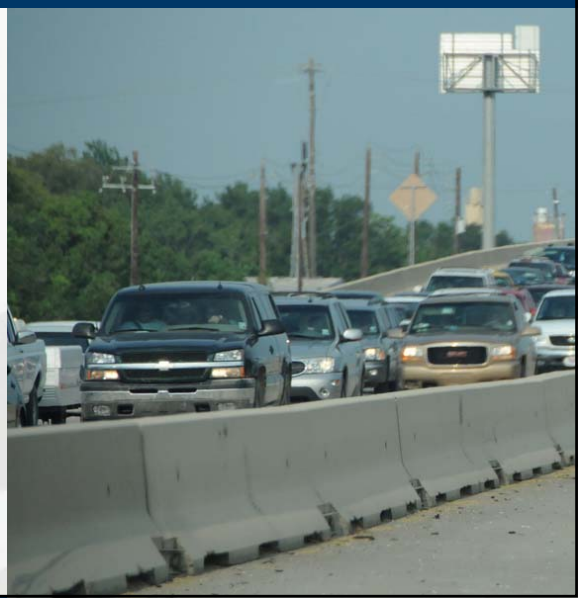
TRAFFIC MODEL INPUTS

- Demographics
- Behavioral Assumptions
- Evacuation Routes
- Roadway Capacities
- Travel Destinations
- Evacuation Scenarios



TRANSPORTATION ANALYSIS
Where will the traffic problems be?

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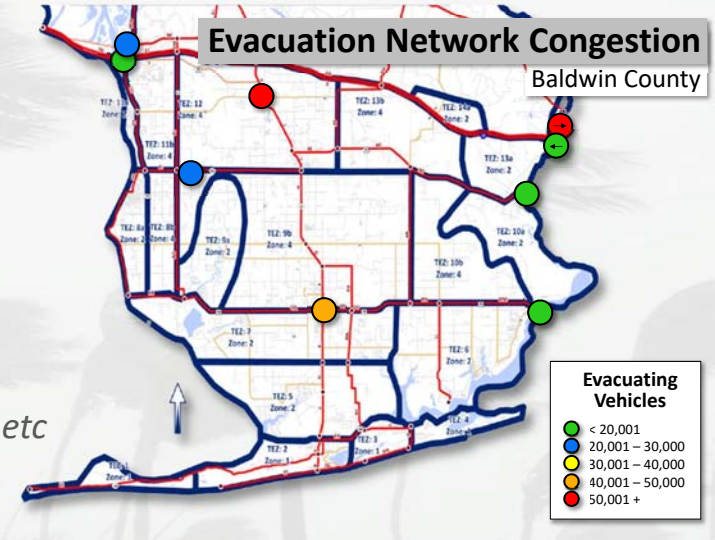
TRANSPORTATION ANALYSIS

- Traffic Patterns
  - Bottle Necks
  - Evacuating Vehicles
- Clearance Times
  - Response Rate
  - Seasonal Population
  - Evacuation Scenarios
    one-way, multi-state, etc



CLEARANCE TIMES
Modeled on the road network

FEMA

CLEARANCE TIMES

Time for the evacuating population to reach a point of safety

- Begins when the first evacuating vehicle enters the road network
- Ends when last vehicle reaches an assumed point of safety
- Includes travel time and waiting in congestion
- Doesn't relate to any one particular vehicle
- Driven by bottlenecks

CLEARANCE TIMES
Evacuation should take how long?

FEMA

Horry County, SC
Scenario C (501 reversal and 544 enhancement plan)

Response	Low Occupancy	Med Occupancy	High Occupancy	Extreme Occupancy
SLOW	22	26	29	31
MEDIUM	20	24	27	29
FAST	19	23	26	28
IMMEDIATE	18	22	25	27

Table 6-44: Evacuation Clearance Times – Scenario C
South Carolina Hurricane Evacuation Study – Technical Data Report – 2013

CLEARANCE TIMES
Evacuation should take how long?

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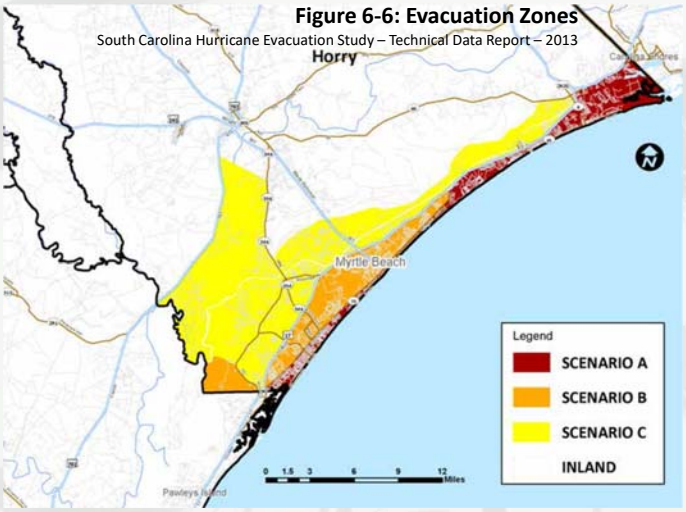
Figure 6-6: Evacuation Zones
South Carolina Hurricane Evacuation Study – Technical Data Report – 2013



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MAKING BETTER DECISIONS
Study. Plan. Execute.

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Study
- Identify Hazards
- Determine Vulnerability
- Evacuation Timing

Plan
- **Inform Hazards and Risk**
- **Develop Timelines**
- **Identify Triggers**

Execute
- Monitor Threat
- Assess Risk
- Take Action

INFORMED PLANS
It's not the Plan, it's the Process.

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Step 1 Form a Collaborative Planning Team

Step 2 Understand the Situation

Step 3 Determine Goals and Objectives

Step 4 Plan Development

Step 5 Plan Preparation, Review & Approval

Step 6 Plan Implementation & Maintenance

INFORMED PLANS
Making Better Decisions

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FAQs

- What forces us to react?
- What is acceptable risk?
- What assumptions can I make?

- **Identify Hazard Triggers**

INFORMED PLANS
What forces you to act?

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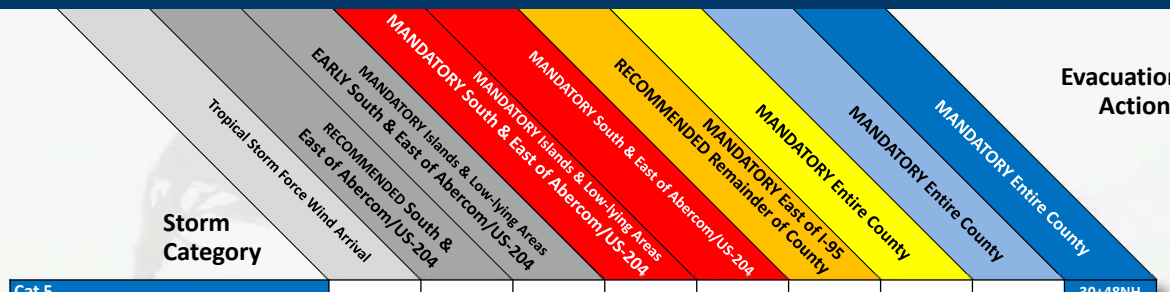
Lane Reversal Decision Factors	
Decision Factor	**Indicator**
The storm's current/projected intensity and the public perception of the threat to their safety.	Category 3 or greater storm portrayed through the media as a significant threat will probably require the use of lane reversal.
Tourism occupancy: High tourist occupancy greatly increases evacuating population and thereby increases traffic congestion.	For a Category 1 or 2 storms, monitor traffic flow and have lane reversal ready. A Category 3 or greater storm will indicate the need for reversal. (Note: Beaufort County requires Highway 278 reversal during tourist season at 85% tourist occupancy)

South Carolina Lane Reversal Factors
South Carolina Hurricane Plan 2015

INFORMED PLANS
Storm Category vs. Evacuation Actions

FEMA



Cat 5									30+48NH
Cat 4								30+48NH	
Cat 3							30+48NH		
Cat 2						24+30NH			
Cat 1 Direct					24+30NH				
Cat 1 Parallel to Coast				18+24NH					
Tropical Storm Direct			18+24NH						
Tropical Storm Parallel Coast		12							
Arrival Tropical Storm									

Islands and Low-lying Area Early Evacuations are 6 to 12 hours prior to Mandatory Evacuations
Hours for Evacuation + Added Hours for Nursing Home (NH) and Special Needs Evacuations

Chatham County Evacuation Guidelines

NWS PRODUCT TIMELINES
When is key information available?

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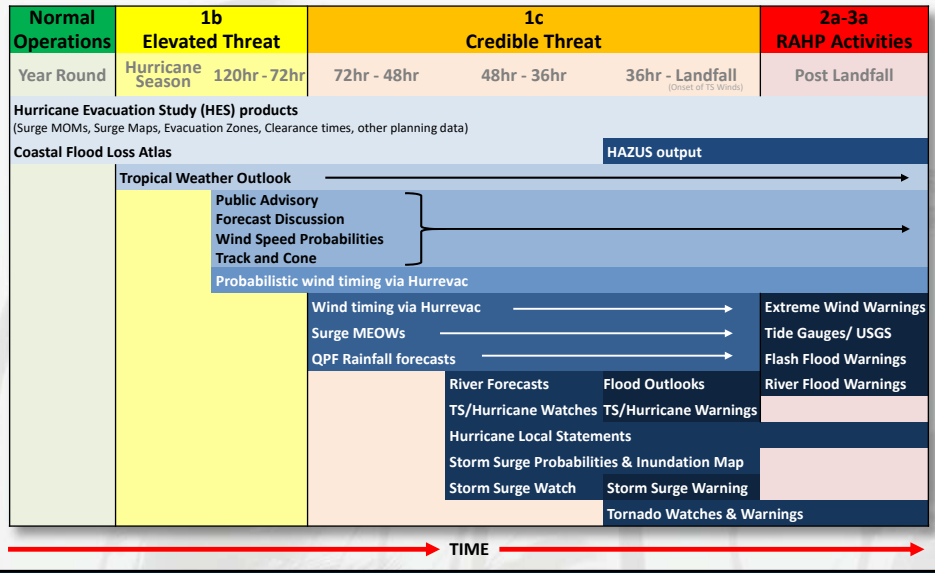
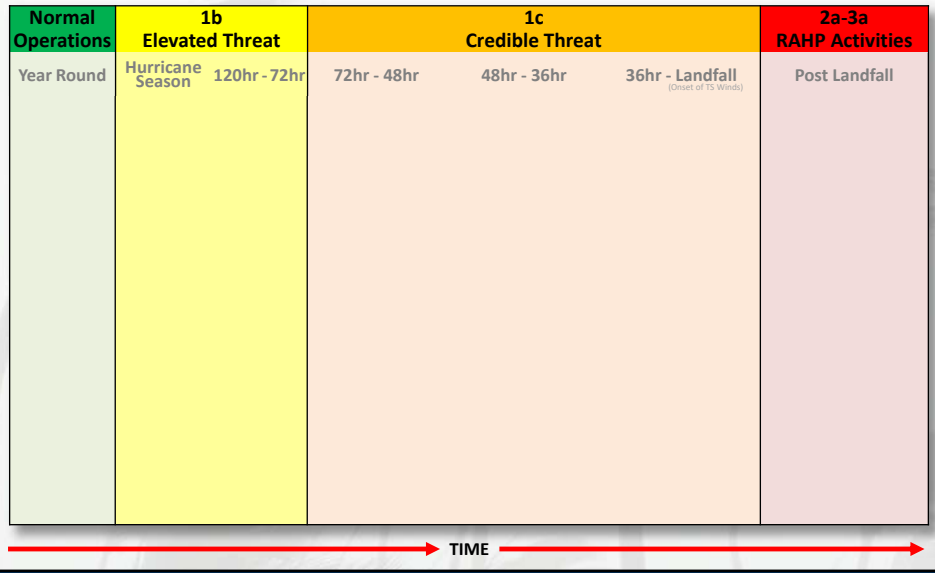


NWS PRODUCT TIMELINES
When is key information available?

FEMA



NWS PRODUCT TIMELINES
When is key information available?

FEMA

Normal Operations	1b Elevated Threat		1c Credible Threat			2a-3a RAHP Activities
Year Round	Hurricane Season	120hr - 72hr	72hr - 48hr	48hr - 36hr	36hr - Landfall (Onset of TS Winds)	Post Landfall
Hurricane Evacuation Study (HES) products (Surge MOMs, Surge Maps, Evacuation Zones, Clearance times, other planning data)						
Coastal Flood Loss Atlas					HAZUS output	

TIME

NWS PRODUCT TIMELINES
When is key information available?

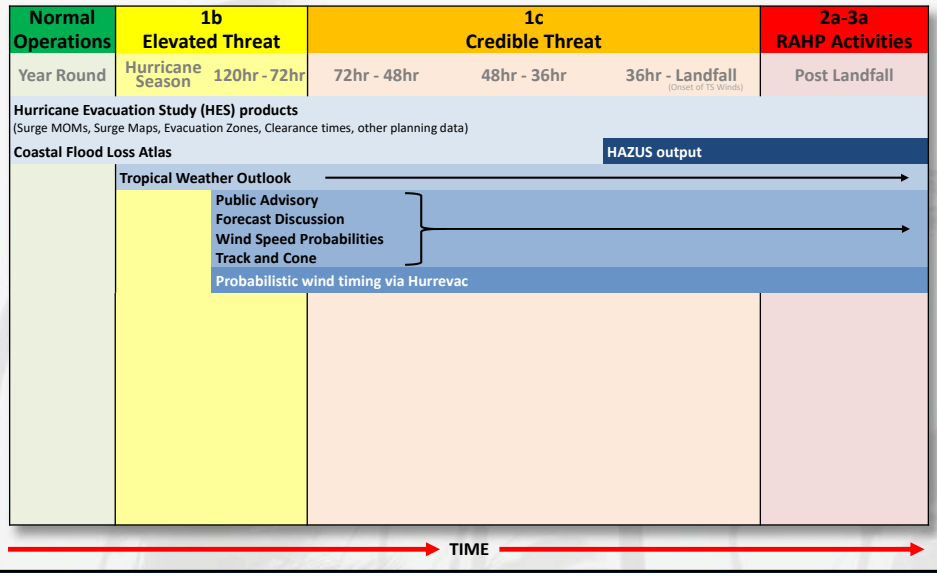
FEMA

Normal Operations	1b Elevated Threat		1c Credible Threat			2a-3a RAHP Activities
Year Round	Hurricane Season	120hr - 72hr	72hr - 48hr	48hr - 36hr	36hr - Landfall (Onset of TS Winds)	Post Landfall
Hurricane Evacuation Study (HES) products (Surge MOMs, Surge Maps, Evacuation Zones, Clearance times, other planning data)						
Coastal Flood Loss Atlas					HAZUS output	
	Tropical Weather Outlook →					

TIME

NWS PRODUCT TIMELINES
When is key information available?

FEMA



NWS PRODUCT TIMELINES
When is key information available?

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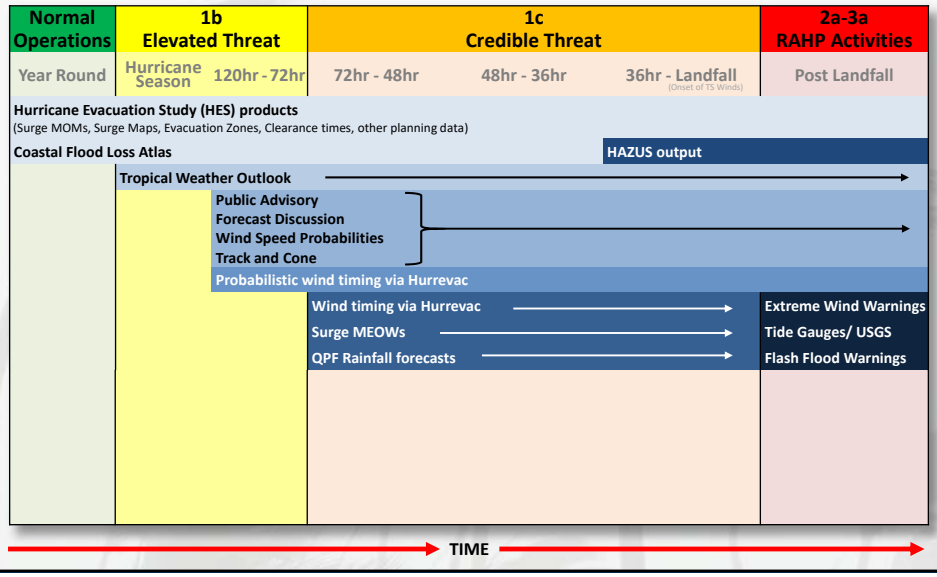

NWS PRODUCT TIMELINES
When is key information available?

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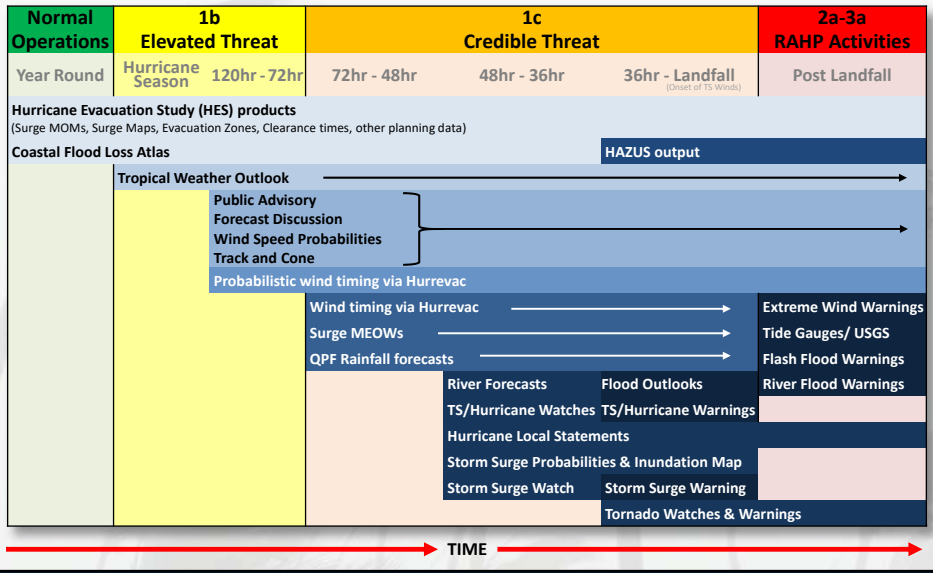

INFORMED PLANS
Making Better Decisions

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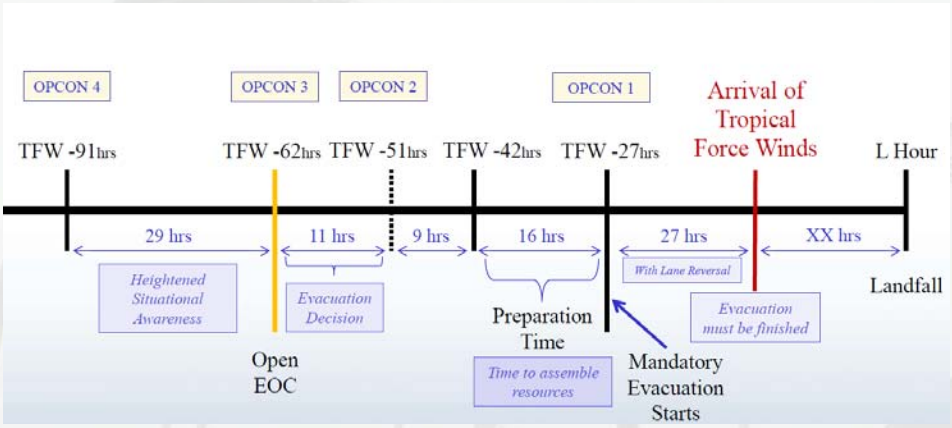
FAQs

- When do we open shelters?
- When do we need to deploy?
- How do we stay synchronized?

- **Decision Timelines**

DECISION TIMELINES
Evacuation scenario decision timeline



Horry County Evacuation Timeline for ABC Scenario

DECISION TIMELINES
Readiness Checklist

Hurricane Readiness Checklist

Hurricane preparedness - prior to June 1	PRIORITY LEVEL	PERSONNEL RESPONSIBLE	STATUS OF TASK	DATE/TIME COMPLETED
Hurricane Planning				
• Update local hurricane operation, evacuation plans and resource lists				
• Revise Standard Operating Procedures (SOPs)				
• Review local emergency management ordinances and update				
• Test Hurrevac and/or other hurricane tracking software				
• Review Stafford Act Policies with State Emergency Management				
• Mitigate Vulnerable Critical Facilities				
• Solidify and review mutual aid agreements				
• Determine evacuation decision making authority w/ 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				

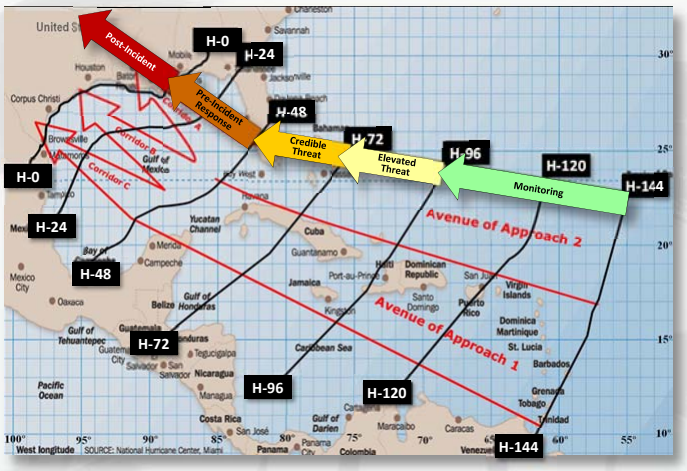
DECISION TIMELINES
Readiness Checklist

FEMA

Hurricane Readiness Checklist				
Storm Impacts Imminent (~36 hours) Hurricane Watches and Warnings Issued	PRIORITY LEVEL	PERSONNEL RESPONSIBLE	STATUS OF TASK	DATE/TIME COMPLETED
Storm Watch				
• Conference calls with NOAA local WFO/RFC/SPC				
• Continue to monitor HURREVAC and other systems				
• Monitor storm track and provide local government officials updates				
• Anticipate the possible arrival of rainfall and tornados				
• Monitor river stages and rainfall forecast				
Emergency Operations Center (EOC)				
• Activate EOC (partial or full based on clearance times and threat)				
• Request primary ESF support agencies provide EOC briefings				
• Complete and distribute EOC situation reports, as applicable				
• Prepare EOC facility- Mitigate for Winds, Water, etc.				

DECISION TIMELINES
Scenario-based Operational Levels

FEMA



FEMA RVI Hurricane Plan

MAKING BETTER DECISIONS
Study. Plan. Execute.

FEMA

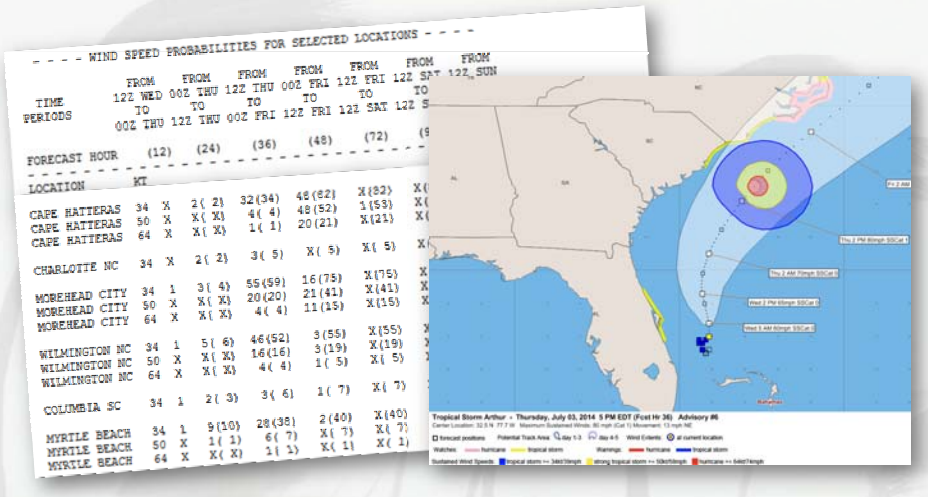
Study
- Identify Hazards
- Determine Vulnerability
- Evacuation Timing

Plan
- Inform Hazards and Risk
- Develop Timelines
- Identify Triggers

Execute
- **Monitor Threat**
- **Assess Risk**
- **Take Action**

INFORMED DECISIONS
There is a storm. Analyze. Respond.

FEMA



INFORMED DECISIONS
Hurricane Evacuation Study

FEMA

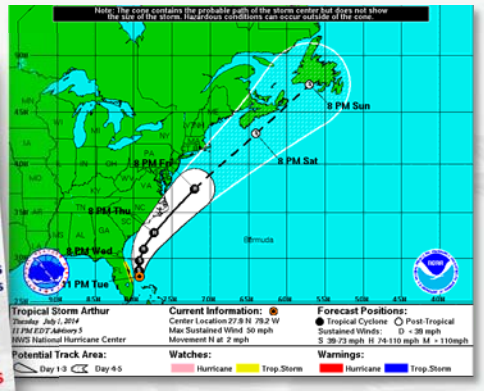
FAQs

- What's the forecast?
- A threat to my community?
- When are hazards expected?

- **NHC Forecasts**

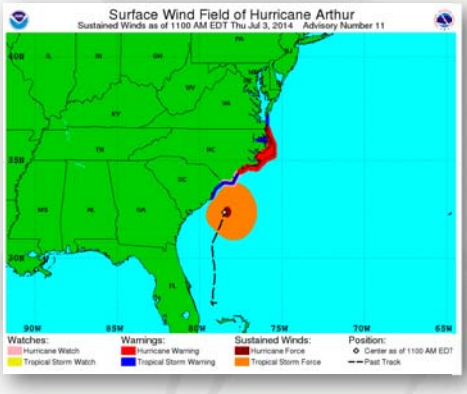
NHC FORECASTS
Where is the storm going?

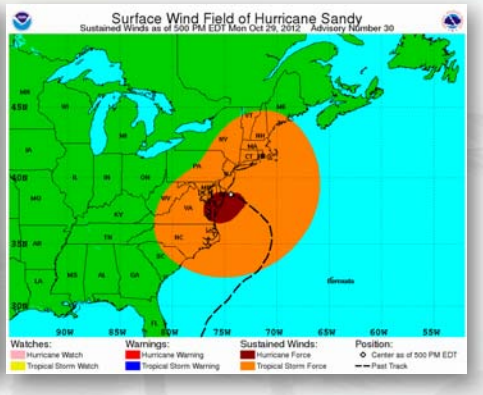
FEMA



NHC FORECASTS
What are the storm characteristics?

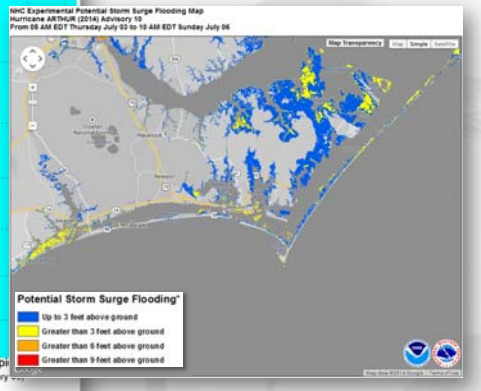
FEMA





NHC FORECASTS
Evaluate the storm threat.

FEMA



NHC FORECASTS
Where is the storm going?

FEMA

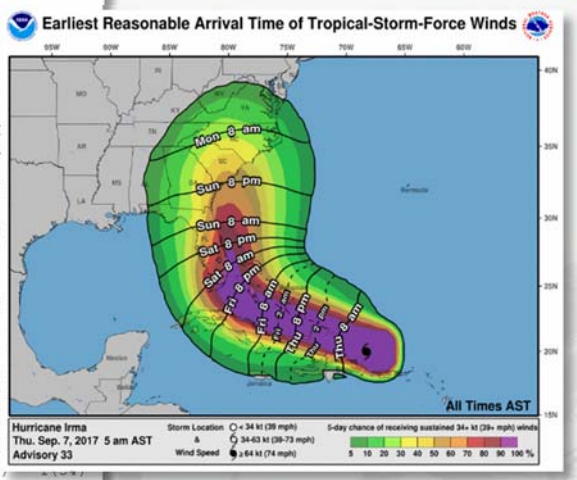
NATIONAL HURRICANE CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

TROPICAL STORM ISAAC WIND SPEED PROBABILITIES NUMBER 21
NWS NATIONAL HURRICANE CENTER MIAMI FL AL092012
0900 UTC SUN AUG 26 2012

- - - - WIND SPEED PROBABILITIES FOR SELECTED LOCATIONS

	FROM	FROM	FROM	FROM	FROM	FROM
TIME	12Z WED	00Z THU	12Z THU	00Z FRI	12Z FRI	12Z SA
PERIODS	TO	TO	TO	TO	TO	TO
	00Z THU	12Z THU	00Z FRI	12Z FRI	12Z SAT	12Z SU
FORECAST HOUR	(12)	(24)	(36)	(48)	(72)	(96
LOCATION KT						
PANAMA CITY FL 34	X	3(3)	22(25)	30(55)	16(71)	2(73
PANAMA CITY FL 50	X	X(X)	1(1)	13(14)	15(29)	2(31
PANAMA CITY FL 64	X	X(X)	X(X)	3(3)	6(9)	2(11
PENSACOLA FL 34	X	X(X)	10(10)	32(42)	31(73)	5(78
PENSACOLA FL 50	X	X(X)	X(X)	6(6)	28(34)	5(39
PENSACOLA FL 64	X	X(X)	X(X)	1(1)	14(15)	3(18
MOBILE AL 34	X	X(X)	5(5)	24(29)	35(64)	8(72
MOBILE AL 50	X	X(X)	X(X)	3(3)	22(25)	8(33
MOBILE AL 64	X	X(X)	X(X)	1(1)	8(9)	4(13
GULFPORT MS 34	X	X(X)	3(3)	21(24)	34(58)	10(68)

1(14)



INFORMED DECISIONS
Hurricane Evacuation Study

FEMA

FAQs

- What is the forecast?
- Evacuation start times?

- **Hurrevac**

HURREVAC
NHC Forecasts and Evacuation Timing

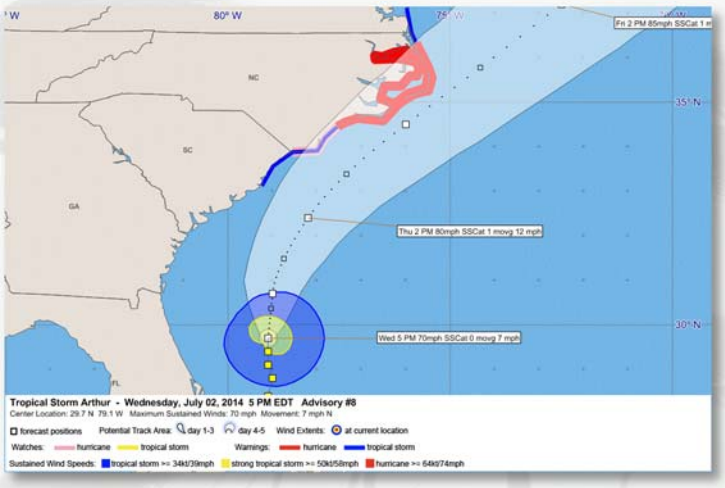
FEMA

HURREVAC

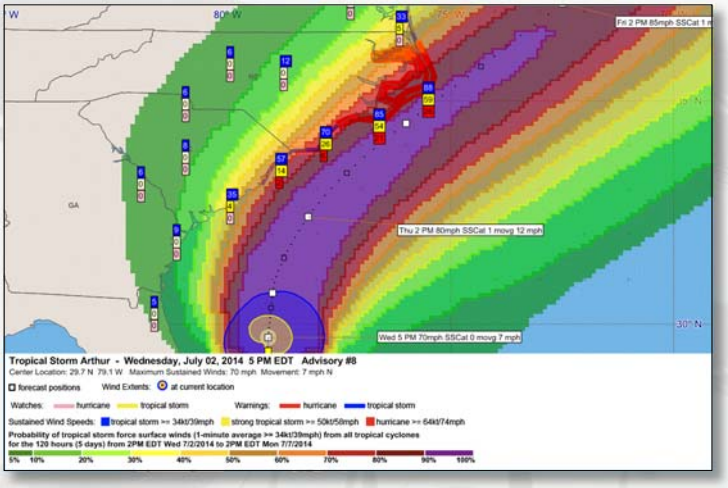
- **A hurricane tracking and decision support tool**
  - Uses NHC forecast data
  - Calculates evacuation start times
- **A resource for EMs during evacuations**
  - Common forecast picture
- **Free download for government users**

HURREVAC
Forecast track. Watches/Warnings. Size.

FEMA

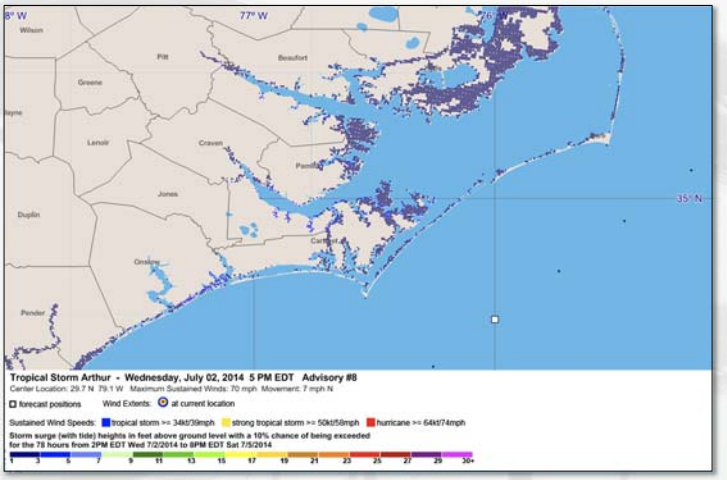


HURREVAC
Wind threat – Wind Speed Probabilities



71

HURREVAC
Surge threat – Surge Probabilities



HURREVAC
Wind Timing – All Affected Areas

FEMA

Report for Hurricane Arthur
Based on Advisory 11 Issued 7/3/2014 11 AM EDT
Wind Timing All Affected Areas

Location	34kt(39mph)	50kt(58mph)	64kt(74mph)	64ktEND(dur)	50ktEND(dur)	34ktEND(dur)	Peak Wind
NC Dare	07/03 22E	07/04 02E	07/04 03E	07/04 06E [03]	07/04 07E [05]	07/04 09E [11]	90kt (104mph) 07/04 04E
NC Hyde	07/03 21E	07/04 01E	07/04 02E	07/04 04E [02]	07/04 06E [05]	07/04 08E [11]	90kt (104mph) 07/04 03E
NC Carteret	07/03 16E	07/03 21E	07/04 00E	07/04 03E [03]	07/04 04E [07]	07/04 07E [15]	90kt (104mph) 07/04 02E
NC Craven	07/03 18E	07/03 23E	07/04 01E	07/04 02E [01]	07/04 03E [04]	07/04 05E [11]	64kt (74mph) 07/04 01E
NC Pamlico	07/03 19E	07/04 00E			07/04 04E [04]	07/04 06E [11]	61kt (70mph) 07/04 02E
NC Onslow	07/03 15E	07/03 21E			07/04 01E [04]	07/04 04E [13]	60kt (69mph) 07/03 23E
NC Tyrrell	07/03 23E	07/04 03E			07/04 06E [03]	07/04 08E [09]	58kt (67mph) 07/04 04E
NC Jones	07/03 18E	07/03 22E			07/04 01E [03]	07/04 04E [10]	56kt (64mph) 07/04 00E
NC Beaufort	07/03 20E	07/04 01E			07/04 03E [02]	07/04 06E [10]	55kt (63mph) 07/04 02E
NC Currituck	07/04 01E	07/04 05E			07/04 06E [01]	07/04 09E [08]	52kt (60mph) 07/04 05E
NC Pender	07/03 15E	07/03 21E			07/03 23E [02]	07/04 02E [11]	52kt (60mph) 07/03 21E
NC New Hanover	07/03 13E	07/03 18E			07/03 21E [03]	07/04 01E [12]	52kt (60mph) 07/03 19E
NC Brunswick	07/03 12E	07/03 18E			07/03 20E [02]	07/04 00E [12]	52kt (60mph) 07/03 18E
NC Washington	07/03 23E					07/04 07E [08]	49kt (56mph) 07/04 03E
NC Camden	07/04 01E					07/04 08E [07]	46kt (53mph) 07/04 05E
MA Nantucket	07/04 21E					07/05 04E [07]	45kt (52mph) 07/05 00E
NC Pasquotank	07/04 02E					07/04 08E [06]	44kt (51mph) 07/04 04E

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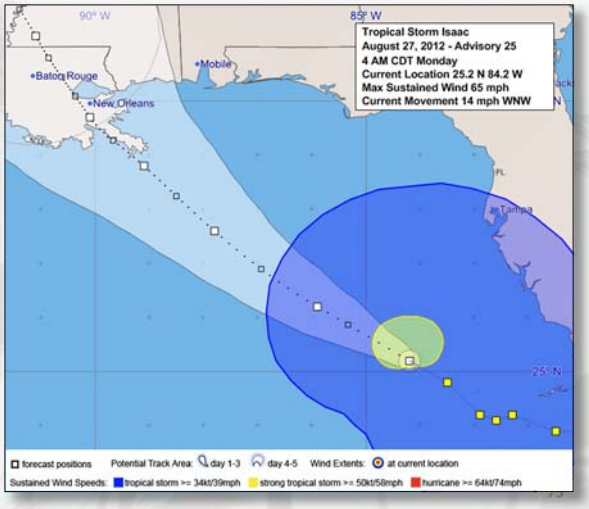
HURREVAC
Wind Timing – Single Location

FEMA

Tropical Cyclone Wind Speed Probabilities
for the 120 hours (5 days) from 2 AM Mon 8/27/2012 to 2 AM Sat 9/1/2012
Percent Probabilities Report for Orleans, Louisiana

Date/Time (hr)	34k Winds	50k Winds	64k Winds
8/27/2012 07CDT	X (X)	X (X)	X (X)
8/27/2012 13CDT	X (X)	X (X)	X (X)
8/27/2012 19CDT	**9** (9)	X (X)	X (X)
8/28/2012 01CDT	**20** (29)	X (X)	X (X)
8/28/2012 07CDT	**19** (48)	**5** (5)	X (X)
8/28/2012 13CDT	**23** (71)	**20** (25)	**3** (3)
8/28/2012 19CDT	**12** (83)	**22** (47)	**12** (15)
8/29/2012 01CDT	**5** (88)	**9** (56)	**9** (24)
8/29/2012 07CDT	**3** (91)	**3** (59)	**2** (26)
8/29/2012 13CDT	X (91)	1 (60)	**1** (27)
8/29/2012 19CDT	1 (92)	1 (61)	X (27)
8/30/2012 01CDT	X (92)	X (61)	1 (28)



HURREVAC
Wind Timing – Single Location

FEMA

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8/28/2012 01CDT	**20** (29)	X (X)	X (X)
8/28/2012 07CDT	**19** (48)	**5** (5)	X (X)
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8/28/2012 19CDT	**12** (83)	**22** (47)	**12** (15)
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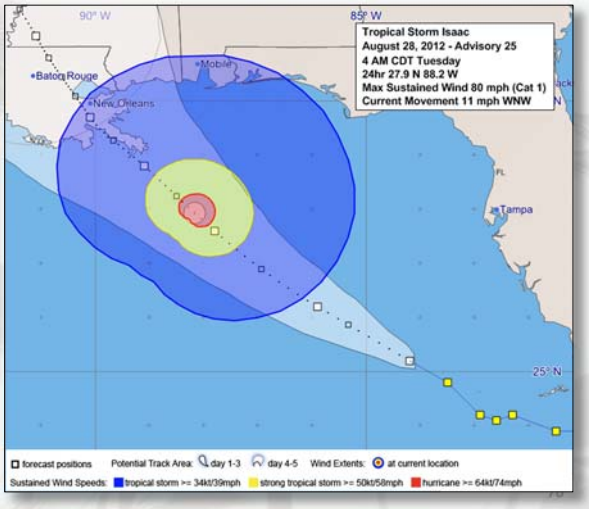
8/29/2012 07CDT	**3** (91)	**3** (59)	**2** (26)
8/29/2012 13CDT	X (91)	1 (60)	**1** (27)
8/29/2012 19CDT	1 (92)	1 (61)	X (27)
8/30/2012 01CDT	X (92)	X (61)	1 (28)



HURREVAC
Wind Timing – Single Location

FEMA

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8/27/2012 19CDT	**9** (9)	X (X)	X (X)
8/28/2012 01CDT	**20** (29)	X (X)	X (X)
8/28/2012 07CDT	**19** (48)	**5** (5)	X (X)
8/28/2012 13CDT	**23** (71)	**20** (25)	**3** (3)
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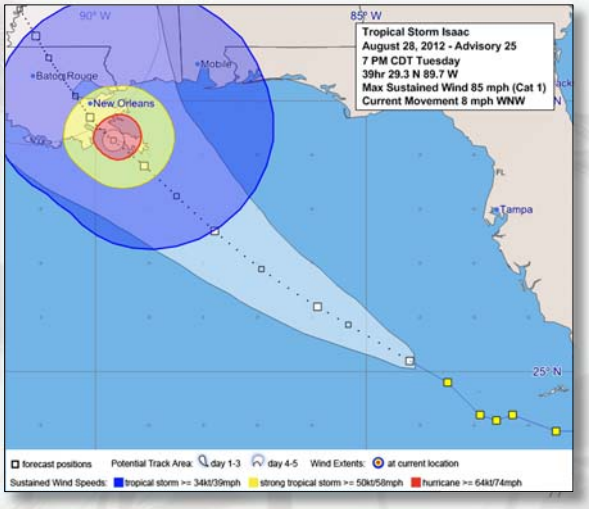
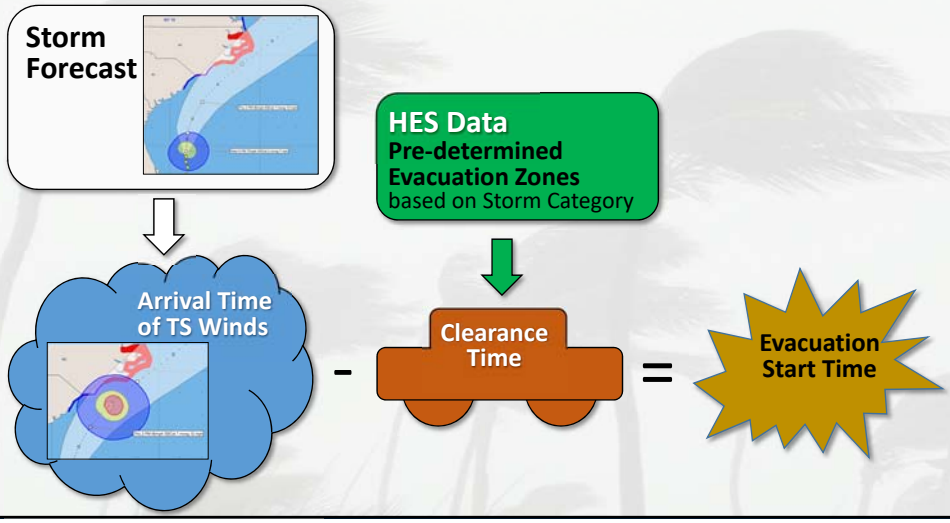


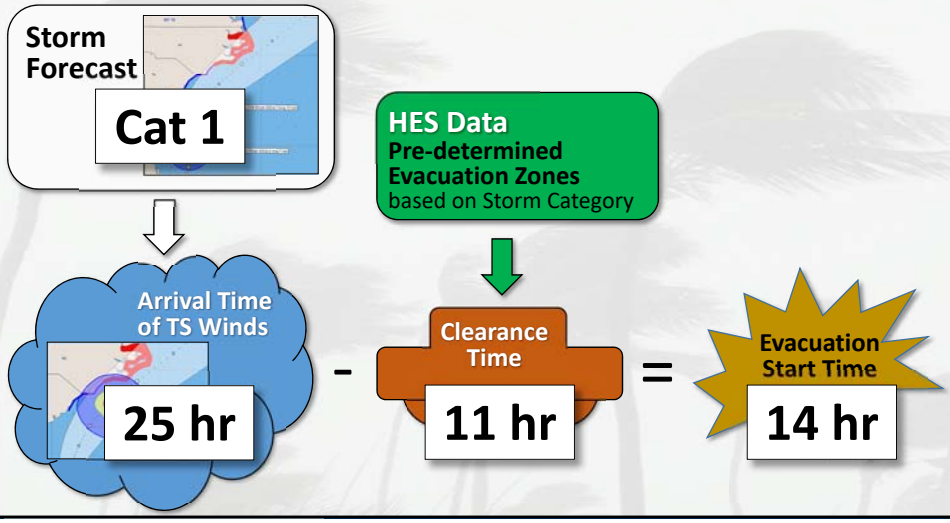
HURREVAC
Calculating evacuation start time

FEMA



HURREVAC
Calculating evacuation start time

FEMA



HURREVAC
Evacuation Start Times

FEMA

Report for Tropical Storm Arthur
Based on Advisory 8 Issued 7/2/2014 5 PM EDT (Old Advisory)
Evacuation Timing All Affected Areas (187 Items)

Location	Evac. Type	Evac Start	Dur.	Dark	Cat/Oc/Re	>34kt(39)
NC Dare	US158 Only	07/03 06E	16	1	1 / M / M	07/03 22E
NC Dare	HvyTrafHES	07/03 01E	21	6	1 / M / M	07/03 22E
NC Dare	US158 US64	07/03 11E	11	1	1 / M / M	07/03 22E
NC Dare	LgtTrafHES	07/03 01E	21	6	1 / M / M	07/03 22E
NC Dare	US64Only	07/03 06E	16	1	1 / M / M	07/03 22E
NC Carteret	Standard	07/03 08E	10	0	1 / M / M	07/03 18E
NC Carteret	HvyTraffic	07/03 07E	11	0	1 / M / M	07/03 18E
NC Hyde	Ocracoke	07/03 00E	21	6	1 / M / M	07/03 21E
NC Hyde	Mainland	07/03 12E	9	0	1 / M / M	07/03 21E
NC Hyde	MainIndHvy	07/03 11E	10	0	1 / M / M	07/03 21E
NC Craven	Standard	07/03 09E	10	0	1 / M / M	07/03 19E
NC Craven	HvyTraffic	07/03 08E	11	0	1 / M / M	07/03 19E

HURREVAC
Evacuation Start Times

FEMA

Report for Tropical Storm Arthur
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NC Dare	HvyTrafHES	07/03 01E	21	6	1 / M / M	07/03 22E
NC Dare	US158 US64	07/03 11E	11	1	1 / M / M	07/03 22E
NC Dare	LgtTrafHES	07/03 01E	21	6	1 / M / M	07/03 22E
NC Dare	US64Only	07/03 06E	16	1	1 / M / M	07/03 22E
NC Carteret	Standard	07/03 08E	10	0	1 / M / M	07/03 18E
NC Carteret	HvyTraffic	07/03 07E	11	0	1 / M / M	07/03 18E
NC Hyde	Ocracoke	07/03 00E	21	6	1 / M / M	07/03 21E
NC Hyde	Mainland	07/03 12E	9	0	1 / M / M	07/03 21E
NC Hyde	MainIndHvy	07/03 11E	10	0	1 / M / M	07/03 21E
NC Craven	Standard	07/03 09E	10	0	1 / M / M	07/03 19E
NC Craven	HvyTraffic	07/03 08E	11	0	1 / M / M	07/03 19E

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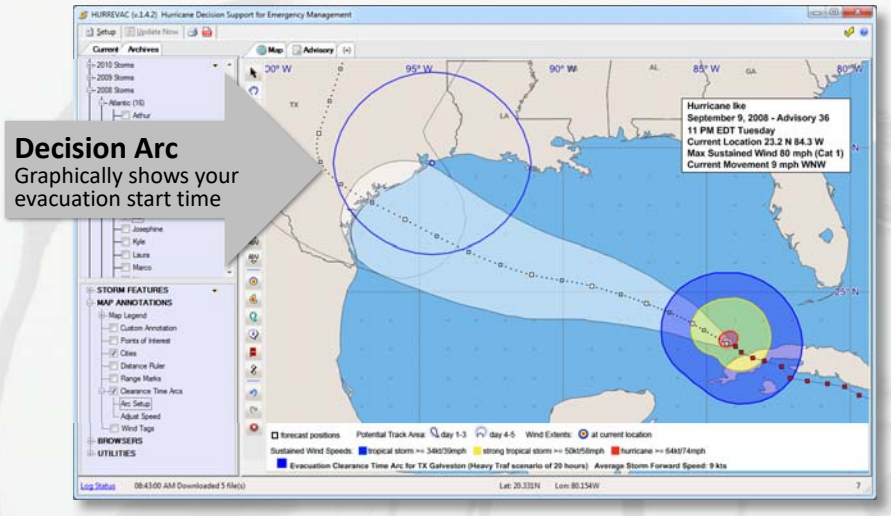
HURREVAC
Timing of hazards vs. Clearance Time

FEMA



HURREVAC MODERNIZATION
New Tools. More Platforms

FEMA

HURREVAC → **(HVX)HURREVAC**

(HVX)HURREVAC
Key Similarities

FEMA

KEY SIMILARITIES

- **Existing HURREVAC capability**
  - View graphical forecast information
  - NHC text products
- **Evacuation clearance time integration**
- **Creating reports**
  - Wind timing
  - Evacuation timing
  - Storm summary

(HVX)HURREVAC
Key Differences

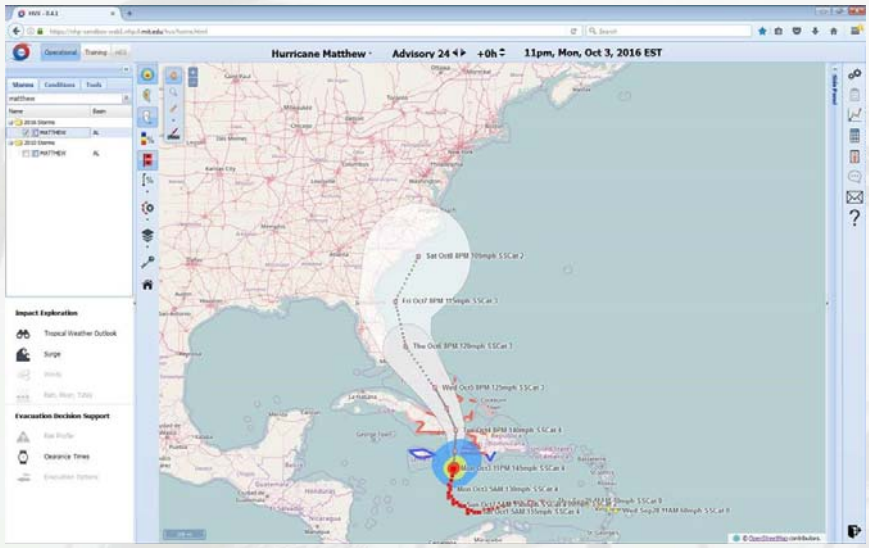
FEMA

KEY DIFFERENCES

- **Web based**
  - No downloads or software to install
  - Use your computer, tablet or phone
  - Access your profile/preferences anywhere
- **Training modules**
  - Intro to HVX/Tutorials
  - Decision-making scenarios
- **SLOSH Display**
  - MOMs & MEOWs
  - MEOW mixer/recommender

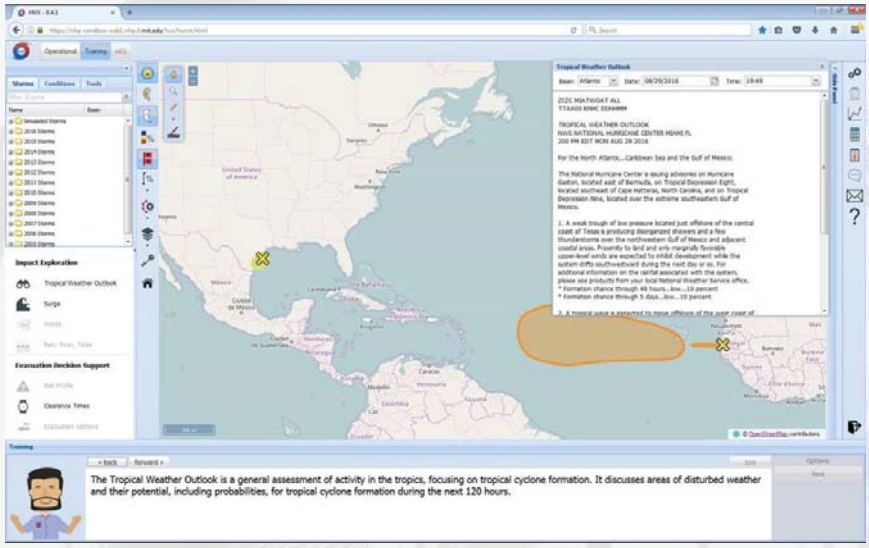
(HVX)HURREVAC
Web Based

FEMA



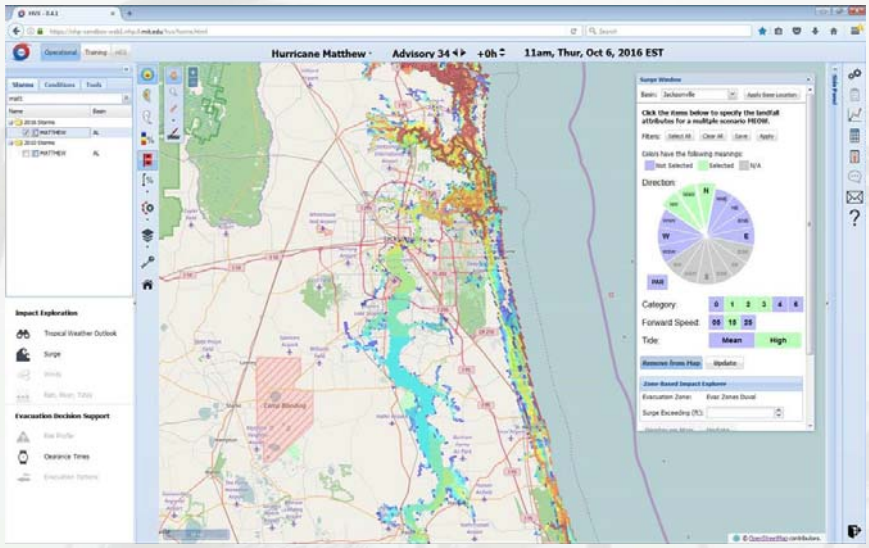
(HVX)HURREVAC
Training Modules

FEMA



(HVX)HURREVAC
SLOSH Display

FEMA



(HVX)HURREVAC
Roll Out Schedule

FEMA

TIMELINE

- **January 2018**
  - NHP HURREVAC training only web-based; No desktop HURREVAC training
- **June 2018**
  - Plan for 5,000 Beta users/testers
- **By the end of 2018**
  - HVX fully operational
  - Desktop HURREVAC operates thru 2018
  - Registered desktop users will receive instructions to access the web-version

INFORMED DECISIONS
Hurricane Evacuation Study

FEMA

FAQs

- Confidence? Contingencies?
- What is the forecast/evacuation timing?
- Can we get a briefing?

- **Hurricane Liaison Team**

HURRICANE LIAISON TEAM
Overview

FEMA

BACKGROUND

- **Initial idea arose in the early 1990s**
- **Proven during response to the 1995 Hurricane Season**
  Erin and Opal
- **Formalized in 1996**
  Request from Governor of Florida to FEMA and NHC Director

HLT Deployment (circa 1998) – pictured Kent Baxter (R6), Bill Massey (R4), Bruce Swiren (R2), Eric Gentry (Florida), Tim Putprush (IT) and Rhonda Orndoff (IT)

HURRICANE LIAISON TEAM
Overview

FEMA

MISSION

"The Hurricane Liaison Team's mission is to **improve our Nation's capability to respond to hurricanes through the rapid exchange of critical information** between the National Hurricane Center and Federal, State, Local, Tribal and Territorial emergency managers."

HURRICANE LIAISON TEAM
Overview

FEMA

RAPID COMMUNICATIONS

- **Partnership between the NWS and FEMA**
  - FEMA Hurricane Program Managers
  - FEMA Reservists
  - NWS meteorologists and hydrologist

HURRICANE LIAISON TEAM
Regional Hurricane Program Manager (HPM)

FEMA

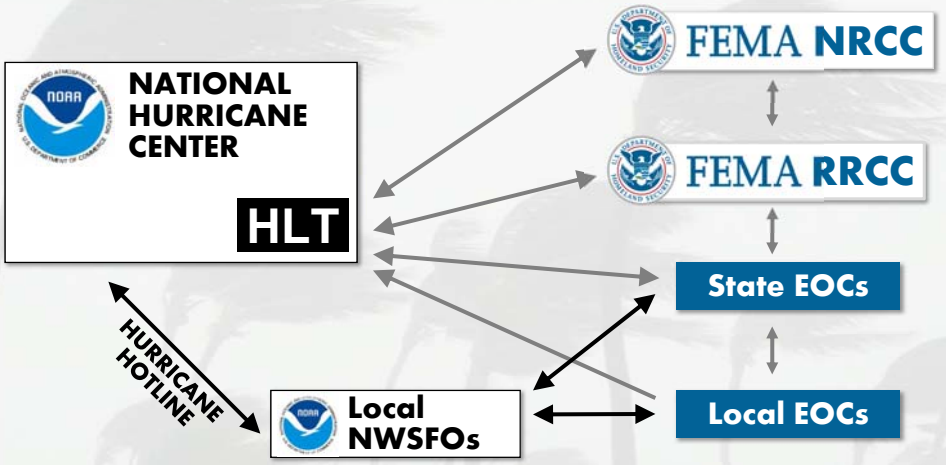
REGIONAL HPM

- Technical Knowledge
- State/Local Relationships
- Deploy to NHC

HURRICANE LIAISON TEAM
Communication Flowchart

FEMA

COMMUNICATION FLOWCHART



HURRICANE LIAISON TEAM
Overview

FEMA

OPERATIONS

- **Full-time FEMA employees at NHC**
- **Activates on June 1**
  - Deploy for hurricane threats to the United States or Territories
  - Deployments can occur within 24 hours of notification
  - Remains operational until the hurricane threat has passed

James Franklin, HSU Chief of the National Hurricane Center provides a briefing on Tropical Storm Bill, June, 16, 2015, at the National Hurricane Center in Miami.

HURRICANE LIAISON TEAM
Overview

FEMA

RESPONSIBILITIES

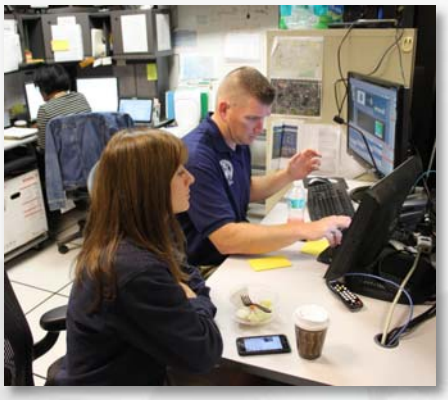
- **Provide real-time interpretation, assessment and guidance;**
  - Integrating and applying NHC forecasts with Regional, State and local response – evacuation plans
- **Provide a forum for emergency managers to ask questions,**
  - Reinforce decisions;
  - Assist with correct use of NHC forecasts and predictive modeling

HURRICANE LIAISON TEAM
Overview

FEMA

RESPONSIBILITIES

- **Provide NHC visibility on State and local protective actions**
  - Improve messaging



Rebecca Moulton, FEMA Regional Team Leader and Rodney Rose, IT lead preparing for a VTC for Hurricane Arthur, July, 2, 2014, at the National Hurricane Center in Miami.

HURRICANE LIAISON TEAM
Overview

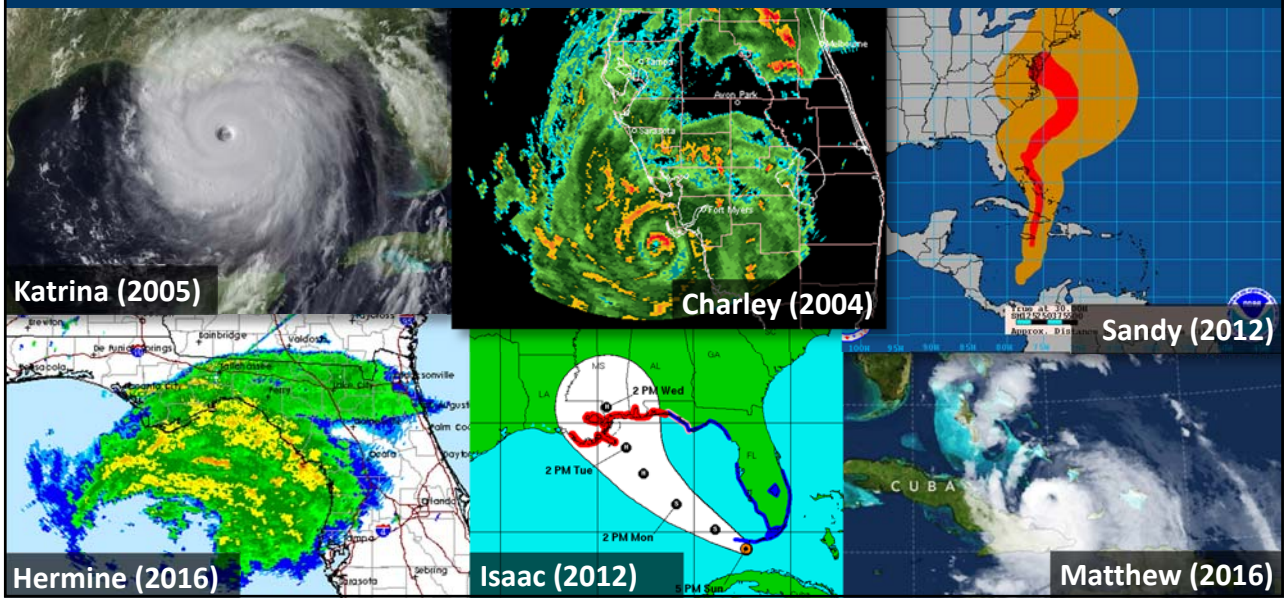
FEMA

RESPONSIBILITIES

- **Facilitate two-way communications**
  - Between the NHC and EMs
  - Common forecast picture
  - Relay EM issues to improve NWS/NHC messaging
- **Video/Teleconferences**
  - NHC/NWS
  - FEMA and other Federal Agencies
  - Emergency Operations Centers (EOCs)

HURRICANE LIAISON TEAM
Recent Storm Examples

FEMA



HURRICANE LIAISON TEAM
Contact Us

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