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# Unit 2: National Weather Service Products

# Unit 2 Objectives



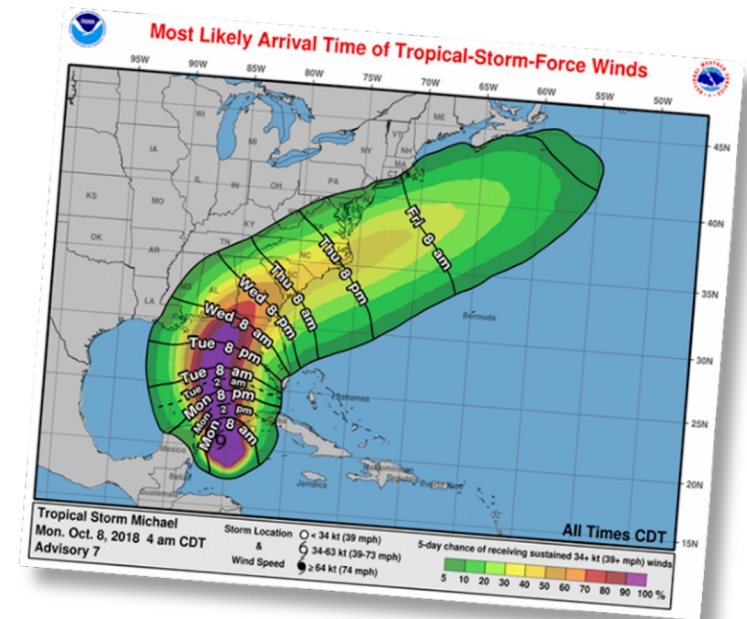
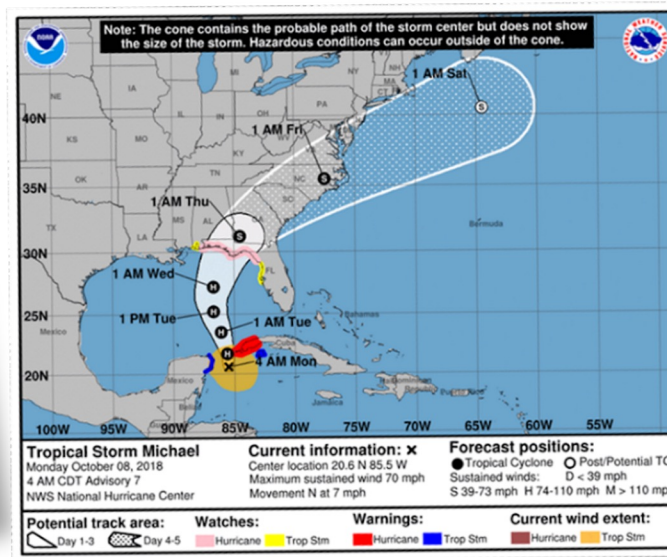
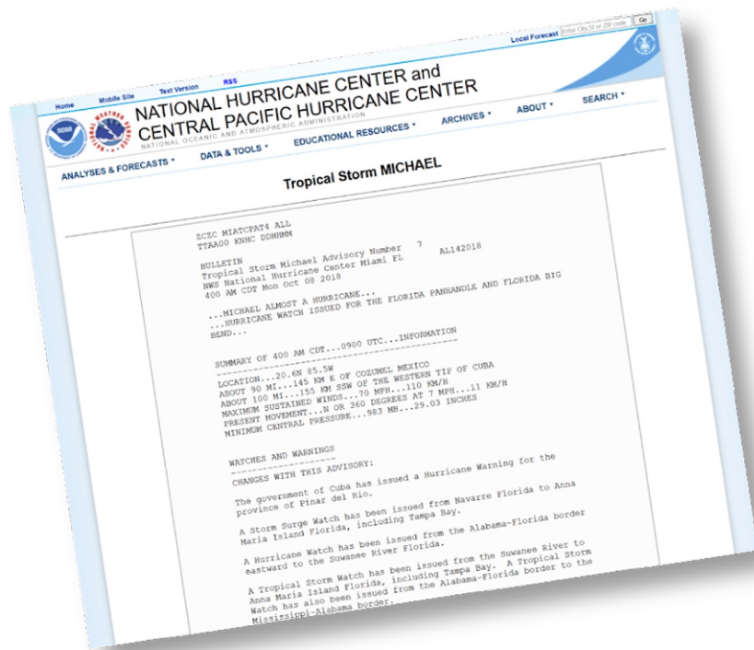
At the end of this unit, you should be able to:

1. Identify the National Weather Service (NWS) forecast products.
2. Explain when NWS products are available.
3. Describe NHC text and graphics products related to wind, such as the Public Advisory, Forecast Discussion, Wind Speed Probabilities, and Arrival Times.
4. Describe NWS text and graphics products related to rainfall and flooding, such as Quantitative Precipitation Forecast (QPF), Excessive Rainfall Outlook (ERO), and hydrographs.



# Tropical Cyclone Products

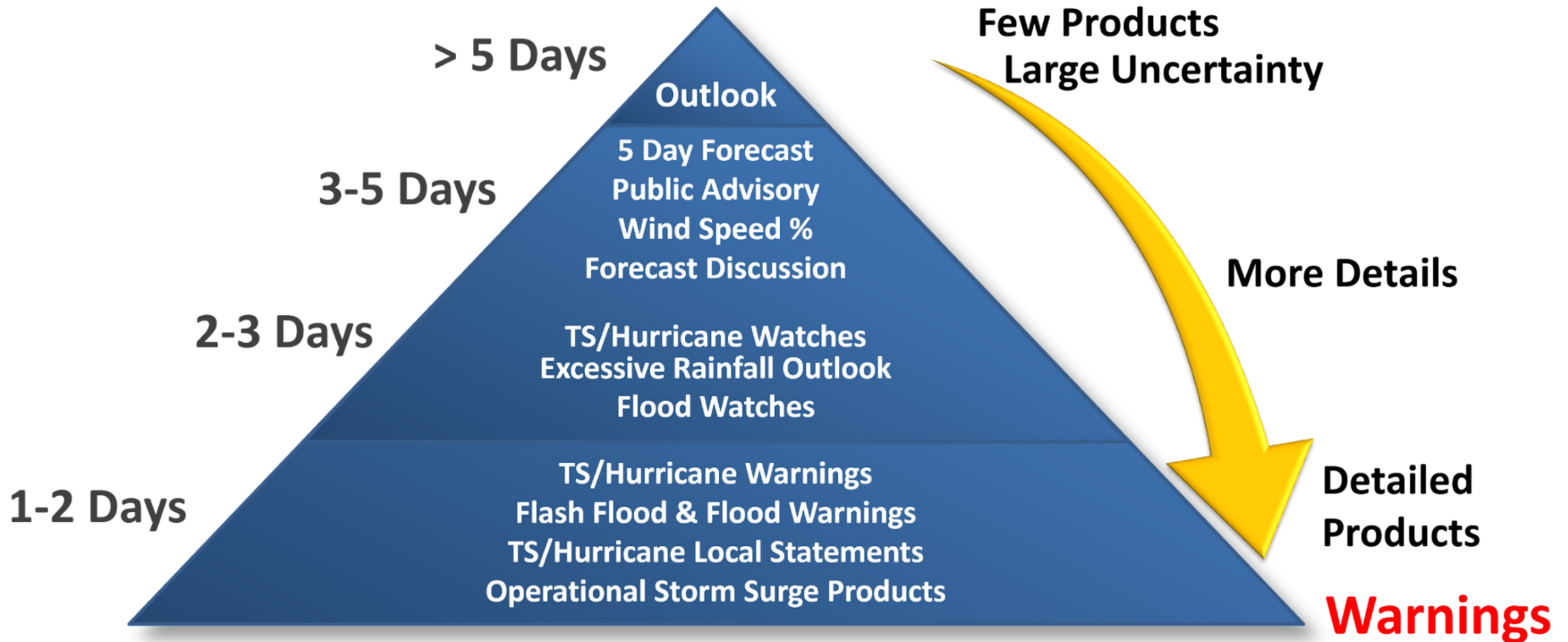
The NWS national centers (**National Hurricane Center (NHC)**, **Weather Prediction Center (WPC)**, **National Water Center (NWC)**, etc.) provide the ‘big picture’ that complements and guides local NWS forecast office products.



# Tropical Cyclone NWS Products Timeframe



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# NWS TC Product Overview



## Wind-related Products

- Tropical Weather Outlook
  - Special Tropical Weather Outlook
- Advisories
  - Public Advisory
  - Intermediate Advisory
  - Tropical Cyclone Update
- Forecast Discussion
- Forecast Error Cone
- Wind Speed Probabilities
- Wind Speed Arrival Timing
- Wind-based Watches/Warnings

## Water-related Products

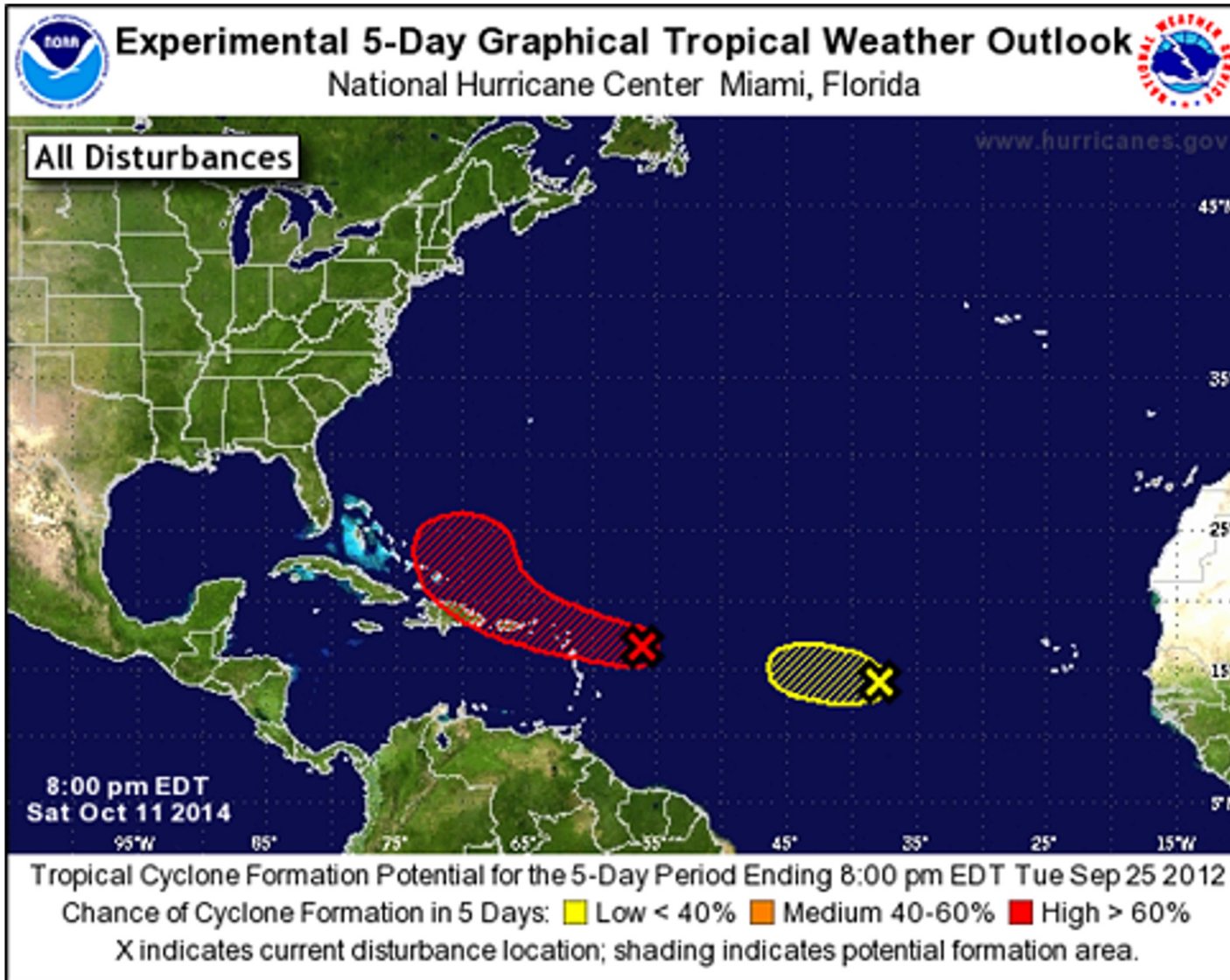
- SLOSH MEOWs/MOMs
- Rainfall forecasts
  - QPF
  - ERO
- Hydrographs
- Flash Flood Warnings/Emergencies
- Flood Warnings (Mainstem)

## **Tropical Weather Outlook (TWO) addresses:**

- What's going on in the tropics?
- Any potential for development?
- Should we be concerned?

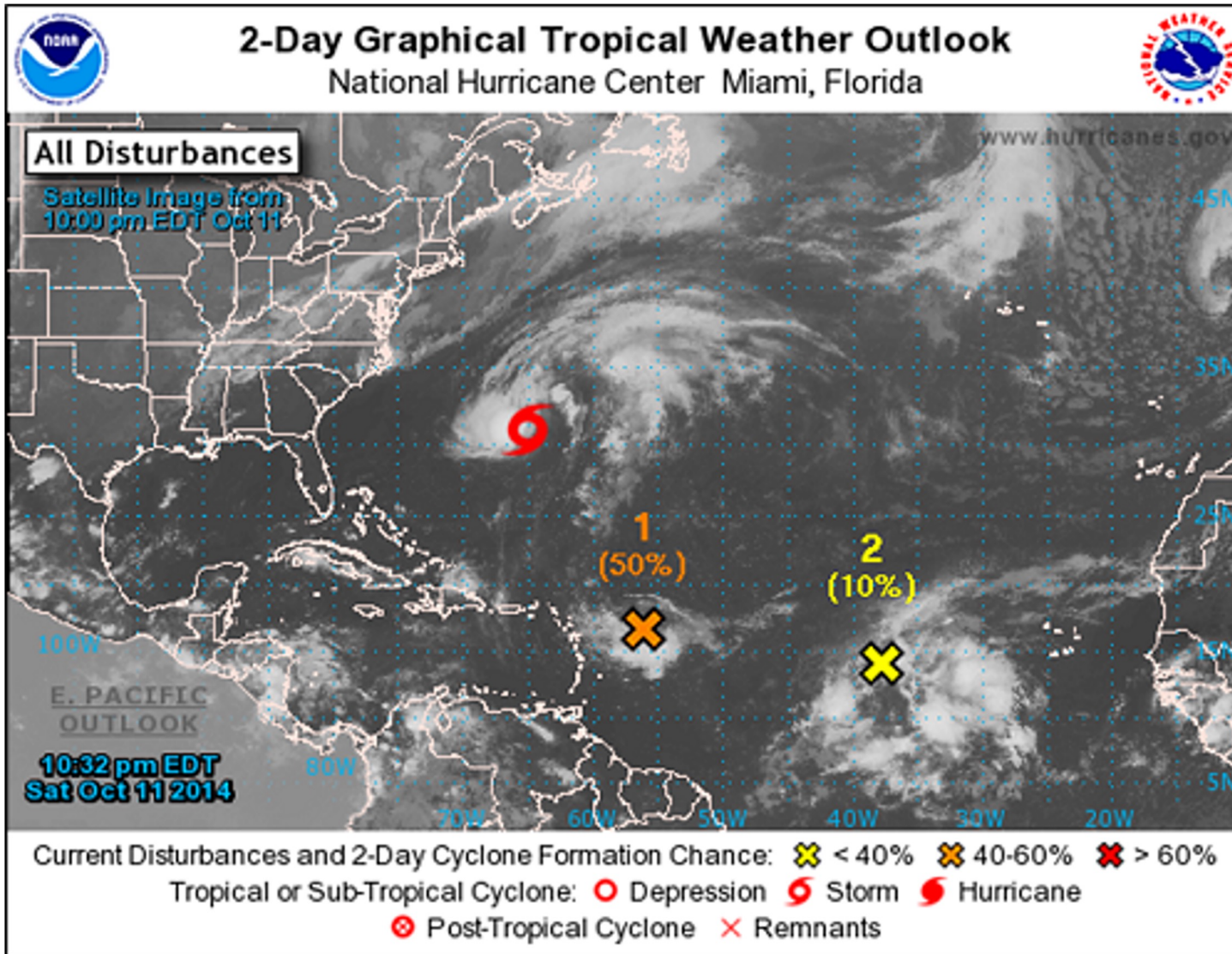


# 5-Day TC Formation Potential



- Shows initial location of two disturbances (X), if existing
- Shading represents the potential formation area within next 5 days
- What's the chance these areas form in the next 5 days?

# 2-Day TC Formation Potential





- Identifies the current location of disturbed weather (discussed in the Tropical Weather Outlook)
- Formation chance during the next 48 hours:
  - Categories (Low, Medium, or High)
  - Probabilities



# Assessment of Tropical Activity



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

TROPICAL WEATHER OUTLOOK  
NWS NATIONAL HURRICANE CENTER MIAMI FL  
800 PM EDT MON OCT 20 2014

For the North Atlantic...Caribbean Sea and the Gulf of Mexico:

Showers and thunderstorms associated with an area of low pressure located over the southwestern Bay of Campeche have changed little in organization since this afternoon. This system has the potential to become a tropical cyclone during the next couple of days while it moves slowly eastward across the southern Bay of Campeche. Later in the week, the low is forecast to interact and possibly merge with a frontal system over the southeastern Gulf of Mexico or northwestern Caribbean Sea. An Air Force Reserve reconnaissance aircraft is scheduled to investigate the disturbance tomorrow afternoon, if necessary. Interests in the Yucatan Peninsula should monitor the progress of this system.

- \* Formation chance through 48 hours...medium...50 percent.
- Formation chance through 5 days...medium...60 percent.


Forecaster Brown



**Potential for development?  
Headed where?**

# Potential for Aerial Surveillance



 **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

TROPICAL WEATHER OUTLOOK  
NWS NATIONAL HURRICANE CENTER MIAMI FL  
800 PM EDT MON OCT 20 2014

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- Formation chance through 5 days...medium...60 percent.



Forecaster Brown

 Sending a plane?



# Special Tropical Weather Outlook



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

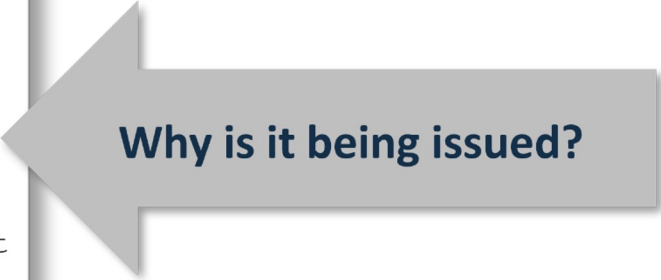
SPECIAL TROPICAL WEATHER OUTLOOK  
NWS NATIONAL HURRICANE CENTER MIAMI FL  
430 PM EDT MON JUN 30 2014

Special outlook issued to update discussion of the area of low pressure east of Florida.

Updated: An Air Force Reserve unit reconnaissance aircraft is investigating the area of low pressure centered about 110 miles east of Melbourne, Florida. While the low is well defined, the associated thunderstorm activity is just below the organizational threshold required to initiate tropical cyclone advisories. Environmental conditions continue to be favorable for development, and only a slight increase in the organization and persistence of the thunderstorm activity would result in the formation of a tropical depression.

Data from the reconnaissance aircraft indicate that peak sustained winds with the low are about 30-35 mph. The low is moving southwestward at around 5 mph, but is expected to turn westward tonight and northward by Wednesday when it will be near the east coast of Florida. If this system becomes a tropical cyclone, a tropical storm watch could be required for portions of the central or northern Atlantic coast of Florida. A turn toward the northeast near the southeastern U.S. coast is expected by Thursday.



- \* Formation chance through 48 hours...high...80 percent.
- \* Formation chance through 5 days...high...80 percent.



# Reports from Hurricane Hunter Flights



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  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

SPECIAL TROPICAL WEATHER OUTLOOK  
NWS NATIONAL HURRICANE CENTER MIAMI FL  
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- \* Formation chance through 5 days...high...80 percent.



# Possibility of Watch/Warning



 **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

SPECIAL TROPICAL WEATHER OUTLOOK  
NWS NATIONAL HURRICANE CENTER MIAMI FL  
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- \* Formation chance through 48 hours...high...80 percent.
- \* Formation chance through 5 days...high...80 percent.



**Watches possible?**

# Tropical Weather Outlook Schedule



## **Tropical Weather Outlook** schedule:

- 2 am – Tropical Weather Outlook
- 8 am – Tropical Weather Outlook
- 2 pm – Tropical Weather Outlook
- 8 pm – Tropical Weather Outlook

A ***Special Tropical Outlook*** can be issued at any time for significant or unexpected changes.

## **Public Advisory addresses:**

- How strong is the storm?
- What are the hazards?
- Are there any warnings?
- When is new information available?
- When is a good time for a conference call?

# Public Advisory – Issued for...



## **Public Advisories issued for:**

### **Tropical Cyclones**

- Tropical Depressions
- Tropical Storms (TS)
- Hurricanes

### **Post-Tropical Cyclones**

- Remains a threat to land  
(e.g., Sandy & Hermine)



### **Potential Tropical Cyclones**

- Systems not yet a tropical cyclone
- Threat of TS-force winds to land within 48 hours. (Introduced in 2017)



# Public Advisory - Example



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Tropical Storm Michael Advisory Number 7  
NWS National Hurricane Center Miami FL AL142018  
400 AM CDT Mon Oct 08 2018

...MICHAEL ALMOST A HURRICANE...  
...HURRICANE WATCH ISSUED FOR THE FLORIDA PANHANDLE AND BIG BEND...

SUMMARY OF 400 AM CDT...0900 UTC...INFORMATION  
-----

LOCATION...20.6N 85.5W  
ABOUT 90 MI...145 KM E OF COZUMEL MEXICO  
ABOUT 100 MI...155 KM SSW OF THE WESTERN TIP OF CUBA  
MAXIMUM SUSTAINED WINDS...70 MPH...110 KM/H  
PRESENT MOVEMENT...N OR 360 DEGREES AT 7 MPH...11 KM/H  
MINIMUM CENTRAL PRESSURE...983 MB...29.03 INCHES

WATCHES AND WARNINGS  
-----

A Storm Surge Watch is in effect for...  
\* Navarre Florida to Anna Maria Island Florida, including Tampa Bay



A Hurricane Watch is in effect for...  
\* Alabama-Florida border to Suwanee River Florida

A Tropical Storm Watch is in effect for...  
\* Suwanee River to Anna Maria Island Florida, including Tampa Bay  
\* Alabama-Florida border to the Mississippi-Alabama border

- Plain-language text
- Originally intended as “rip and read”

# Public Advisory – Location



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Tropical Storm Michael Advisory Number 7  
NWS National Hurricane Center Miami FL AL142018  
400 AM CDT Mon Oct 08 2018

...MICHAEL ALMOST A HURRICANE...  
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A Tropical Storm Watch is in effect for...  
\* Suwanee River to Anna Maria Island Florida, including Tampa Bay  
\* Alabama-Florida border to the Mississippi-Alabama border





**Where is the storm located?**



# Public Advisory – Strength



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Tropical Storm Michael Advisory Number 7  
NWS National Hurricane Center Miami FL AL142018  
400 AM CDT Mon Oct 08 2018

...MICHAEL ALMOST A HURRICANE...  
...HURRICANE WATCH ISSUED FOR THE FLORIDA PANHANDLE AND BIG BEND...

SUMMARY OF 400 AM CDT...0900 UTC...INFORMATION  
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LOCATION...20.6N 85.5W  
ABOUT 90 MI...145 KM E OF COZUMEL MEXICO  
ABOUT 100 MI...155 KM SSW OF THE WESTERN TIP OF CUBA  
**MAXIMUM SUSTAINED WINDS...70 MPH...110 KM/H**  
PRESENT MOVEMENT...N OR 360 DEGREES AT 7 MPH...11 KM/H  
MINIMUM CENTRAL PRESSURE...983 MB...29.03 INCHES

WATCHES AND WARNINGS  
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A Storm Surge Watch is in effect for...  
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A Hurricane Watch is in effect for...  
\* Alabama-Florida border to Suwanee River Florida



A Tropical Storm Watch is in effect for...  
\* Suwanee River to Anna Maria Island Florida, including Tampa Bay  
\* Alabama-Florida border to the Mississippi-Alabama border



How strong is the storm?

# Public Advisory – Watches/Warnings



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Tropical Storm Michael Advisory Number 7  
NWS National Hurricane Center Miami FL AL142018  
400 AM CDT Mon Oct 08 2018

...MICHAEL ALMOST A HURRICANE...  
...HURRICANE WATCH ISSUED FOR THE FLORIDA PANHANDLE AND BIG BEND...

SUMMARY OF 400 AM CDT...0900 UTC...INFORMATION  
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LOCATION...20.6N 85.5W  
ABOUT 90 MI...145 KM E OF COZUMEL MEXICO  
ABOUT 100 MI...155 KM SSW OF THE WESTERN TIP OF CUBA  
MAXIMUM SUSTAINED WINDS...70 MPH...110 KM/H  
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MINIMUM CENTRAL PRESSURE...983 MB...29.03 INCHES

WATCHES AND WARNINGS  
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# Public Advisory – Track Forecast



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

**DISCUSSION AND OUTLOOK**

-----

At 400 AM CDT (0900 UTC), the center of Tropical Storm Michael was located by an Air Force Reserve Hurricane Hunter aircraft near latitude 20.6 North, longitude 85.5 West. Michael is moving toward the north near 7 mph (11 km/h). A northward motion at a slightly faster forward speed is expected through Tuesday night, followed by a northeastward motion on Wednesday and Thursday. On the forecast track, the center of Michael will move northward across the Yucatan Channel later today, and then across the eastern Gulf of Mexico this evening through Wednesday. Michael is expected to move inland over the Florida Panhandle or Florida Big Bend area on Wednesday, and then move northeastward across the southeastern United States Wednesday night and Thursday.

Data from the Hurricane Hunter aircraft indicate that maximum sustained winds have increased to near 70 mph (110 km/h) with higher gusts. Additional strengthening is forecast, and Michael is expected to become a hurricane later today. Michael is forecast to be near or at major hurricane strength when it reaches the northeastern Gulf of Mexico Tuesday night and Wednesday.

Tropical-storm-force winds extend outward up to 175 miles (280 km) from the center.

The minimum central pressure based on aircraft data is 983 mb (29.03 inches).



# Public Advisory – Wind Intensity Forecast



FEMA



## DISCUSSION AND OUTLOOK

At 400 AM CDT (0900 UTC), the center of Tropical Storm Michael was located by an Air Force Reserve Hurricane Hunter aircraft near latitude 20.6 North, longitude 85.5 West. Michael is moving toward the north near 7 mph (11 km/h). A northward motion at a slightly faster forward speed is expected through Tuesday night, followed by a northeastward motion on Wednesday and Thursday. On the forecast track, the center of Michael will move northward across the Yucatan Channel later today, and then across the eastern Gulf of Mexico this evening through Wednesday. Michael is expected to move inland over the Florida Panhandle or Florida Big Bend area on Wednesday, and then move northeastward across the southeastern United States Wednesday night and Thursday.

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Tropical-storm-force winds extend outward up to 175 miles (280 km) from the center.

The minimum central pressure based on aircraft data is 983 mb (29.03 inches).



Covers a 3-day period

Forecast to  
weaken?  
Strengthen?



# Public Advisory – Surge Forecast



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HAZARDS AFFECTING LAND  
-----

**STORM SURGE:** The combination of a dangerous storm surge and the tide will cause normally dry areas near the coast to be flooded by rising waters moving inland from the shoreline. The water has the potential to reach the following heights above ground if peak surge occurs at the time of high tide...

Indian Pass to Crystal River...7-11 ft  
Crystal River to Anclote River...4-6 ft  
Okaloosa/Walton County Line to Indian Pass...4-7 ft  
Anclote River to Anna Maria Island including Tampa Bay...2-4 ft  
Navarre to Okaloosa/Walton County Line...2-4 ft

**WIND:** Hurricane conditions are expected across the far western part of the Cuban province of Pinar del Rio later today. Tropical storm conditions are expected across the remainder of the warning areas in Cuba and the Yucatan Peninsula later today.



Hurricane conditions are possible within the hurricane watch area along the U.S. Gulf coast by Wednesday, with tropical storm conditions possible by Tuesday night or early Wednesday. Tropical storm conditions are possible within the tropical storm watch area by Tuesday night or early Wednesday.



How much storm surge is forecast?

# Public Advisory – Rain Forecast



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HAZARDS AFFECTING LAND  
-----

**WIND:** Hurricane conditions are expected across the far western part of the Cuban province of Pinar del Rio later today. Tropical storm conditions are expected across the remainder of the warning areas in Cuba and the Yucatan Peninsula later today.

Hurricane conditions are possible within the hurricane watch area along the U.S. Gulf coast by Wednesday, with tropical storm conditions possible by Tuesday night or early Wednesday. Tropical storm conditions are possible within the tropical storm watch area by Tuesday night or early Wednesday.

**RAINFALL:** Michael is expected to produce the following rainfall amounts through Wednesday night...

Florida Panhandle and Big Bend into southern Georgia...4 to 8 inches, with isolated maximum amounts of 12 inches. This rainfall may lead to life threatening flash floods.

Florida Keys...2 to 4 inches.



Yucatan Peninsula...1 to 2 inches.



**How much rain is forecast?**

# Intermediate Public Advisory



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Tropical Storm Michael Intermediate Advisory Number 7A  
NWS National Hurricane Center Miami FL AL142018  
700 AM CDT Mon Oct 08 2018

...MICHAEL EXPECTED TO BECOME A HURRICANE VERY SOON...

SUMMARY OF 700 AM CDT...1200 UTC...INFORMATION  
-----

LOCATION...20.9N 85.1W  
ABOUT 70 MI...115 KM S OF THE WESTERN TIP OF CUBA  
MAXIMUM SUSTAINED WINDS...70 MPH...110 KM/H  
PRESENT MOVEMENT...N OR 5 DEGREES AT 7 MPH...11 KM/H  
MINIMUM CENTRAL PRESSURE...982 MB...29.00 INCHES

WATCHES AND WARNINGS  
-----

SUMMARY OF WATCHES AND WARNINGS IN EFFECT:  
A Storm Surge Watch is in effect for...  
\* Navarre Florida to Anna Maria Island Florida, including Tampa Bay

A Hurricane Watch is in effect for...  
\* Alabama-Florida border to Suwannee River Florida


A Tropical Storm Watch is in effect for...  
\* Suwannee River to Anna Maria Island Florida, including Tampa Bay  
\* Alabama-Florida border to the Mississippi-Alabama border

**Similar content but issued  
3 hours after complete  
advisory package**

**✓ Watch or Warning in effect**

# Tropical Cyclone Update



 **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Hurricane Michael Tropical Cyclone Update  
NWS National Hurricane Center Miami FL AL142018  
1200 PM CDT Wed Oct 10 2018

...EYEWALL OF MICHAEL COMING ASHORE...

With the landfall of Michael's eye imminent, everyone in the landfall area is reminded not to venture out into the relative calm of the eye, hazardous winds will increase quickly as the eye passes!

A weather station at the Gulf County Emergency Operations Center in Port St. Joe recently reported a wind gust of 106 mph (171 km/h). A Weatherflow station in St. Andrew Bay recently reported a sustained wind of 62 mph (100 km/h) and a wind gust of 77 mph (124 km/h). The Apalachicola airport recently reported sustained winds of 63 mph (102 km/h) with a gust of 89 mph (143 km/h).

Water levels continue to rise quickly along the Florida Panhandle coast. A National Ocean Service water level station at Apalachicola recently reported over 6.5 feet of inundation above ground level.

SUMMARY OF 1200 PM CDT...1700 UTC...INFORMATION  
-----  
LOCATION...29.9N 85.7W  
ABOUT 15 MI...25 KM WSW OF MEXICO BEACH FLORIDA  
MAXIMUM SUSTAINED WINDS...150 MPH...240 KM/H  
PRESENT MOVEMENT...NNE OR 15 DEGREES AT 14 MPH...22 KM/H  
MINIMUM CENTRAL PRESSURE...919 MB...27.14 INCHES

\$\$  
Forecaster Brown/Brennan

NNNN

• Unexpected changes occur in the cyclone

• Cyclone landfall

• Issuing international watches and warnings

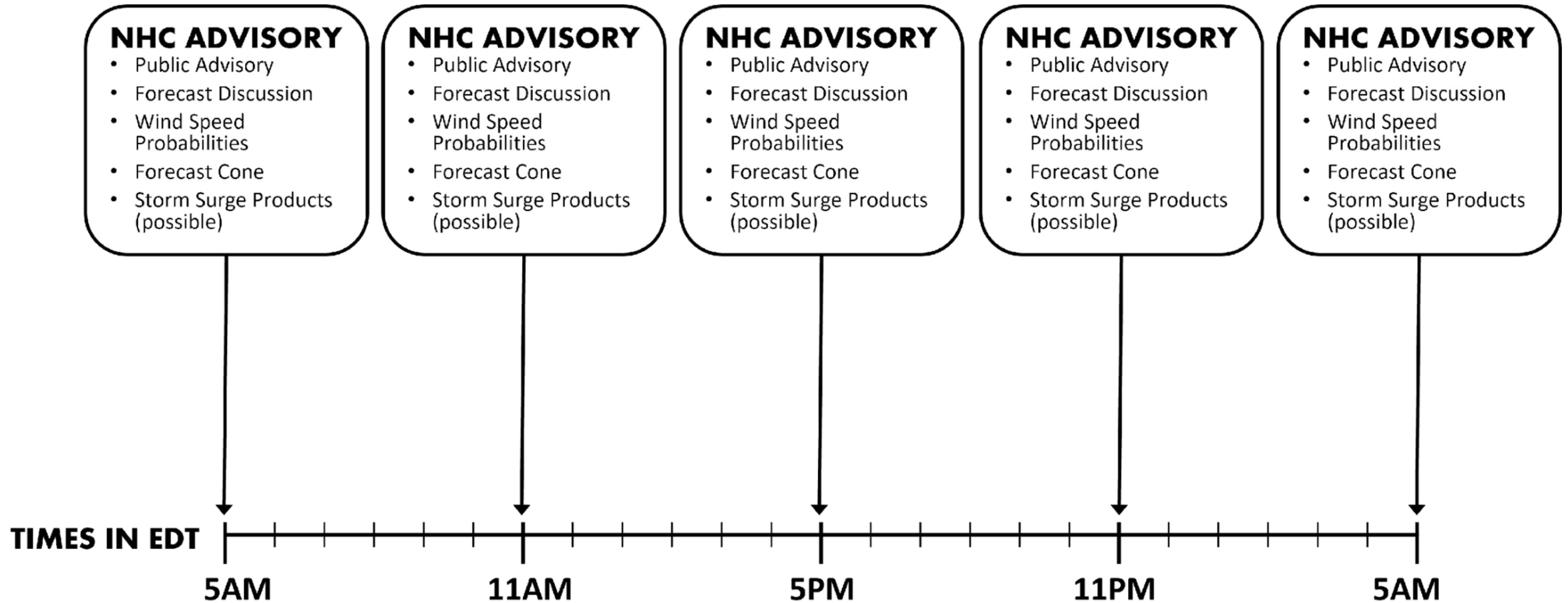
• 1-hourly position estimates when a cyclone with an eye is nearing land



# Scheduled Updates



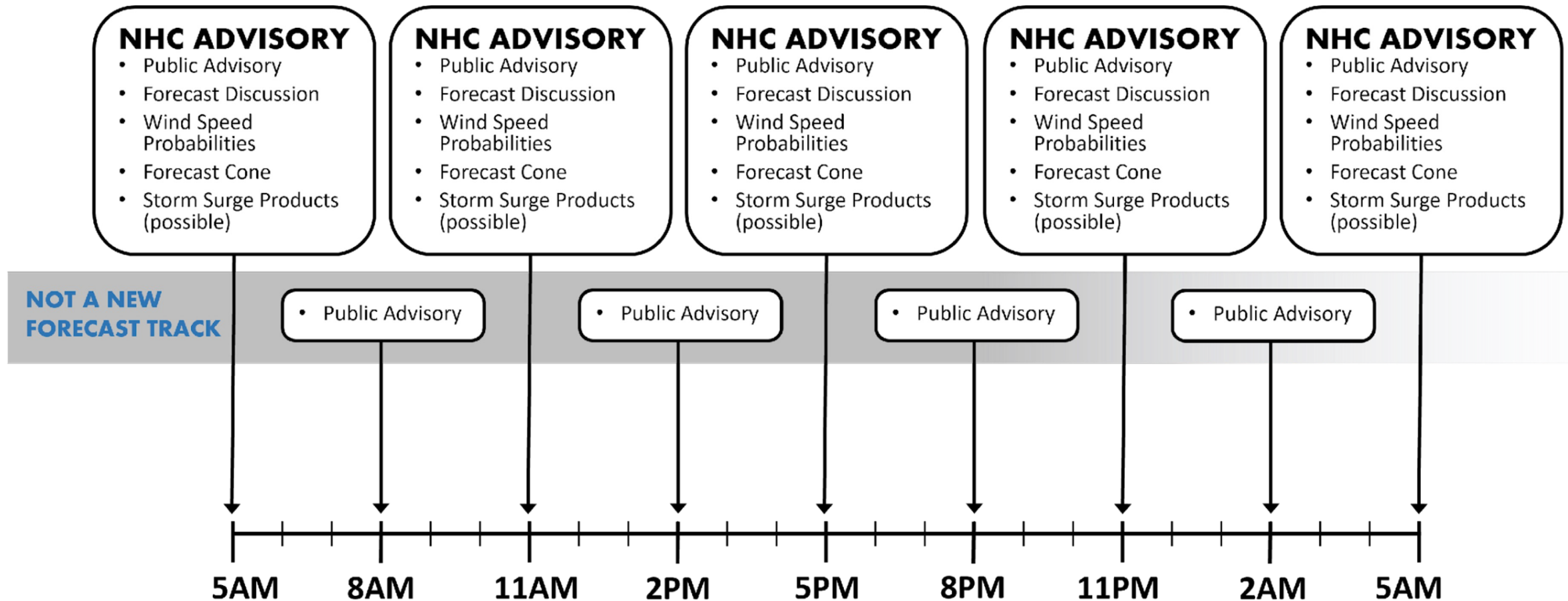
## No Watches/Warnings



# Scheduled Updates – W/W



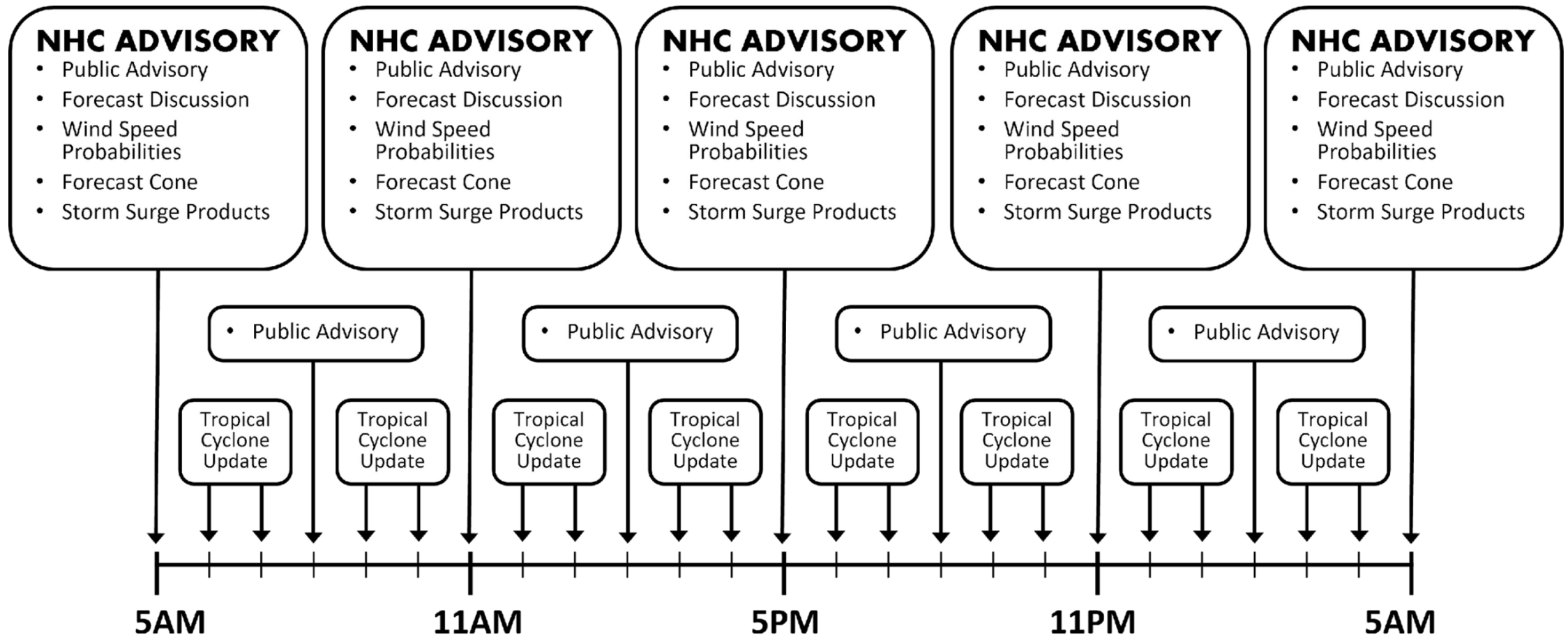
## Watches/Warnings in effect



# Scheduled Updates – Eye Tracked



## Watches/Warnings in effect and eye tracked by radar





## **Forecast Discussion addresses:**

- How confident are the forecasters?
- Key messages?

# Reasoning? Confidence? Scenarios?



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Tropical Storm Michael Discussion Number 7  
NWS National Hurricane Center Miami FL AL142018  
400 AM CDT Mon Oct 08 2018

An Air Force Reserve Hurricane Hunter aircraft made several passes through the system and found that the central pressure has fallen to about 983 mb and maximum winds have increased to near 60 kt. This increase in intensity indicates that despite the shear, Michael has by definition rapidly intensified during the past 24 hours. Decreasing vertical shear and very warm sea surface temperatures are expected to support continued strengthening, and due to the favorable conditions, the NHC intensity forecast follows a blend of the IVCN consensus and the HCCA model. This new official forecast brings the intensity to just below major hurricane strength in 48 hours, and since the storm will still be over water for a time between 48 and 72 hours, there is a real possibility that Michael will strengthen to a major hurricane before landfall.



Nearly all of the track models have shifted westward after 24 hours, which left the previous forecast near the eastern edge of the guidance envelope. Due to this shift, the new NHC track forecast has also been adjusted westward close to the consensus aids. Overall the track guidance is in fairly good agreement up until landfall along the Florida Panhandle or Florida Big Bend, which has yielded a fairly confident track forecast.

- Forecast reasoning
- Relevant Observations
- Model Guidance
- Forecast Uncertainties



# Key Messages



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

**Key Messages:**

1. Hurricane conditions are expected over portions of western Cuba, where a hurricane warning is now in effect. Tropical storm conditions are expected over the northeastern Yucatan Peninsula and the Isle of Youth today.
2. Michael is expected to produce heavy rainfall and flash flooding over portions of western Cuba and the northeastern Yucatan Peninsula of Mexico during the next couple of days.
3. Michael is forecast to be a hurricane, and possibly a major hurricane, when it reaches the northeastern Gulf Coast by mid-week, and storm surge and hurricane watches are now in effect for portions of the area. Some areas along the Florida Gulf Coast are especially vulnerable to storm surge, regardless of the storm's exact track or intensity. Residents in the watch areas should monitor the progress of this system and follow any advice given by local officials.

## Key Messages

- Forecast Confidence
- Highlight Threats

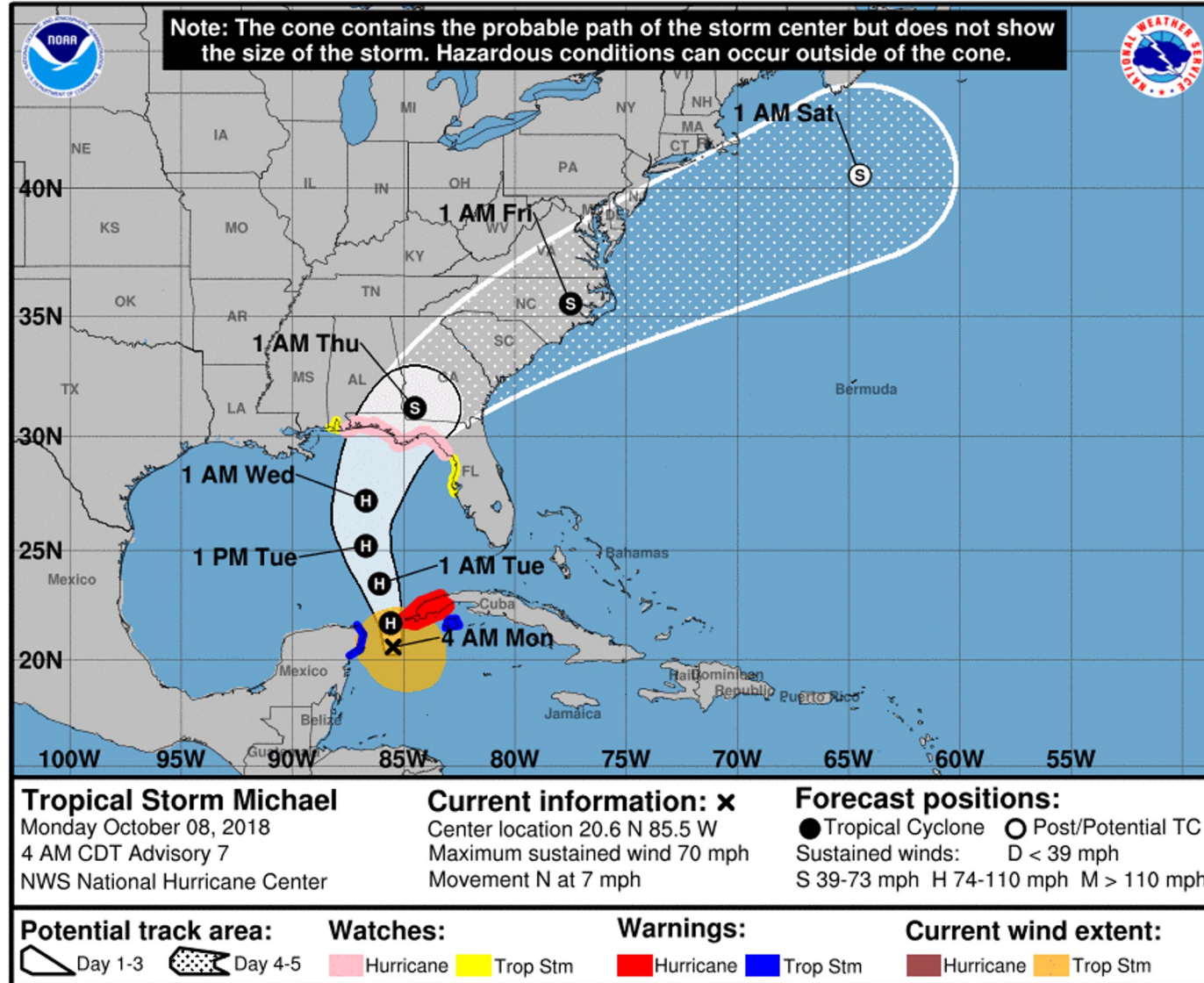
## **Forecast Error Cone addresses:**

- What is the official NHC-issued forecast storm track?
- How can I see this in non-text format?

# Forecast Error Cone



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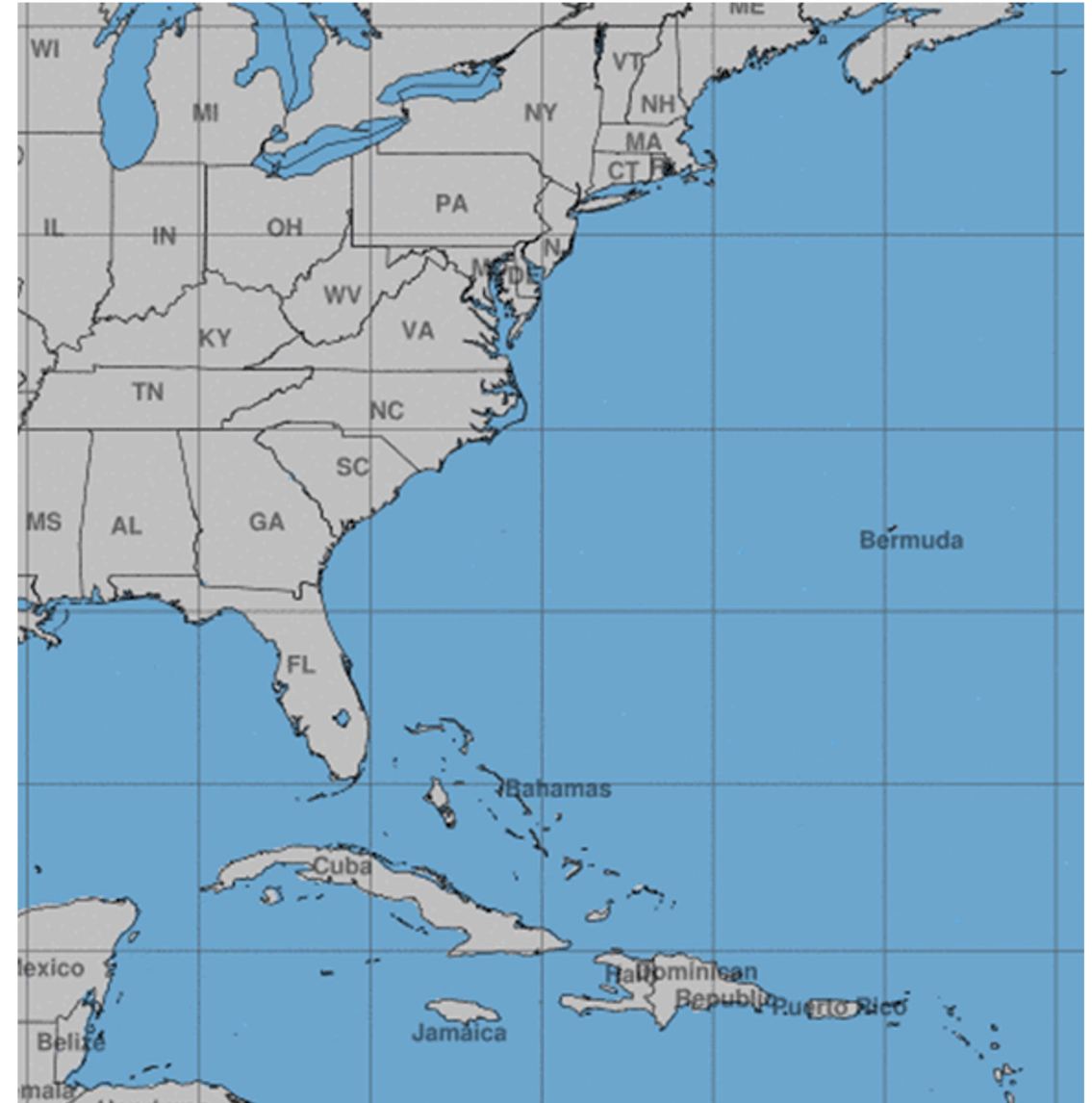
# Cure For The Skinny Black Line?



FEMA

## ERROR CONE

- Probable track of the center of the tropical cyclone
- Formed by connecting circles centered on each forecast point
- Each circle uses NHC historical (5-year) track errors
  - Actual storm position will be within the circle 67% of the time



# Not In The Cone: No Worries?



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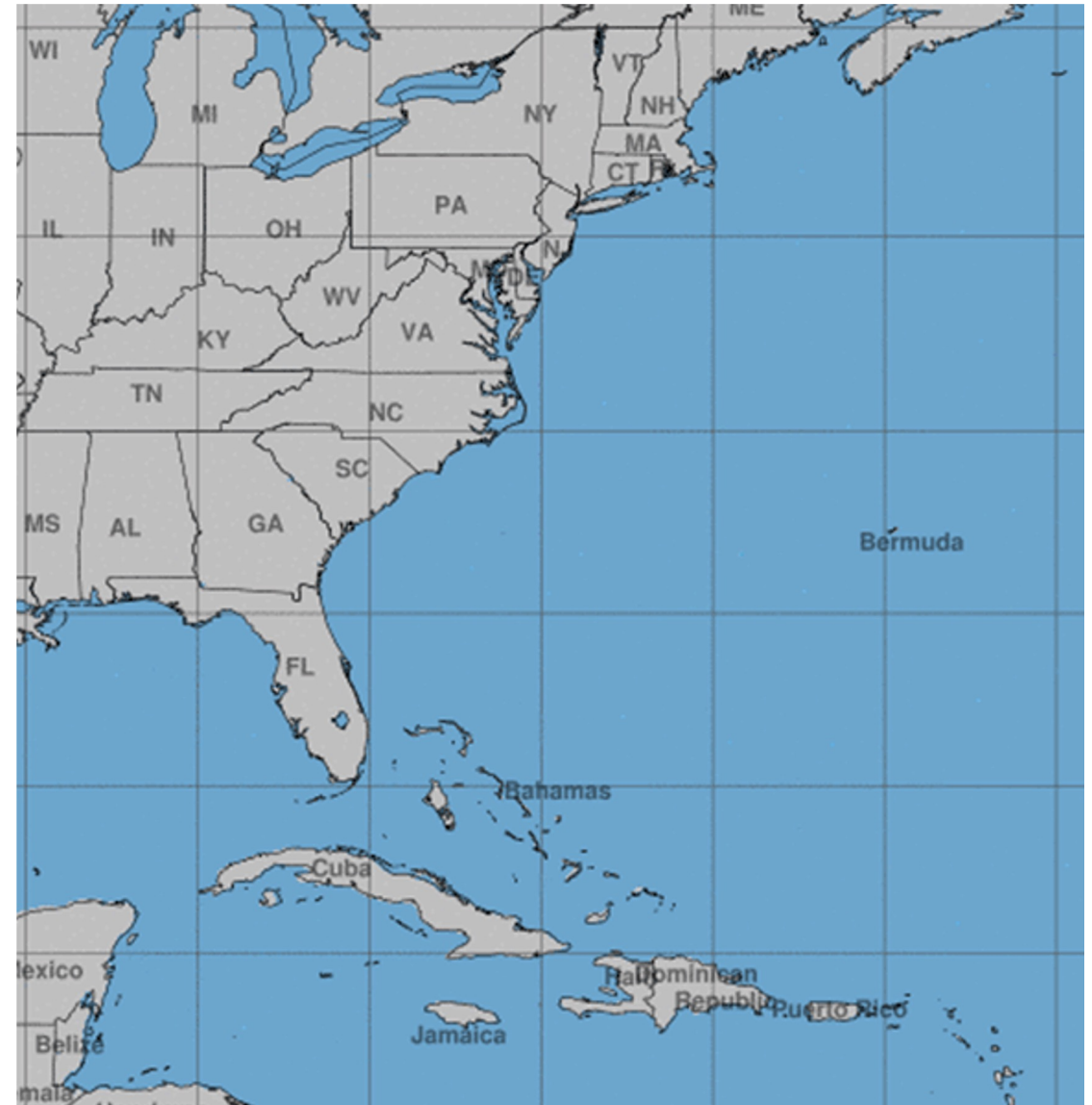
## ERROR CONE

Only displays information about track uncertainty

- Nothing about specific impacts

Impacts can occur well outside the area enclosed by the cone

- Center is expected to be outside the cone about 1/3 of the time



## **Wind Speed Probabilities address:**

- Chance for some effects?
- How can I better see forecast wind impacts?
- Are staging areas at risk?

# 5-Day Cumulative Graphic: TS-Force

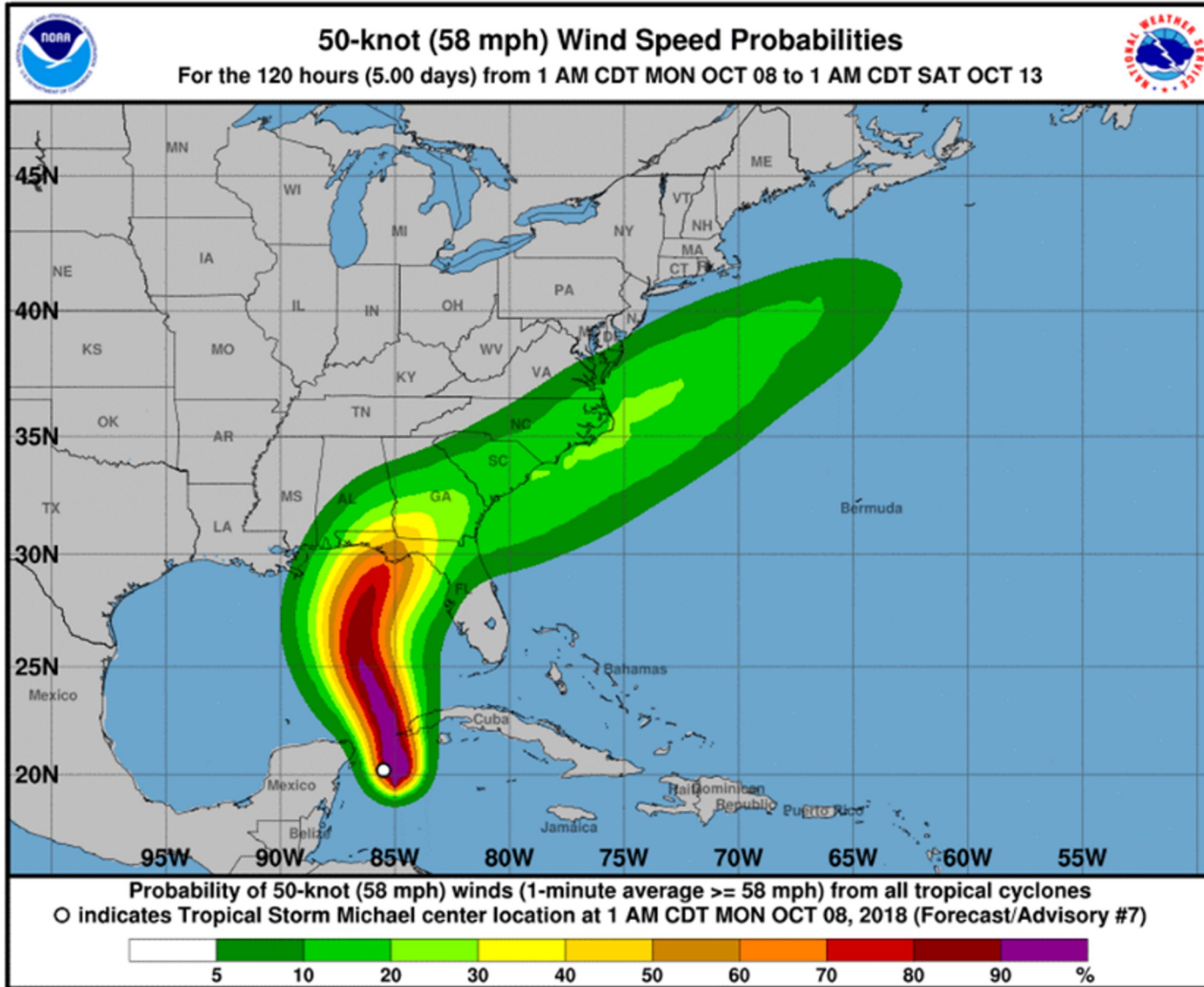


Location-specific Probabilities

- **Tropical Storm-Force**
- 58 mph (“Strong” Tropical Storm)
- Hurricane-Force



# 5-Day Cumulative Graphic: 'Strong' TS-Force



Location-specific  
Probabilities

- **Tropical Storm-Force**
- 58 mph ("Strong" Tropical Storm)
- Hurricane-Force

# 5-Day Cumulative Graphic: Hurricane-Force



## Location-specific Probabilities

- **Tropical Storm-Force**
- 58 mph (“Strong” Tropical Storm)
- Hurricane-Force

## **Arrival Times address:**

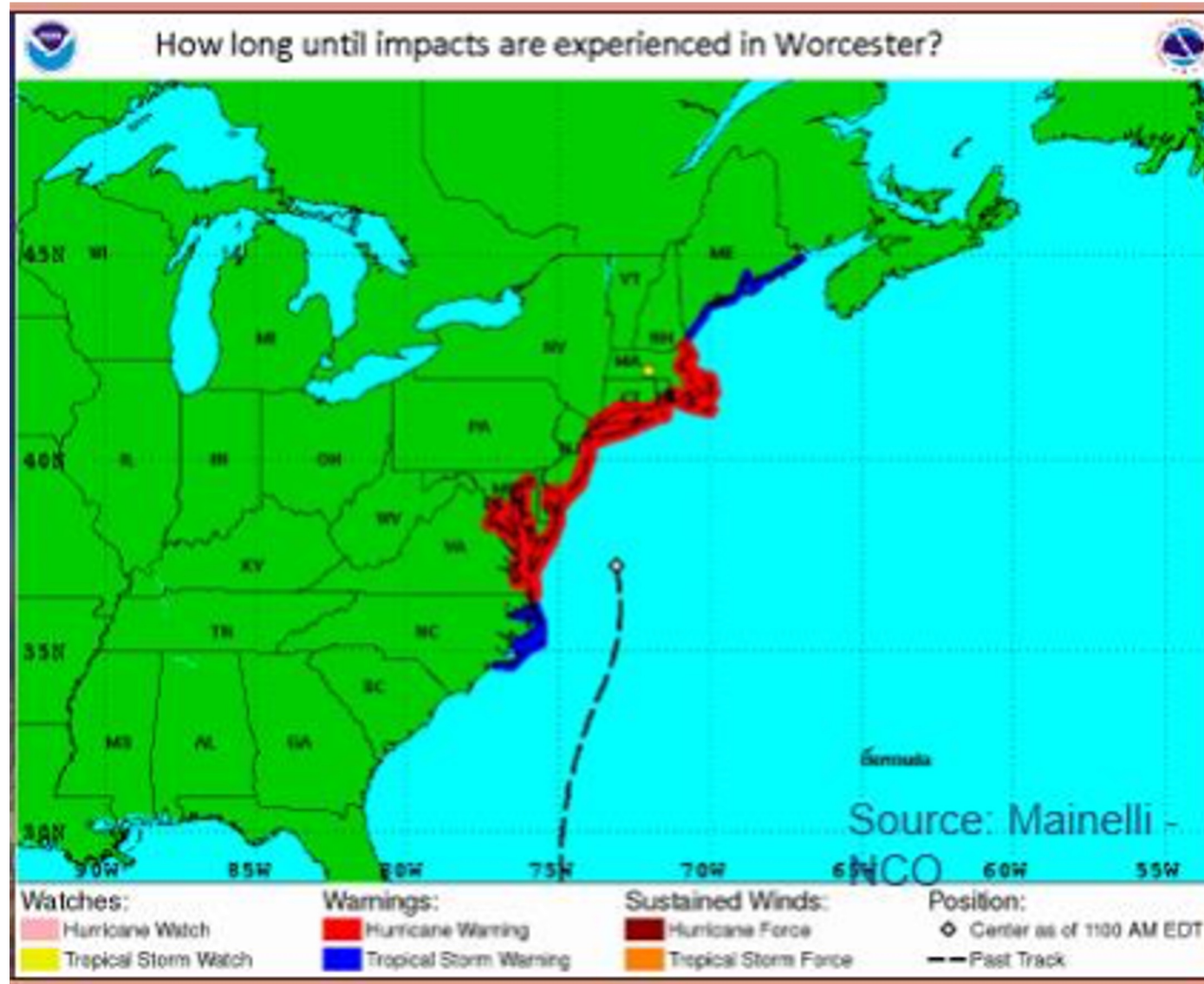
- When is the earliest TS winds could begin?



# 1938 Hurricane Demonstration



FEMA

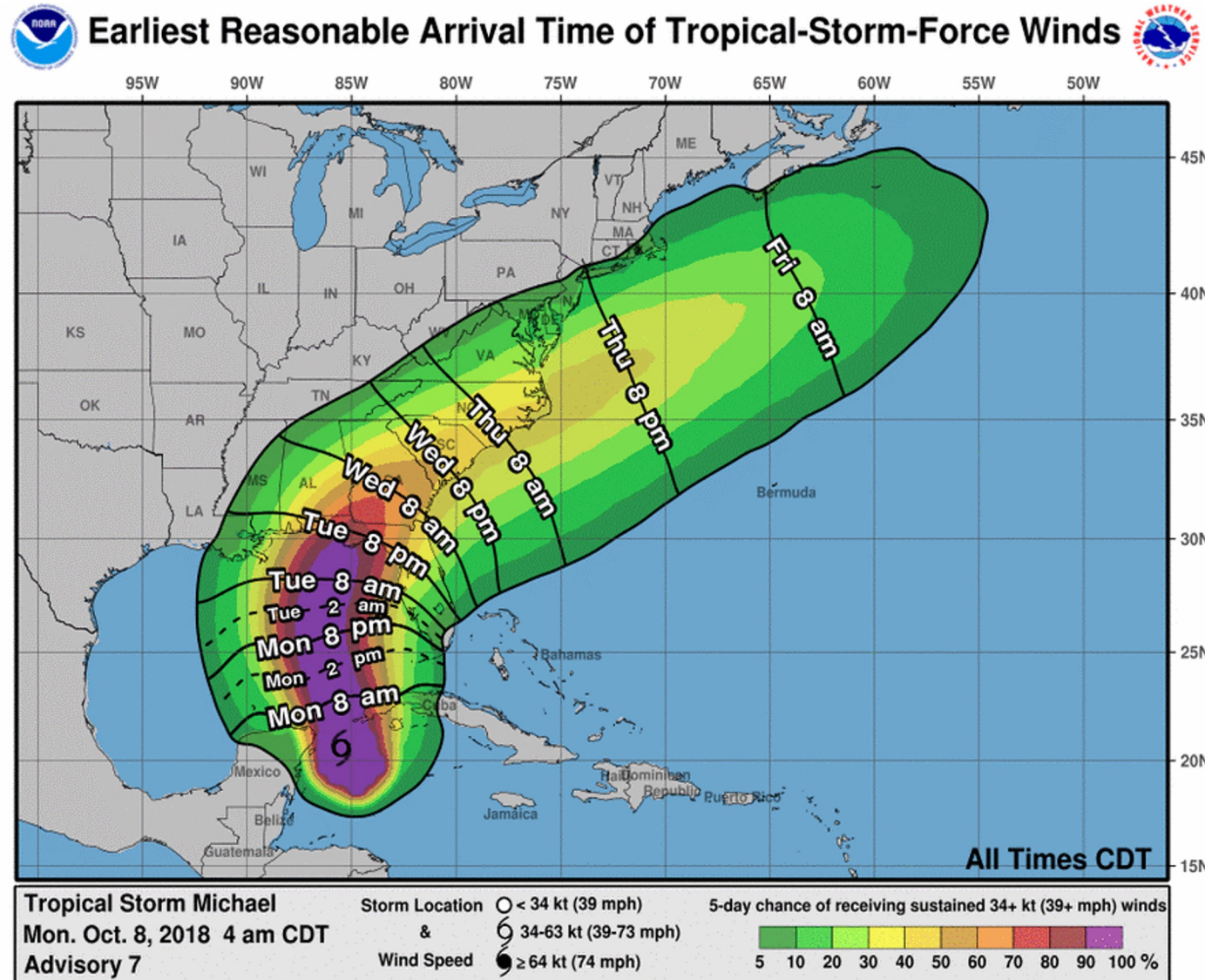


# Earliest Reasonable Onset of TS Winds



## Earliest Reasonable

- 10% chance of onset (Most conservative timing)
- Black Contours: Arrival time of TS winds
- Color fill: 5-day cumulative TS probabilities

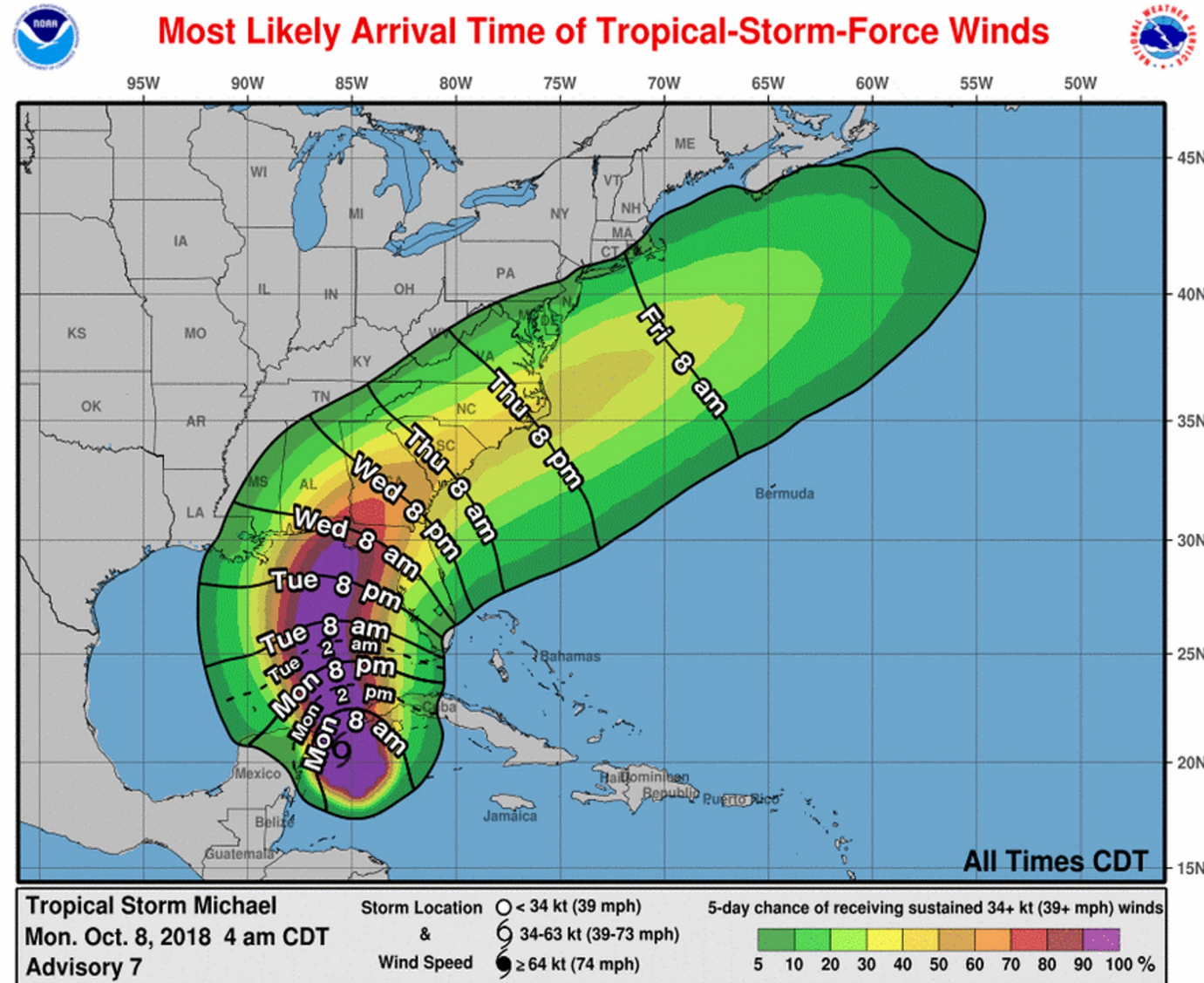




# Most Likely Onset of TS Winds

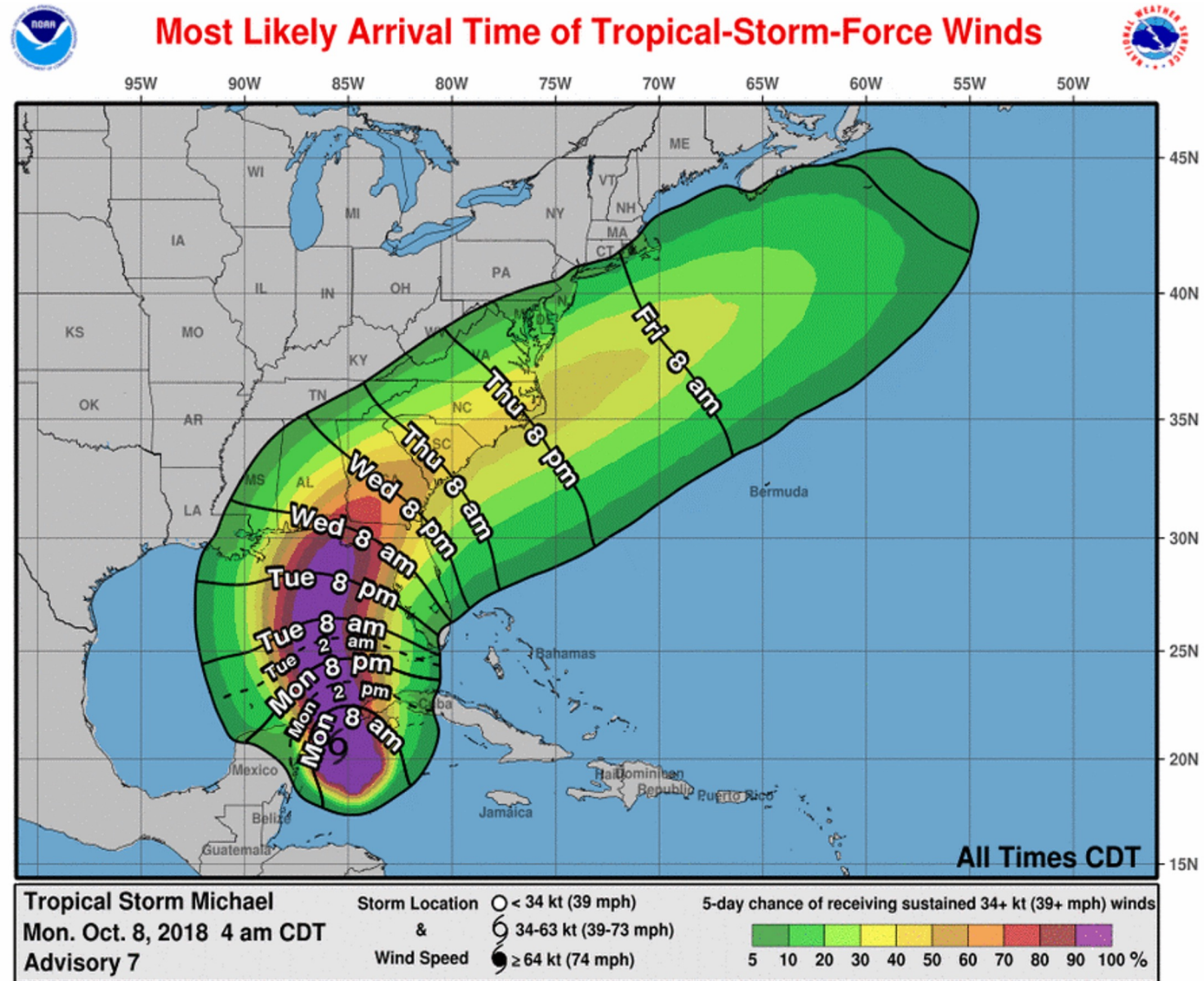
## Most Likely

- 50% chance of onset (Equally likely to occur before as after)
- Black Contours: Arrival time of TS winds
- Color fill: 5-day cumulative TS probabilities



# Timing Uncertainty

- Earliest Reasonable
  - 10% chance of onset
  - Most conservative timing
  - Tuesday 8pm
- Most Likely
  - 50% chance of onset
  - Equally likely before as after
  - Wednesday 8am
- **Range of wind arrival: 12 h**
- Tue 8pm – Wed 8am



## **Wind Watches and Warnings address:**

- Where is the greatest concern?
- When will hurricane hazards begin?



# Hurricane Watches/Warnings



The lead time for tropical storm and hurricane watches and warnings are tied to the anticipated arrival time of tropical-storm-force winds

## Hurricane Watch

- Hurricane conditions are **possible** within the watch area, generally **within 48 hours**

## Hurricane Warning

- Hurricane conditions are **expected** within the warning area, generally **within 36 hours**



# Tropical Storm vs. High Wind Watches/Warnings



## • Tropical Storm

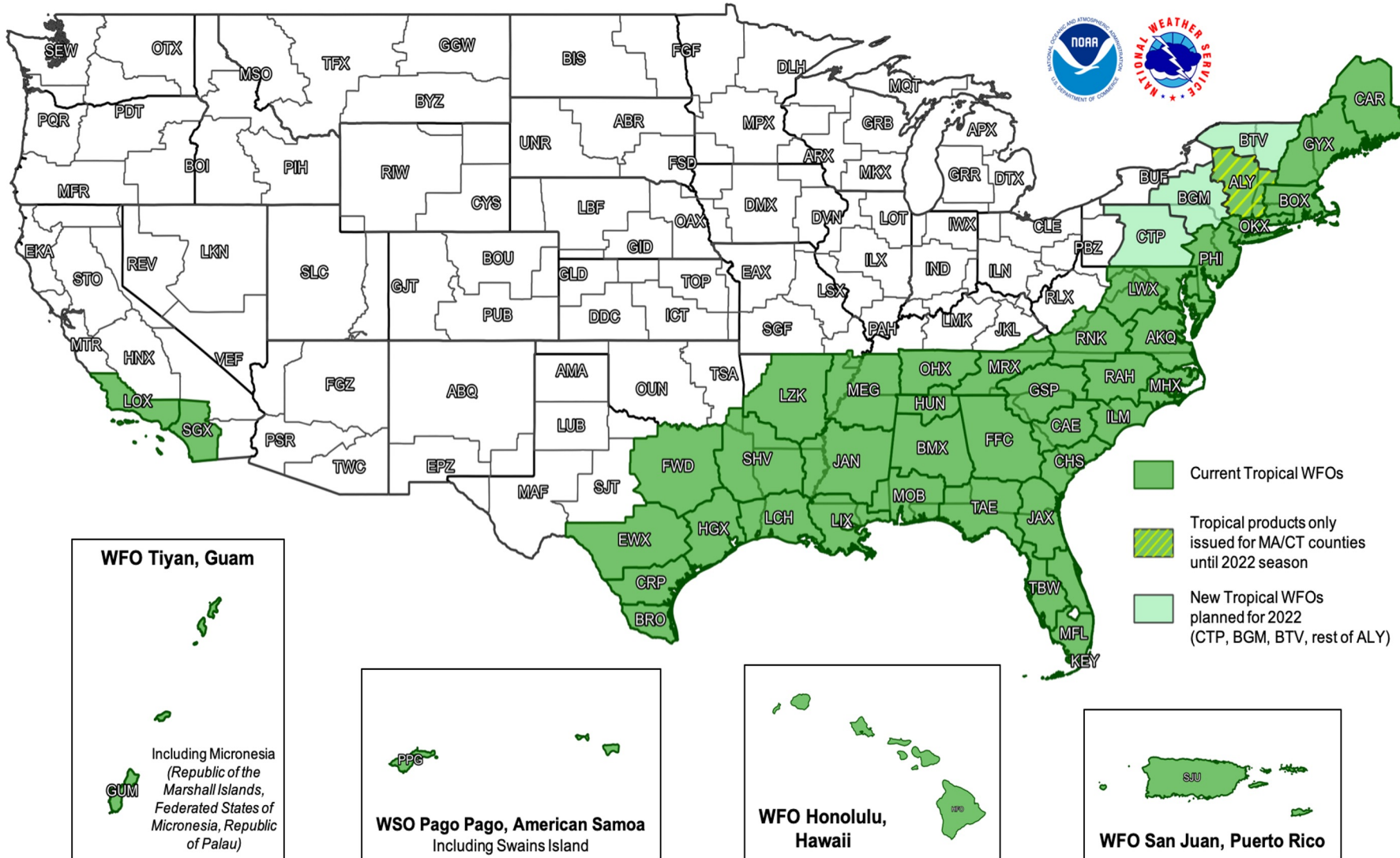
### Watches/Warnings

- Issued for tropical storm-strength wind speeds (sustained winds of 39 to 74 mph).
- Watches issued when tropical storm winds **possible** within **36 to 48 hours**.
- Warnings issued when tropical storm winds are **expected** within **36 hours**.
- **Will be issued for inland counties covered by WFOs designated to issue Tropical Cyclone Products (based on historical return periods for tropical storm winds)**

## • High Wind Watches/Warnings

- Issued for wind speeds that meet or exceed locally defined warning criteria (typically sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration)
- Watches issued when high winds are **possible** within **12 to 48 hours**.
- Warnings issued when high winds are **expected** within **12 hours**.
- **Will be issued for inland counties covered by WFOs that are not designated as “tropical”**

# Which NWS Offices Will Issue Tropical Storm vs High Wind Watches/Warnings?



Green/Teal = you will receive Tropical Storm or Hurricane Watches/Warnings for inland wind hazards.

White = you will receive High Wind Watches/Warnings for inland wind hazards.

# Tornado Watches & Warnings



## **Tornado WATCH**

- Conditions are favorable for severe thunderstorms and tornadoes. It does not mean tornadoes will occur, but they are possible.

## **Tornado WARNING**

- A tornado has been spotted or indicated by weather radar, meaning a tornado is occurring or expected soon.

## **Tornado EMERGENCY**

- A special type of Tornado Warning issued for exceedingly rare situations when a severe threat to human life and catastrophic damage due to a confirmed violent tornado is imminent or occurring.

## **Storm Surge Products address:**

- Where might storm surge occur?
- What are the possible impacts of storm surge?



# SLOSH MOMs and MEOWs - MOMs



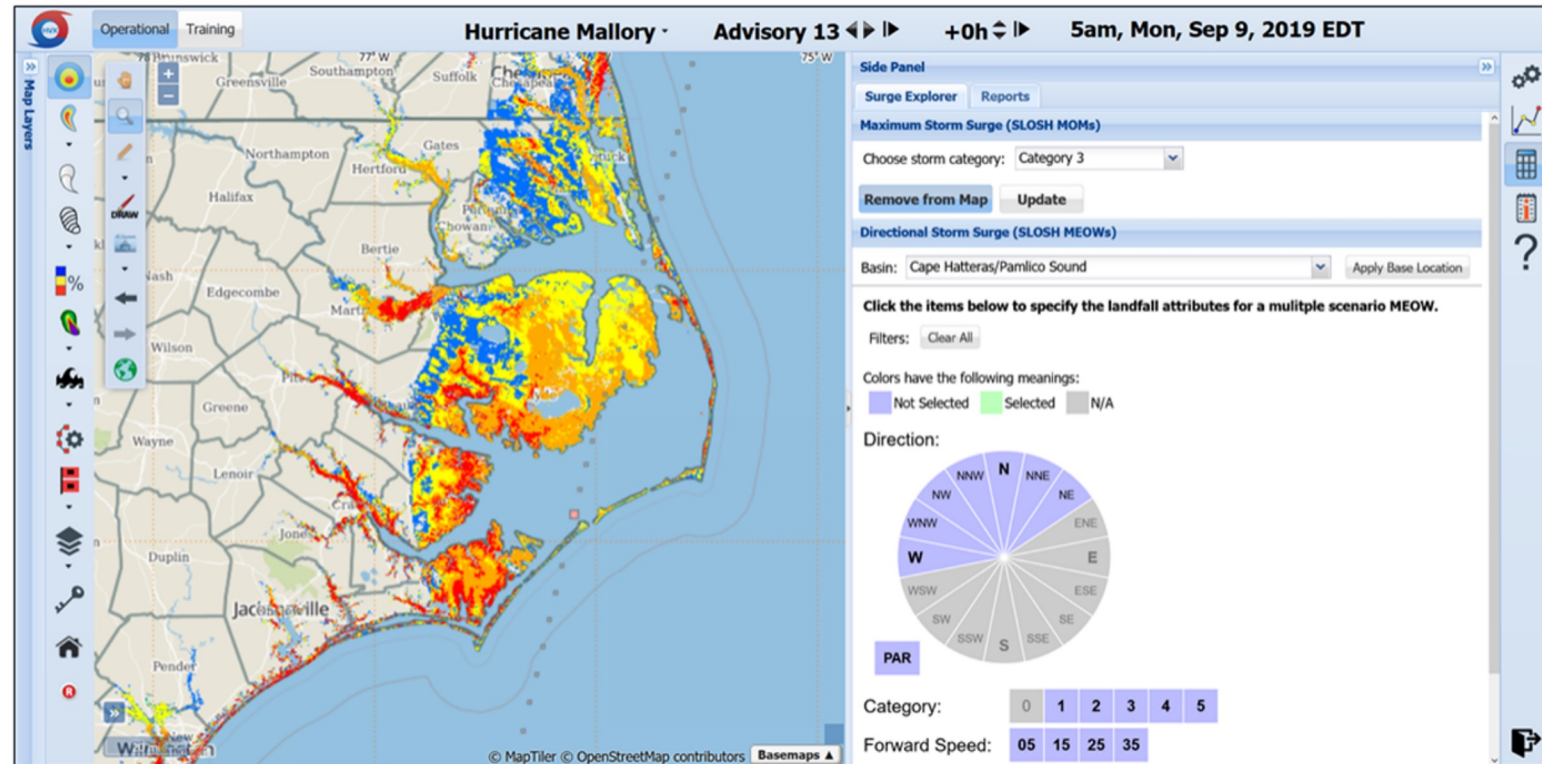
## MOMs - Maximum of Maximums

Worst-case for a particular category storm

Combination of many scenarios

- Forward speed
- Angle of approach
- Size (Radius of maximum wind)
- Initial tide level

No single hurricane will produce the regional flooding depicted in a MOMs



# SLOSH MOMs and MEOWs - MEOWs

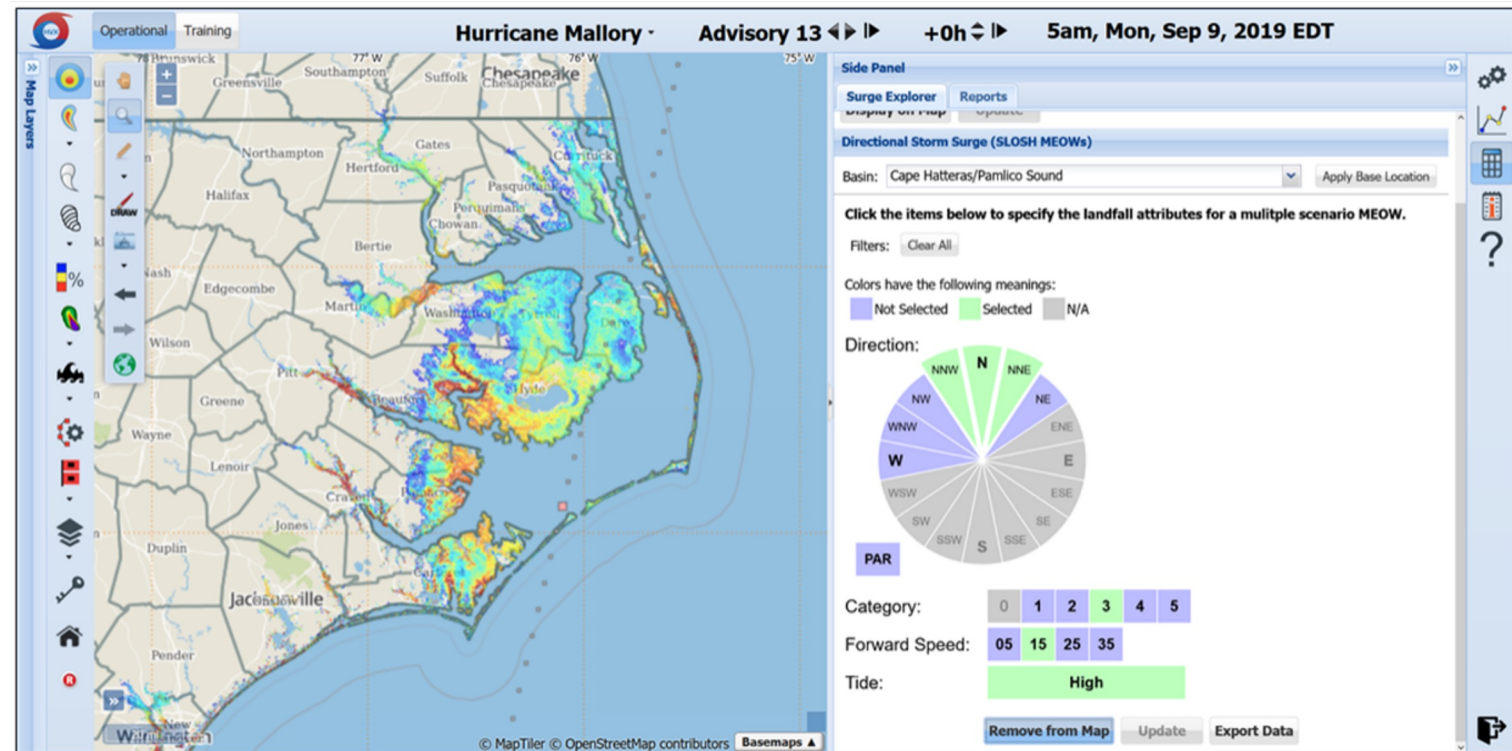


## MEOWs – Maximum Envelope of Water

Composite of the maximum storm surge for a given set of parameters (by basin)

Used as guidance of planning and operations

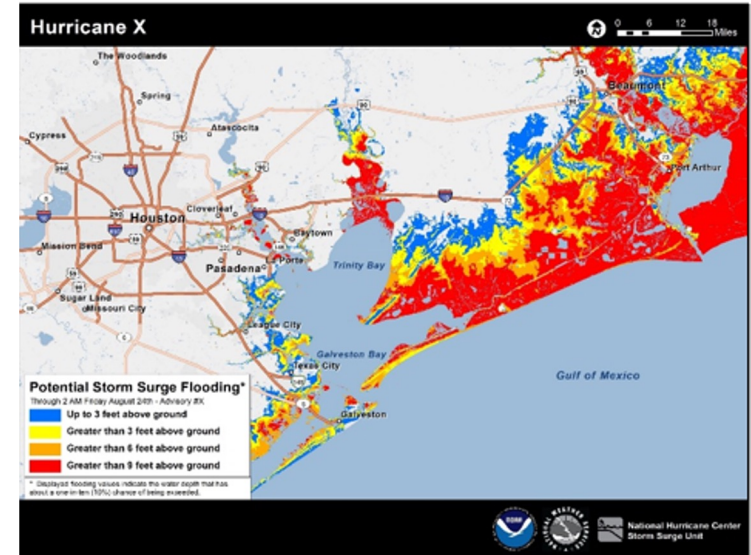
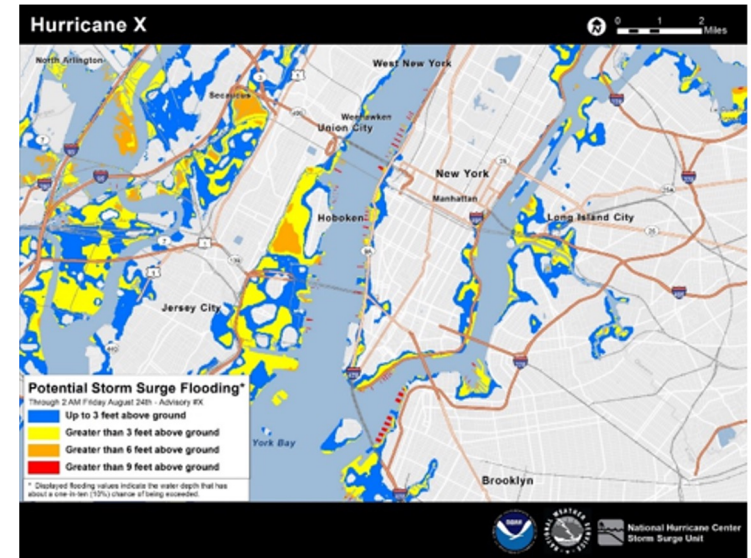
- Category (Cat 3)
- Landfall direction (NW,N, NE)
- Forward speed (15 mph)
- Initial tide (High)



# Potential Storm Surge Flooding Map

## Inundation Map

- Height above ground that the water could reach
  - Reasonable worst-case scenario for any individual location
  - Values have a 10% chance of being exceeded
- Issued with Hurricane Watch
  - Sometimes with Tropical Storm watch
- Available 60+ minutes after the advisory release





# Storm Surge Watches/Warnings

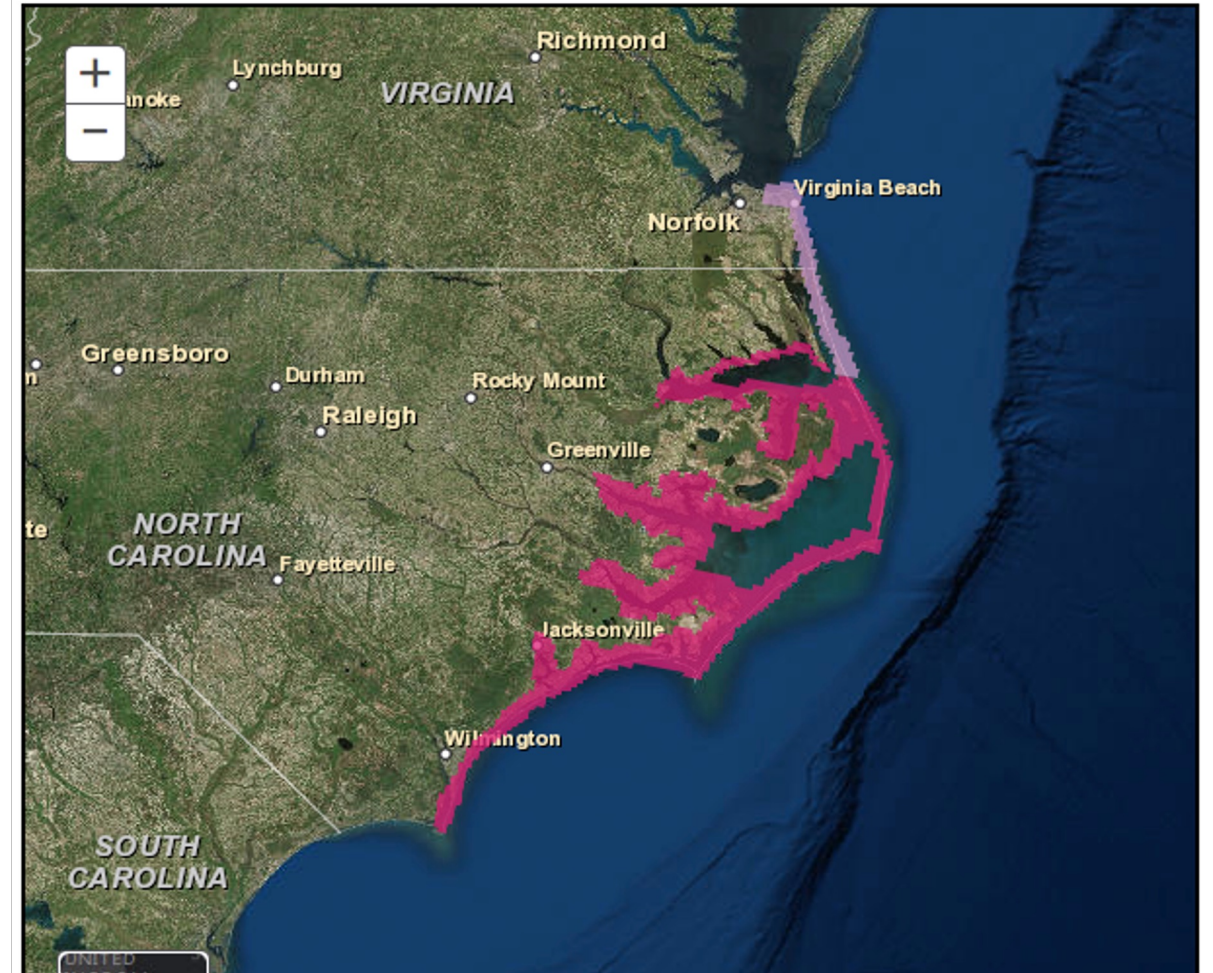


## Storm Surge Watch

- There is the **possibility** of life-threatening inundation, generally **within 48 hours**

## Storm Surge Warning

- There is a danger of life-threatening inundation, generally **within 36 hours**

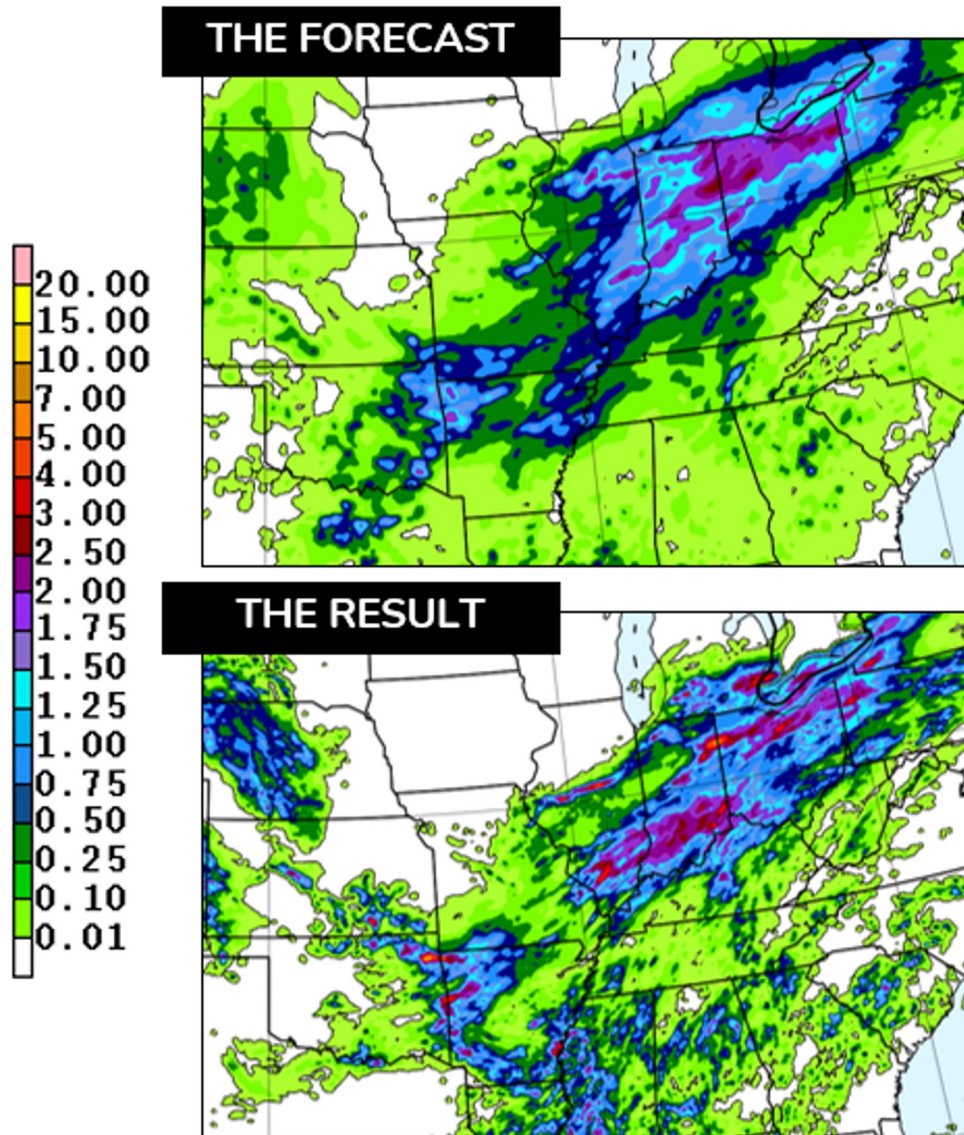


## **Rainfall & Inland Flooding Products address:**

- How much rain is forecast?
- What areas will flood?
- How do wireless emergency alerts work?



# Quantitative Precipitative Forecast (QPF)

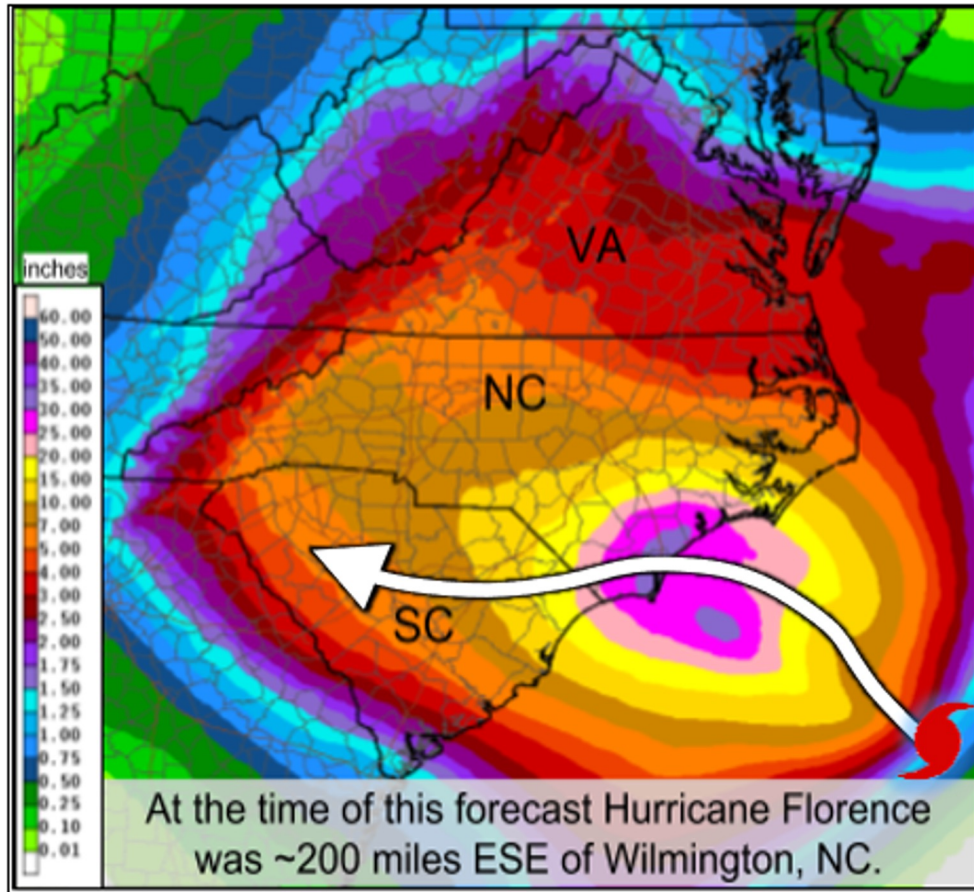


- Forecast precipitation over a given period of time. For tropical cyclones
- The forecast depicts average amounts over a large area; does not capture localized minimum or maximum.
- More accurate in situations with large, organized weather systems

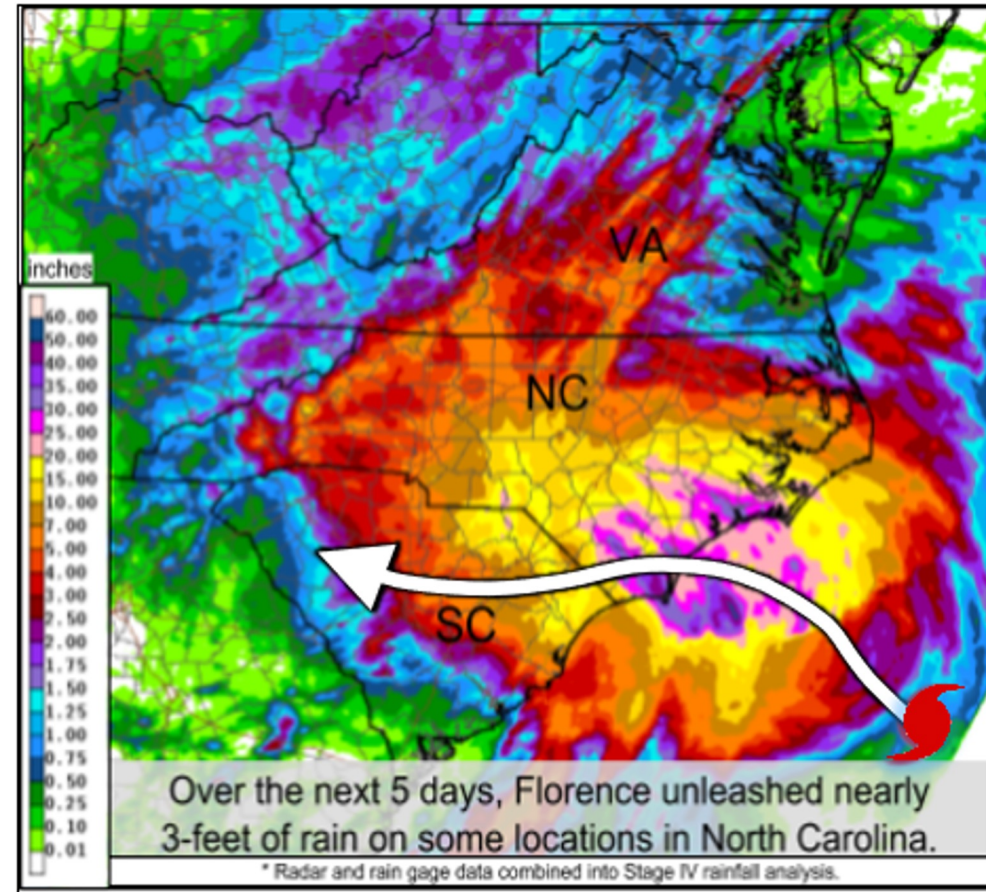


# Hurricane Florence (2018)

## 5-Day Forecast vs. Observed Rainfall



5-day Rainfall Forecast - Issued Sep 13, 2018



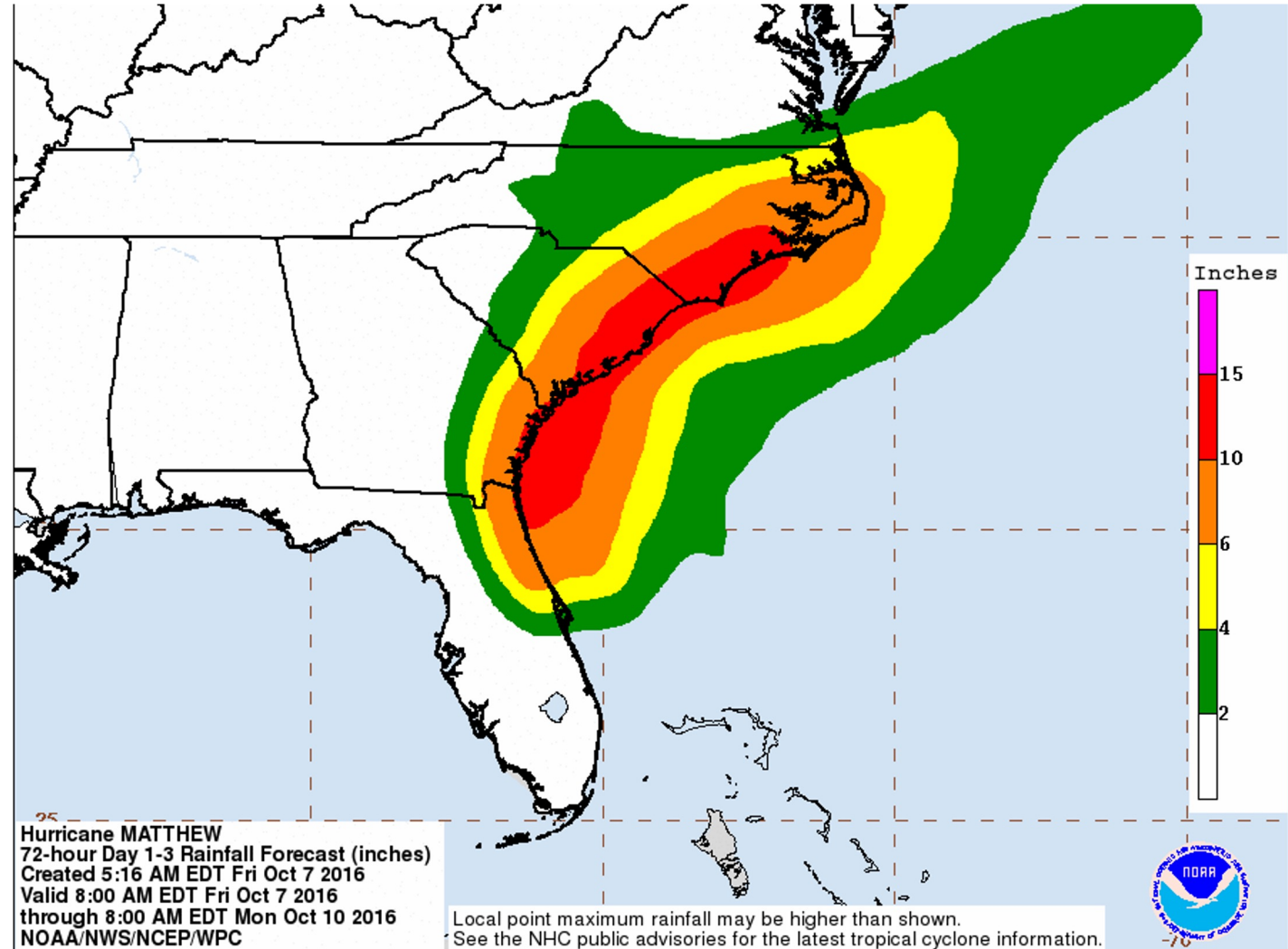
5-day Rainfall - Sep 13-18, 2018

# Rainfall Forecast

WPC issues *storm-specific* rainfall forecast graphic.

- Simplified scale

This is the version included with the NHC Public Advisory forecast package.





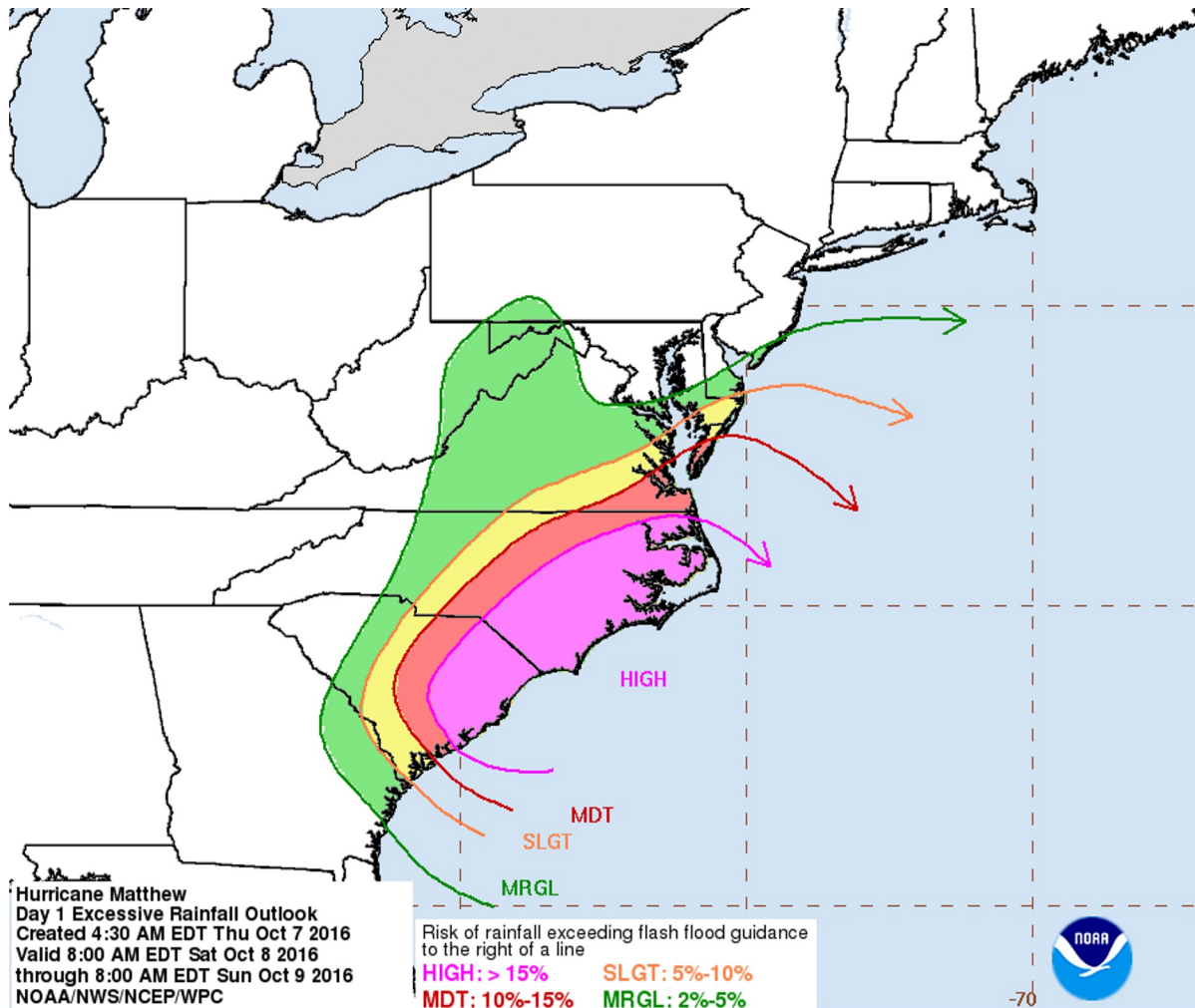
# Rainfall Forecasts

## Context Matters:

A forecast of 1 inch has different impacts if the rain falls over 24 hours vs. 10 minutes.



# Excessive Rainfall Outlook (ERO)



- Chance that rainfall can cause flash flooding
- A situational awareness and planning tool
- Accounts for some uncertainty
- Summaries large-scale risk factors
- Does NOT
  - Account for longer-term flooding on mainstem rivers
  - Forecast flash flooding at specific locations



# Excessive Rainfall Categories



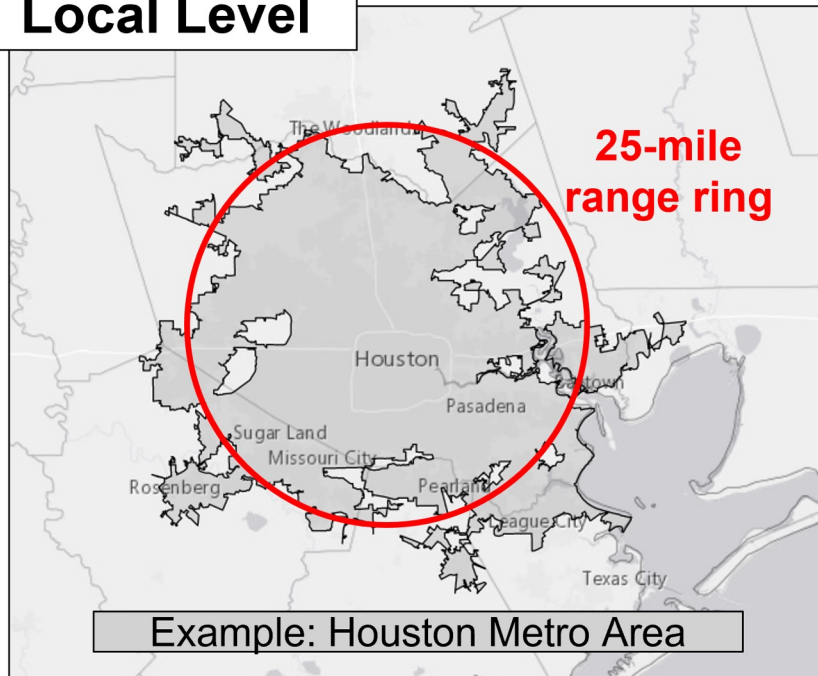
FEMA

## Understanding WPC Excessive Rainfall Risk Categories

<p><b>No Area/Label</b></p> <p>Flash floods are generally not expected.</p> <p><a href="http://www.wpc.ncep.noaa.gov">www.wpc.ncep.noaa.gov</a> @NWSWPC</p>	<p><b>MARGINAL (MRGL)</b></p> <p><b>Isolated flash floods possible</b></p> <p>Localized and primarily affecting places that can experience rapid runoff with heavy rainfall.</p>	<p><b>SLIGHT (SLGT)</b></p> <p><b>Scattered flash floods possible</b></p> <p>Mainly localized. Most vulnerable are urban areas, roads, small streams and washes. Isolated significant flash floods possible.</p>	<p><b>MODERATE (MDT)</b></p> <p><b>Numerous flash floods likely</b></p> <p>Numerous flash flooding events with significant events possible. Many streams may flood, potentially affecting larger rivers.</p>	<p><b>HIGH (HIGH)</b></p> <p><b>Widespread flash floods expected</b></p> <p>Severe, widespread flash flooding. Areas that don't normally experience flash flooding, could. Lives and property in greater danger.</p>
<p>Flash flooding near me?</p>	<p>Flash Flooding</p> <p>NO Flash Flooding</p>			
<p><b>WEATHER PREDICTION CENTER</b></p>				

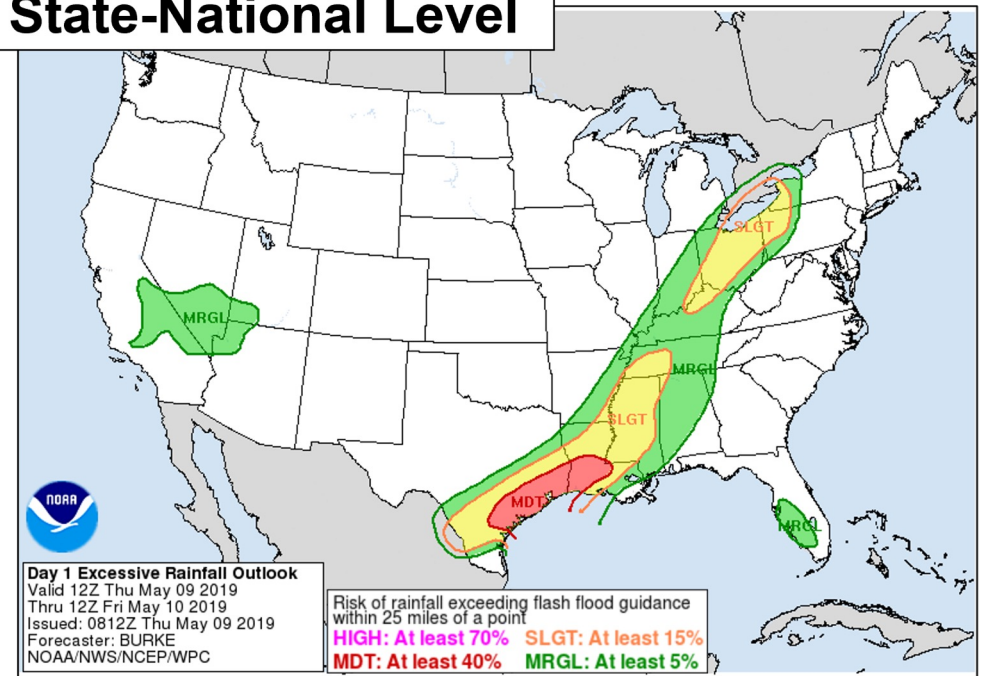
# Interpreting the ERO

## Local Level



- Potential for intense rainfall and flash flooding.
  - Where is the relative risk higher?

## State-National Level



- Probability of flash flooding within an area approximately the size of a large metro area or country/parish.



# River Gauges

Monitor the volume of water flowing through streams.

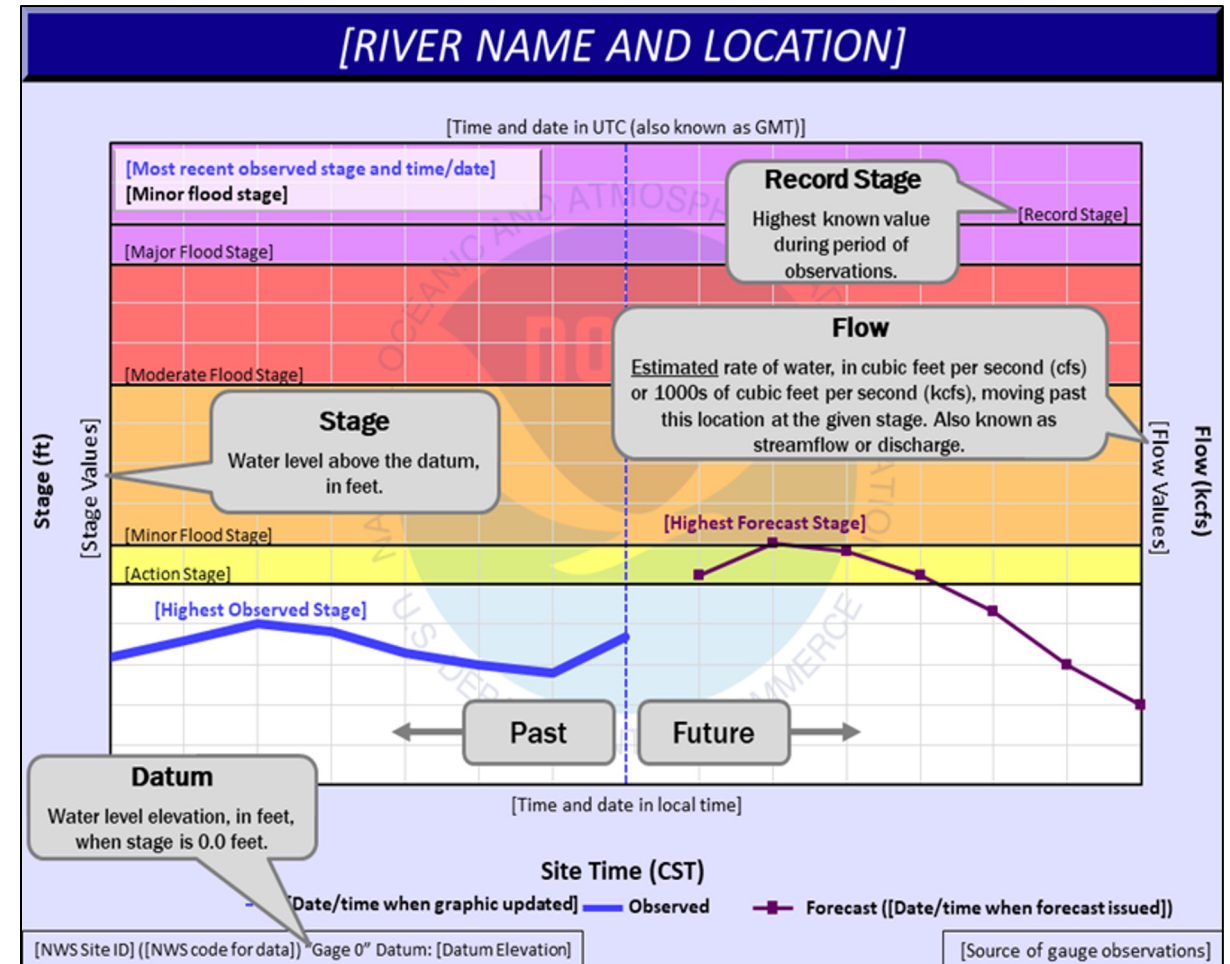
Typical measurements include stage and discharge (flow):

- Stage: The water level above a reference elevation, called a datum.
  - **Not the same as depth!**
- Discharge (flow): The rate of water moving past a location



# Hydrographs

- Display water level information over time.
- Hydrograph Plot
  - May display stage, streamflow, and sometimes both.
- Hydrographs visualize water level observations and forecasts on a single graphic.





## **Instructor-Led Demonstration of AHPS** (Advanced Hydrologic Prediction Service) **Website**

Time: 5 minutes

Goal: Explore the [AHPS website](#)

1. Layout of the interface
2. Locations of key information
3. How to view:
  - Hydrographs, Impact tables, Crest records, Hydro watches/warnings in effect, Links to FIM and probabilistic models, Other Data about the gage

# Monitoring Rivers Demo 1



National Oceanic and Atmospheric Administration's  
**National Weather Service**

Local forecast by "City, St"

City, St  Go

RSS Feeds  
Warnings  
Current  
By State/County...  
UV Alerts  
Observations  
Radar  
Satellite  
Snow Cover  
Surface  
Weather...  
Observed Precip  
Forecasts  
Local  
Graphical  
Aviation  
Marine  
Hurricanes  
Severe Weather  
Fire Weather  
Text Messages  
By State  
By Message Type  
National  
Forecast Models  
Numerical  
Models  
Statistical  
Models...  
MOS Prod  
GFS-LAMP Prod  
Climate  
Past Weather  
Predictions  
Weather Safety  
Weather Radio  
Hazard Asmt...

Site Map News Organization

National Observations

Warnings & Forecasts Graphical Forecasts National Maps Radar Water Air Quality Satellite Climate

River Observations River Forecasts Long-Range River Flood Risk Precipitation River Download Other Information

Auto Refresh: OFF

Print this map Permalink  
Bookmark and Share

All Locations

Click on the map or select one of the data views below:

- United States
- NWS Weather Forecast Offices
- NWS River Forecast Centers
- Water Resources Regions

Probability and forecasts available  
 Observations only available  
 Forecasts available

8989 total gauges  
Show all locations in flood (268)

- 33 Gauges: Major Flooding
- 61 Gauges: Moderate Flooding
- 174 Gauges: Minor Flooding
- 245 Gauges: Near Flood Stage
- 5228 Gauges: No Flooding
- 2489 Flood Category Not Defined
- 13 At or Below Low Water Threshold
- 602 Gauges: Observations Are Not Current
- 144 Gauges: Out of Service

Show all locations

Last map update:  
03/19/2019 at 11:01:55 am EDT  
03/19/2019 at 15:01:55 UTC

National Weather Service  
**Advanced Hydrologic Prediction Service**

Home News Organization Search for:

National Observations National Forecasts WFO Forecast

Local weather forecast by "City, ST"

City, ST  Go

**ALERT!!** A Flood Warning and Flood Advisory are in effect for portions of the area.  
View all valid statements/warnings or choose a specific point or river to get the details for that location.

Weather Forecast Office Memphis, TN Lower Mississippi River Forecast Center  
Southeast River Forecast Center

River Observations River Forecasts Long-Range Flood Risk Precipitation Download

Auto Refresh: OFF

Print this map Permalink Bookmark and Share

Maximum Forecast Flood Category Through: 04/01/2019 15:38:31 UTC

Day 1 2 3 4 5 6 7 8 9 10 11 12 13

185 total gauges  32 gauges in flood

Forecast available  
Probability and forecasts available  
Major Flooding  
Moderate Flooding  
Minor Flooding  
Near Flood Stage  
No Flooding  
Forecasts Are Not Current  
No Forecast Within Selected Timeframe  
Out of Service  
Flood Category Not Defined  
At or Below Low Water Threshold

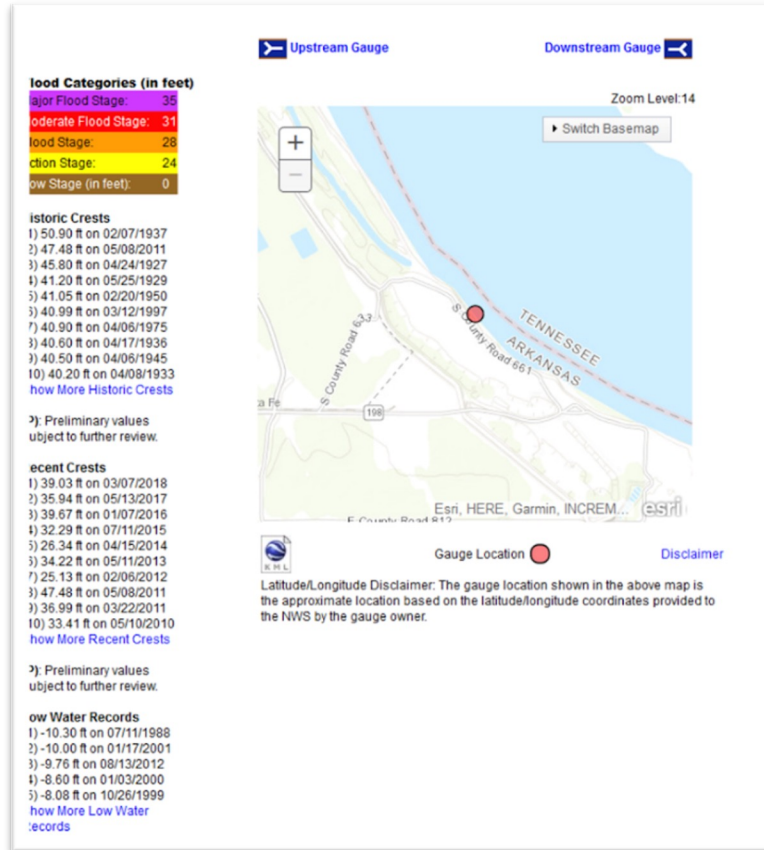
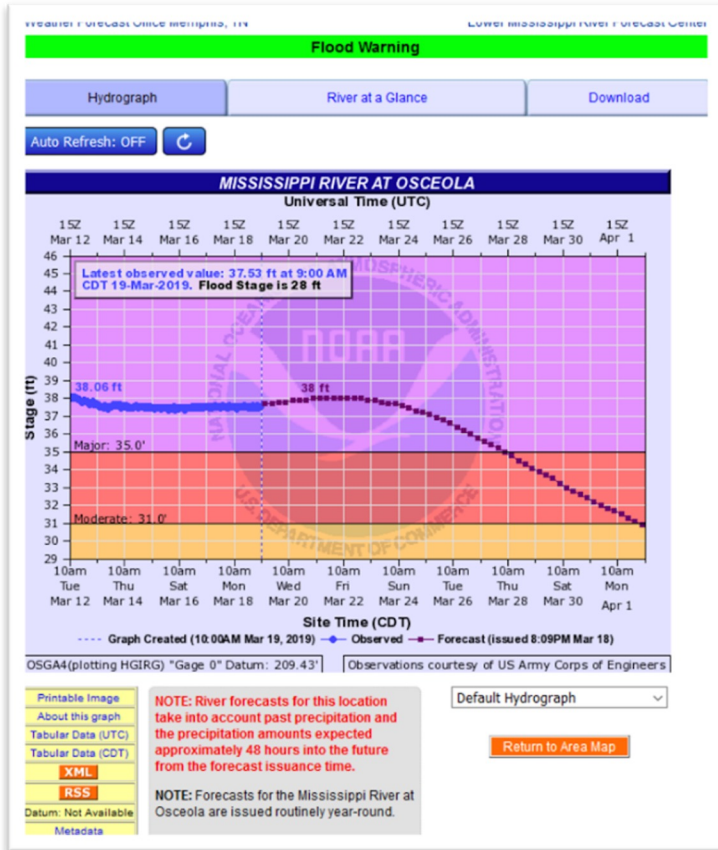
Last map update:  
03/19/2019 at 10:38:37 am CDT  
03/19/2019 at 15:38:37 UTC

What is UTC time?  
Map Help

WHEN FLOODED  
TURN AROUND  
DON'T  
DROWN

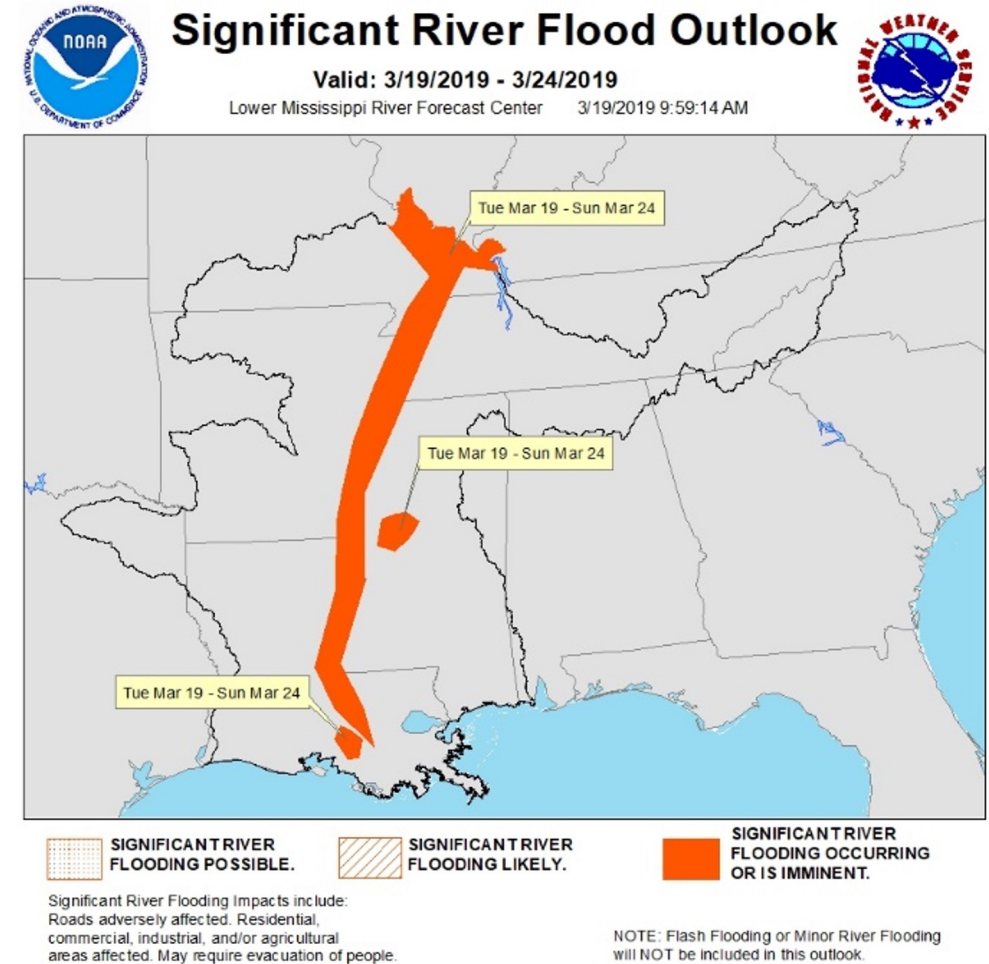
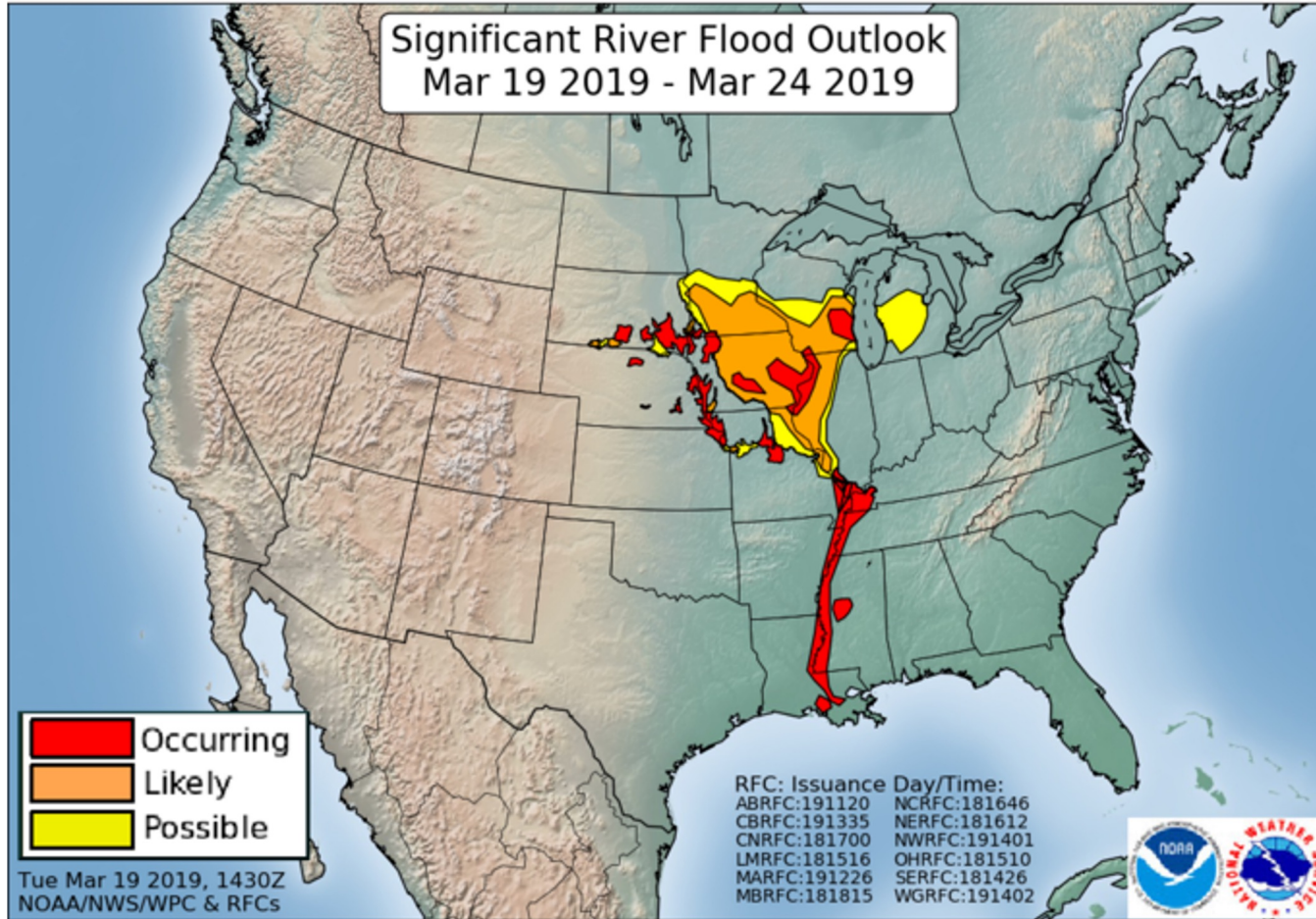


# Monitoring Rivers Demo 2



- Flood Impacts & Photos** Collapse
- If you notice any errors in the below information, please contact our Webmaster
- All land east of the Arkansas Levee to the Tennessee Bluffs is under 10 to 25 feet of water.
  - Highway 87 is flooded just east of Fulton, Tennessee.
  - Farm headquarters near the intersection of Coon Valley and Herring Hill Roads, Tennessee is being flooded.
  - Water is very high on the Arkansas Levee. All homesteads along Crawford Road West in Tennessee are flooded.
  - Farmstead on Island 37, Tennessee is totally flooded.
  - In Tennessee, camp on Sunrise Towhead is almost all covered. All fields in the Barfield Point area are awash.
  - In Tennessee, all houses along Route 19 are awash. Camp on west side of Island 34 is completely flooded. Water has crept into buildings on the west side of Ballard Slough Road. Many sections of Herring Hill Road are now in deep water.
  - In Tennessee, the house at the south end of Outbounds Road is awash. Fields are flooding north of the Hatchie River east past Ft. Pillow State Prison. Herring Hill Road is flooding just north of the Shelby County Line.
  - In Tennessee, stilt house north of Fullen Landing is being flooded. Houses at the south end of Outbounds Road are flooding as is the homestead at the northeast end of Outbounds Road right on Open Lake. Most of Highway 19 is awash. Most all homesteads north of Fort Pillow are under water. Island 35 is essentially all covered. Bottomland south of Richardson's Landing is under water. In Arkansas, Sans Souci Road is flooding inside the levee. Terminal elevator at Osceola is flooding.
  - In Tennessee, Highway 19 is flooding near the bluff. Water is overflowing a house on Sunk Lake Road. Houses east of Outbounds Road and west of Conner Road are flooding. Houses all along Highway 19 are being covered. Centennial Island is completely flooded. In Arkansas, elevator at Osceola is flooding.
  - In Tennessee, Highway 19 is flooded at Conner Road cutting off evacuations west of that intersection. Crawford Road East is under water at places. Trailer settlement south of Coker Slough is covered. House on east end of Outbounds Road is flooding. Moore Farmstead is being covered. Houses on Cash Road are flooding. Hunting camp on Sunrise Towhead is beginning to flood. Farmstead on Sniper Island west of Herring Hill road is going under water. In Arkansas, farmstead at Tomato is under water.
  - In Tennessee, homesteads between Johnston Road and Sunk Lake Road on Highway 19 west are flooding. House at south end of Oscar Griggs Road is flooding. Ashport is flooding. Flooding is occurring near the north end of Sunk Lake Road. Settlement between Coker Slough and Highway 19 is flooded. Water is overflowing the farm headquarters just north of the Sunk Lake Road and Long Hole Road Junction.

# Significant River Flood Outlooks





# Flood-Related Watches & Warnings



- **Flood Watch**
  - Conditions are favorable for flash flooding or mainstem river flooding. It does not mean flooding will occur, but it is possible.
- **Flood Warning**
  - Mainstem river flooding is imminent or occurring.
- **Flash Flood Warning**
  - Flash flooding is imminent or occurring. Some roads will be flooded. Homes and businesses may flood.
- **Flash Flood Emergency**
  - A special type of Flash Flood Warning issued for exceedingly rare situations when a severe threat to human life and catastrophic damage from a flash flood is imminent or occurring. At risk individuals should evacuate to higher ground immediately. Travel is discouraged unless the individual is under an evacuation order.

# Flash Flood Warnings



FEMA

The National Weather Service in Mount Holly has issued a

- \* Flash Flood Warning for...  
Northwestern New Castle County in northern Delaware...  
Southeastern Berks County in eastern Pennsylvania...  
Chester County in southeastern Pennsylvania...  
Western Delaware County in southeastern Pennsylvania...  
Central Montgomery County in southeastern Pennsylvania...
- \* Until 700 PM EDT.
- \* At 253 PM EDT, Doppler radar indicated thunderstorms producing heavy rain across the warned area. Between 0.5 and 1 inch of rain has fallen. Flash flooding is ongoing or expected to begin shortly. Additional rainfall is expected over the next couple hours.

HAZARD...Flash flooding caused by thunderstorms.

SOURCE...Radar.

IMPACT...Flooding of small creeks and streams, urban areas, highways, streets, and underpasses as well as other drainage and low lying areas.

- \* Some locations that may experience flash flooding include...  
Wilmington, Newark, West Chester, Norristown, Pottstown, Phoenixville, Lansdale, West Norriton, East Norriton, Coatesville, Westtown, and Downingtown.

This includes the following highways...  
Pennsylvania Turnpike between mile markers 298 and 331.  
Interstate 95 in Delaware between mile markers 0 and 19.  
Interstate 76 in Pennsylvania between mile markers 327 and 330.  
Northeast Extension between mile markers 23 and 30.

This includes the following streams and drainages...  
Chester-Sassafras, Crosswicks-Neshaminy, Brandywine-Christina, Schuylkill, Lower Delaware, and Lower Susquehanna.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

Turn around...don't drown when encountering flooded roads. Most flood deaths occur in vehicles.

[Block of lat lon coordinates would appear here]

FLASH FLOOD...RADAR INDICATED

General Location

How long the hazard will last

Situation & Flood Type

Potential/Expected Impacts

More Specific Locations  
(Towns, roadways,  
streams/basins, etc.)

Tags

# Flash Flood Emergencies



FEMA

...FLASH FLOOD EMERGENCY FOR MONTGOMERY COUNTY...

...FLASH FLOOD WARNING REMAINS IN EFFECT UNTIL 845 PM EDT THIS EVENING FOR NORTHEASTERN CHESTER, NORTHWESTERN DELAWARE, AND MONTGOMERY COUNTIES...

At 621 PM EDT, Thunderstorms are producing heavy rain in Northern Chester County and Southern Montgomery County. Between 3 and 4.5 inches of rain have fallen. Additional rainfall amounts of 1.5 to 3 inches are possible in the warned area. Flash flooding is already occurring. Over 30 water rescues are ongoing in portions of Montgomery County.

This is a FLASH FLOOD EMERGENCY for Montgomery County. This is a PARTICULARLY DANGEROUS SITUATION. SEEK HIGHER GROUND NOW!

HAZARD...Life threatening flash flooding caused by thunderstorms.

SOURCE...Emergency management reported.

IMPACT...This is a PARTICULARLY DANGEROUS SITUATION. SEEK HIGHER GROUND NOW! Life threatening flash flooding of low water crossings, small creeks and streams, urban areas, highways, streets, and underpasses.

Some locations that may experience flash flooding include...

West Chester, Norristown, Pottstown, Phoenixville, Lansdale, West Norriton, East Norriton, Westtown, Downingtown, Souderton, Ambler, and Collegeville.

This includes the following highways...

Pennsylvania Turnpike between mile markers 307 and 333.  
Interstate 76 in Pennsylvania between mile markers 327 and 330.  
Interstate 476 in Pennsylvania between mile markers 17 and 19.  
Northeast Extension between mile markers 21 and 38.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

Move to higher ground now! This is an extremely dangerous and life-threatening situation. Do not attempt to travel unless you are fleeing an area subject to flooding or under an evacuation order.

Turn around...don't drown when encountering flooded roads. Most flood deaths occur in vehicles.

Motorists should not attempt to drive around barricades or drive cars through flooded areas.

[Block of lat lon coordinates would appear here]

FLASH FLOOD...OBSERVED  
FLASH FLOOD DAMAGE THREAT...CATASTROPHIC

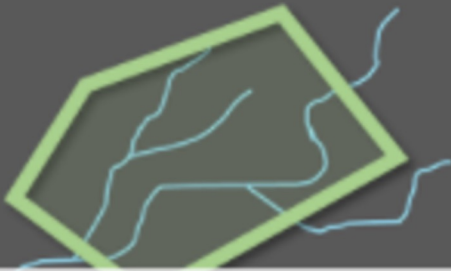
Red lettering added for emphasis.

# “Tagging” Flash Flood Warnings for WEAs.



FEMA

Flash Flood Warnings will be tagged based upon expected severity.



FLASH FLOOD... OBSERVED  
FLASH FLOOD DAMAGE THREAT... CONSIDERABLE



Wireless  
Emergency  
Alert (WEA)

Flash Flood Severity

Lowest

Highest

Flash Flood Warning

Flash Flood Warning

“CONSIDERABLE”  
damage threat

Flash Flood Warning

“CATASTROPHIC”  
damage threat



# Flood Warnings for Mainstem Rivers



Current flood stage and/or forecast flood stage

How long the flooding will last

Impacted river and communities

Impacts

Additional Details

```
ARC067-147-271600-
/O.EXT.KLZK.FL.W.0003.000000T0000Z-220128T1200Z/
/PTTA4.2.ER.220103T0945Z.220109T1530Z.220127T0600Z.NO/
952 AM CST Wed Jan 26 2022

...FLOOD WARNING NOW IN EFFECT FROM THIS MORNING THROUGH LATE
THURSDAY NIGHT...

* WHAT...Minor flooding is occurring and minor flooding is forecast.
* WHERE...Cache River Near Patterson.
* WHEN...Until Friday morning.
* IMPACTS...At 9.0 feet, Low swampy timberland along the river
begins to flood. Flood gates should be closed and equipment moved
out of the low grounds along the river and tributaries.
* ADDITIONAL DETAILS...
- At 9:15 AM CST Wednesday the stage was 9.2 feet.
- Forecast...The river is expected to fall below flood stage
just after midnight tonight and continue falling to 6.3 feet
Monday morning.
- Flood stage is 9.0 feet.
- http://www.weather.gov/safety/flood

&&



      Fld   Observed   Forecast 12 PM   Crest
Location Stg   Stg Day/Time   Thu   Fri   Sat   Crest Time Date
Cache River
Patterson 9.0   9.2 Wed 9 AM   8.8  8.5  7.8   Falling
```

## **Local NWS Weather Forecast Office addresses:**

- More detailed localized forecast information?

# Hurricane Local Statements



  **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

**HURRICANE WILMA LOCAL STATEMENT** ADVISORY NUMBER 32  
NATIONAL WEATHER SERVICE MIAMI FL AL242005  
530 AM EDT SUN OCT 23 2005

THIS PRODUCT COVERS MAINLAND SOUTH FLORIDA

\*\*EXTENSIVE TO DEVASTATING DAMAGE AND LIFE-THREATENING CONDITIONS EXPECTED AS HURRICANE WILMA MOVES NORTHEAST ACROSS SOUTH FLORIDA\*\*

NEW INFORMATION  
-----

\* CHANGES TO WATCHES AND WARNINGS:  
- A HURRICANE WATCH HAS BEEN UPGRADED TO A HURRICANE WARNING FOR MIAMI-DADE...BROWARD...PALM BEACH...COLLIER...GLADES AND MONROE COUNTIES

\* CURRENT WATCHES AND WARNINGS:  
- A HURRICANE WARNING IS IN EFFECT FOR MIAMI -DADE...BROWARD...PALM BEACH...COLLIER...HENDRY...GLADES AND MAINLAND MONROE COUNTIES

\* STORM INFORMATION:  
- ABOUT 405 MI SW OF NAPLES FL  
- 22.1N 86.6W  
- STORM INTENSITY 100 MPH WITH HIGHER GUSTS  
- MOVING NORTHEAST AT 3 MPH

SITUATION OVERVIEW  
-----

EXTREMELY DANGEROUS HURRICANE WILMA IS EXPECTED TO IMPACT SOUTH FLORIDA BEGINNING THIS EVENING. THE MAIN CONCERN IS FOR LIFE-THREATENING INUNDATION IN SURGE-PRONE AREAS OF COLLIER/MAINLAND

## Issued by local NWS office


- Hurricane (Tropical Storm) Watch/Warning in effect

## Situation overview

- Watch/warning information
- Potential impact information
- Preparedness actions

# Hurricane Local Statements: Where is affected?



 **NATIONAL HURRICANE CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HURRICANE WILMA LOCAL STATEMENT ADVISORY NUMBER 32  
NATIONAL WEATHER SERVICE MIAMI FL AL242005  
530 AM EDT SUN OCT 23 2005

THIS PRODUCT COVERS MAINLAND SOUTH FLORIDA

**\*\*EXTENSIVE TO DEVASTATING DAMAGE AND LIFE-THREATENING CONDITIONS EXPECTED AS HURRICANE WILMA MOVES NORTHEAST ACROSS SOUTH FLORIDA\*\***

NEW INFORMATION  
-----

\* CHANGES TO WATCHES AND WARNINGS:  
- A HURRICANE WATCH HAS BEEN UPGRADED TO A HURRICANE WARNING FOR MIAMI-DADE...BROWARD...PALM BEACH...COLLIER...GLADES AND MONROE COUNTIES

\* CURRENT WATCHES AND WARNINGS:  
- A HURRICANE WARNING IS IN EFFECT FOR MIAMI -DADE...BROWARD...PALM BEACH...COLLIER...HENDRY...GLADES AND MAINLAND MONROE COUNTIES

\* STORM INFORMATION:  
- ABOUT 405 MI SW OF NAPLES FL  
- 22.1N 86.6W  
- STORM INTENSITY 100 MPH WITH HIGHER GUSTS  
- MOVING NORTHEAST AT 3 MPH

SITUATION OVERVIEW  
-----

EXTREMELY DANGEROUS HURRICANE WILMA IS EXPECTED TO IMPACT SOUTH FLORIDA BEGINNING THIS EVENING. THE MAIN CONCERN IS FOR LIFE-THREATENING INUNDATION IN SURGE-PRONE AREAS OF COLLIER/MAINLAND

What is the  
affected area?



# Hurricane Local Statements: Any changes?



FEMA



## NATIONAL HURRICANE CENTER

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HURRICANE WILMA LOCAL STATEMENT ADVISORY NUMBER 32  
NATIONAL WEATHER SERVICE MIAMI FL AL242005  
530 AM EDT SUN OCT 23 2005

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Are there any  
changes since  
the last update?

# NWS Email Briefings & Webinars



Most NWS Weather Forecast Offices (WFOs) and River Forecast Centers (RFCs) issue routine briefings for hazardous weather.

These briefings provide information on:

- Timing and Location of Hazards
- Range of Outcomes
- Expected Impacts
- Relevant Forecast Graphics
- Watches/Warnings/Advisories
- Forecast Challenges / Uncertainty / Confidence Levels
- Additional Information

Offices send briefing information to core partners

- EMs, other public safety officials, school officials, etc.

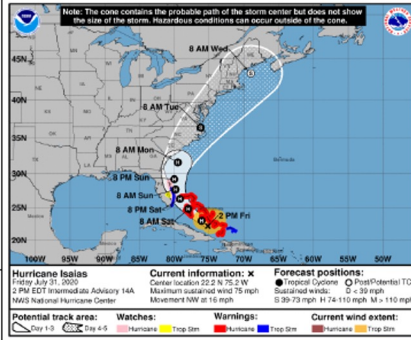
Contact your WFO and RFC to ask about being added to their email/webinar briefing list!

## Heavy Rain Possible Next Week Central Pennsylvania WEATHER FORECAST OFFICE

**OVERVIEW:**

- Hurricane Isaias (ees-ah-EE-ahs) is expected to move north along the east coast and bring the potential for heavy rain in east-central PA early next week.
- The storm is still several days away. Please continue to monitor the forecast as a westward shift in the track could mean more significant impacts in Central PA.

<b>TIMING &amp; LOCATION</b>	▪ The current forecast track brings the storm along the east coast, with impacts being felt in Pennsylvania as early as Monday night and as late as Wednesday morning.
<b>HAZARDS &amp; IMPACTS</b>	▪ Heavy rainfall appears to be the most significant threat at this time, with the westward extent of impacts still uncertain. ▪ Gusty winds are also possible, especially in eastern PA.
<b>FORECAST CHALLENGES</b>	▪ Small tweaks to the storm track and intensity are likely over the next few days. Continue to monitor the forecast. ▪ The interaction between Isaias and a cold front approaching from the west will determine the extent and intensity of heavy rainfall.
<b>ADDITIONAL INFORMATION</b>	▪ Note that the forecast cone represents the probable track of the CENTER of a tropical cyclone. ▪ Impacts often occur well outside of the cone.
<b>NEXT BRIEFING</b>	▪ By 6PM Saturday 8/1



**Hurricane Isaias**  
Friday, July 31, 2020  
2 PM EDT Immediate Advisory 14A  
NWS National Hurricane Center

**Current information:** x  
Center location 22.2 N 75.2 W  
Maximum sustained wind 75 mph  
Movement NW at 16 mph

**Forecast positions:**  
● Tropical Cyclone  
○ Post-tropical TC  
Solid red circle: 2 - 33 mph  
Solid red circle: 39-73 mph  
H 74-110 mph  
M > 110 mph

**Potential track area:**  
Day 1-3: Tropical Storm  
Day 4-5: Hurricane  
Day 6-7: Tropical Storm

**Watches:**  
Tropical Storm  
Hurricane

**Warnings:**  
Tropical Storm  
Hurricane

**Current wind extent:**  
Tropical Storm  
Hurricane

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.

ISSUED: 7/31/2020 3:31 PM [www.weather.gov/ctp/tropical](http://www.weather.gov/ctp/tropical)

## **Post-storm reports address:**

- What information is available after the storm?
- Where can I find summary information?

# Tropical Cyclone Reports

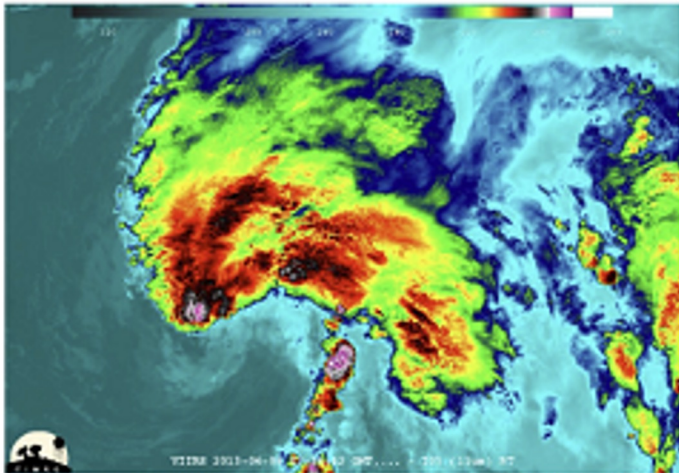


NATIONAL HURRICANE CENTER  
TROPICAL CYCLONE REPORT

TROPICAL STORM ANDREA  
(AL012013)

5 – 7 June 2013

John L. Beven II  
National Hurricane Center  
22 August 2013



SNPP VIRS INFRARED IMAGE OF ANDREA 0724 UTC 6 JUNE 2013. IMAGE COURTESY OF CIMSS

Andrea was a tropical storm that made landfall on the northwest coast of the Florida Peninsula. It became a gale-force extratropical low over the southeastern United States.

## Summary Report

Available on the NHC website weeks to months after storm

Provides a complete summary report for every Atlantic and East Pacific storm

- Final track, intensity, and size information
- Damage and casualty figures
- Forecast critique



# NWS Products – When is Key Info Available?



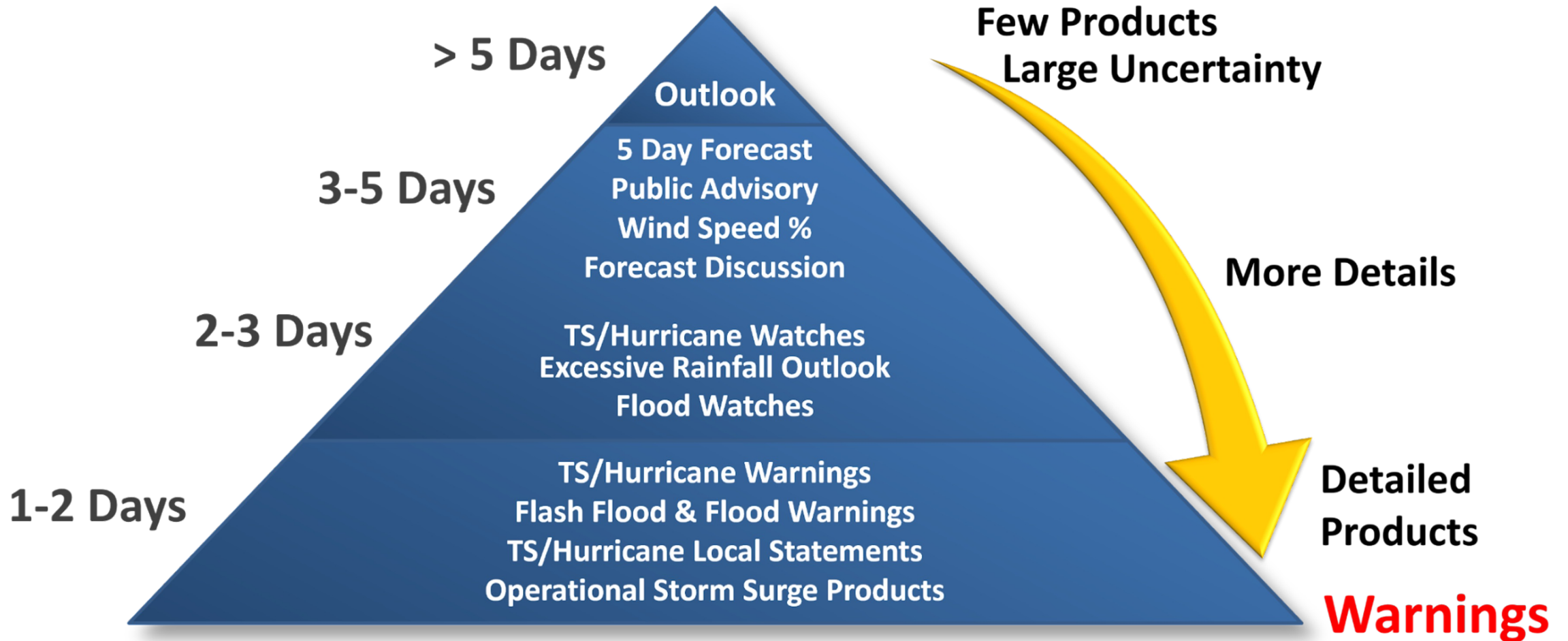
Year Round	Hurricane Season	120hr - 72hr	72hr - 48hr	48hr - 36hr	36hr - Onset of TS Winds	Post Landfall	
Hurricane Evacuation Study (HES) products (Surge MOMs, Surge Maps, Evacuation Zones, Clearance times, other planning data)							
Flood Inundation Mapping (FIM) – for select river stretches							
Flood Insurance Studies and FEMA Hazard Risk Areas							
Tropical Weather Outlook							
		Public Advisory					
		Forecast Discussion					
		Wind Speed Probabilities					
		Track and Cone					
		Probabilistic wind timing via Hurrevac					
		QPF Rainfall forecasts					
		Wind timing via Hurrevac				Extreme Wind Warnings	
		Surge MEOs				Tide Gauges/ USGS	
		Excessive Rainfall Outlooks				Flash Flood Warnings	
		River Forecasts				River Flood Warnings	
			TS/Hurricane Watches		TS/Hurricane Warnings		
			Hurricane Local Statements				
			Storm Surge Probabilities & Inundation Map				
			Storm Surge Watch		Storm Surge Warning		
						Tornado Watches & Warnings	



# Tropical Cyclone Products Timeframe



FEMA





### Hurricane Irma

**...IRMA MOVING THROUGH THE SOUTHEASTERN BAHAMAS AS AN EXTREMELY DANGEROUS CATEGORY 4 HURRICANE...**

**5:00 AM EDT Fri Sep 8**  
Location: 21.7°N 73.8°W  
Moving: WNW at 16 mph  
Min pressure: 925 mb  
Max sustained: 155 mph

**Public Advisory #37**  
500 AM EDT

**Aviso Publico #37**  
500 AM EDT

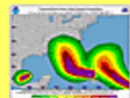
**Forecast Advisory #37**  
0900 UTC

**Forecast Discussion #37**  
500 AM CDT

**Wind Speed Probabilities #37**  
0900 UTC

**NWS Local Products**  
613 AM CDT

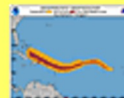
**US Watch/Warning**  
452 AM EDT



Wind Speed Probabilities



Experimental Arrival Time of Winds



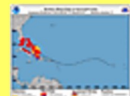
Wind History



Warnings/Cone Interactive Map



Warnings/Cone Static Images



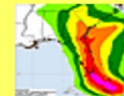
Warnings and Surface Wind



Storm Surge Inundation



Storm Surge Watch/Warning



U.S. Rainfall Potential

# Questions/Comments?



FEMA

A composite image featuring a screenshot of the National Hurricane Center (NHC) website and a photograph of an "EVACUATION ROUTE" sign. The website screenshot shows the NHC logo, navigation tabs (Home, News, Organization, Search), and a "Top News of the Day" section with the following items:

- **NHC Issuing advisories on Hurricane ARTHUR and TD DOUGLAS**
- Inside the Eye: Storm Surge—Plain and Simple (Part 2)
- Five-day Graphical Tropical Weather Outlook introduced (PDF) - video overview
- Update on NHC Products and Services for 2014 (PDF)

Below the news is a map titled "Atlantic Tropical Cyclone Activity" showing the Atlantic Ocean and the Eastern United States. A red dot on the map is labeled "ARTHUR". The map includes a timestamp: "3:00 am EDT Fri Jul 4 2014". The "EVACUATION ROUTE" sign is a blue circular sign with a white hurricane symbol and the text "EVACUATION ROUTE" in white. Below it is a blue rectangular sign with a white arrow pointing to the right. The background of the entire image is a faded satellite image of a hurricane.