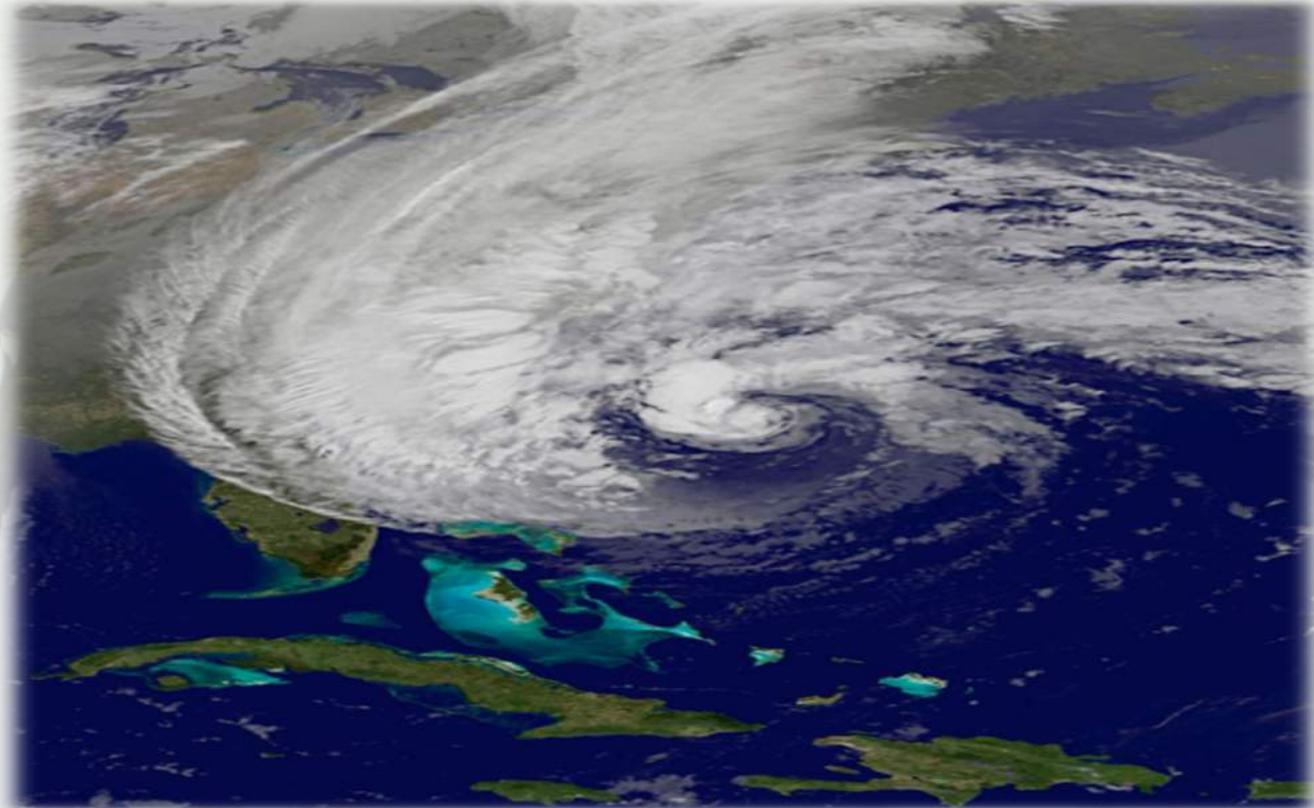




2021 Hurricane Season



**David Wally, Tropical Program Lead
National Weather Service, New York, NY
GNYHA – Emergency Preparedness Coordinating
Council Meeting
June 17, 2021**

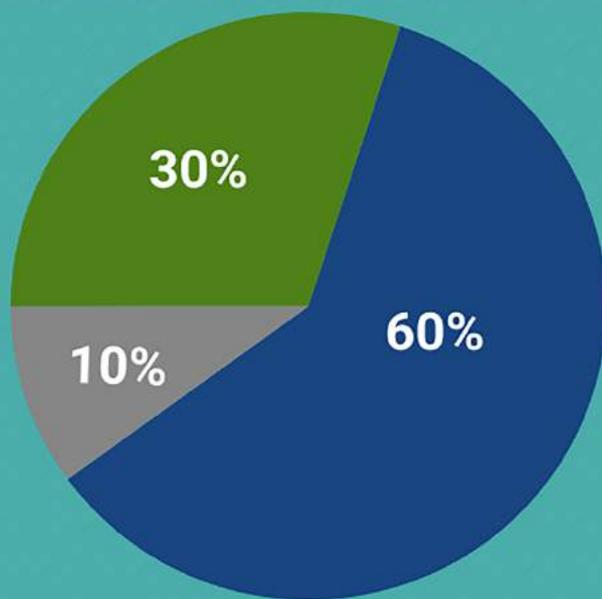


NOAA's

2021 Atlantic Hurricane Season Outlook



2021 Atlantic Hurricane Season Outlook



■ Above-normal ■ Near-normal ■ Below-normal season

Season probability

Named storms

13-20

Hurricanes

6-10

Major hurricanes

3-5

Be prepared: Visit hurricanes.gov and follow @NWS and @NHC_Atlantic on Twitter.

May 2021



NOAA's

2021 Atlantic Hurricane Season Outlook



Above Normal Activity Likely

- Favorable wind patterns and Above normal water temperatures in Main Development Region are forecasted
- Active West African Monsoon

Near-or weaker-
than-average
vertical wind shear

Above-average SSTs

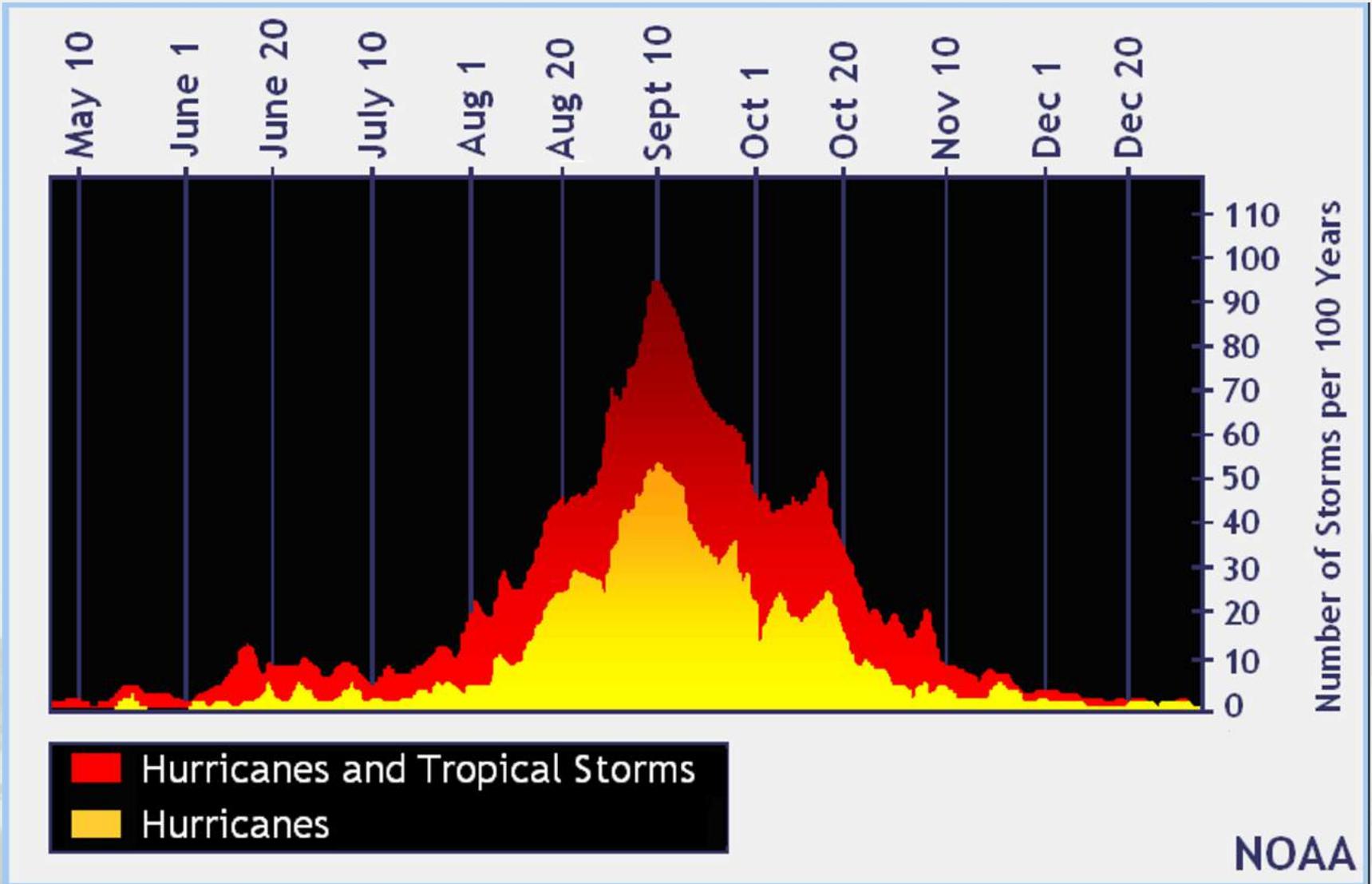
Weaker easterly trade winds
and vertical wind shear

Stronger, wetter
West African
monsoon

Atlantic Main Development Region



Tropical Cyclone Climatology

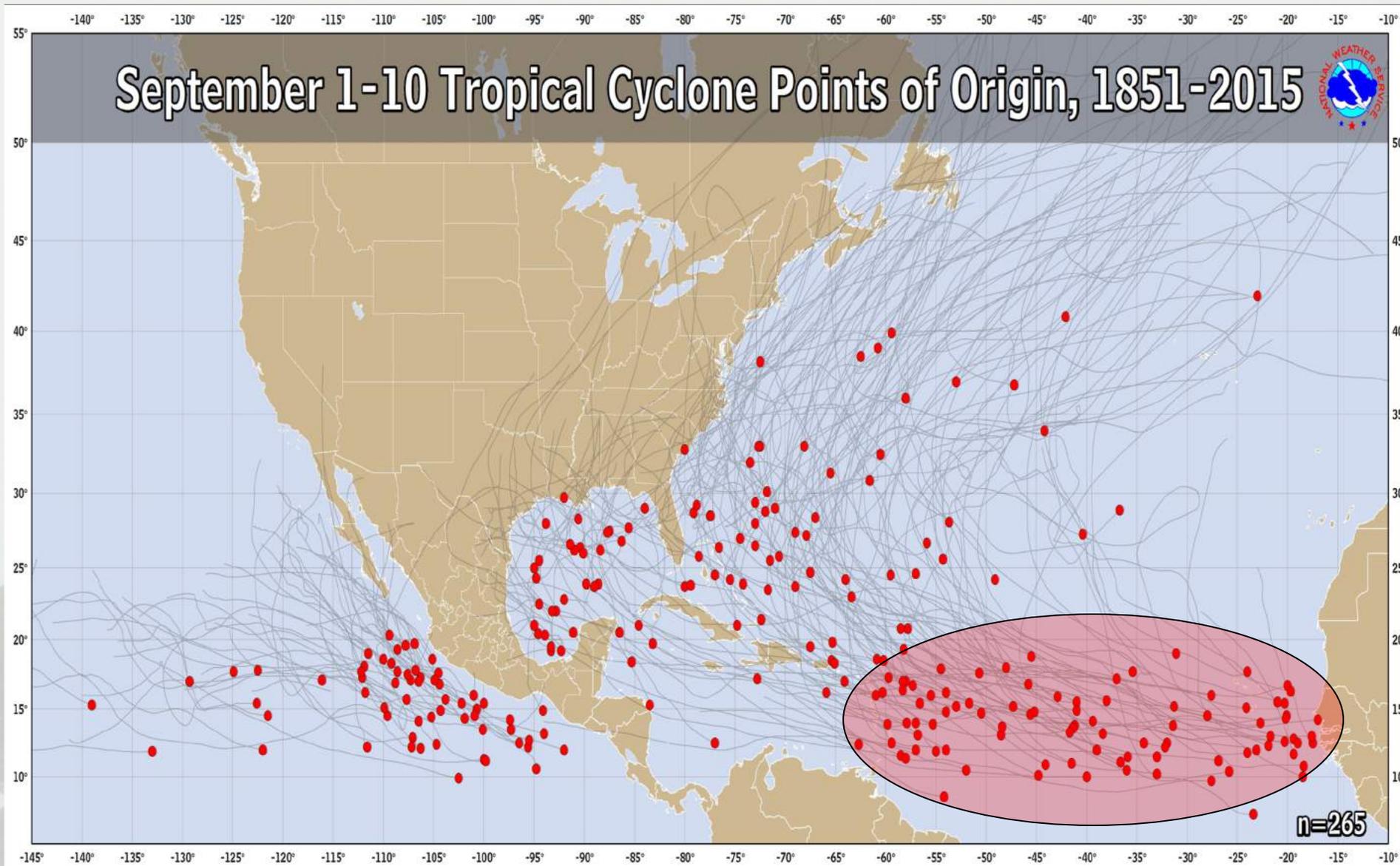




Main Development Region at Peak Season



September 1-10 Tropical Cyclone Points of Origin, 1851-2015





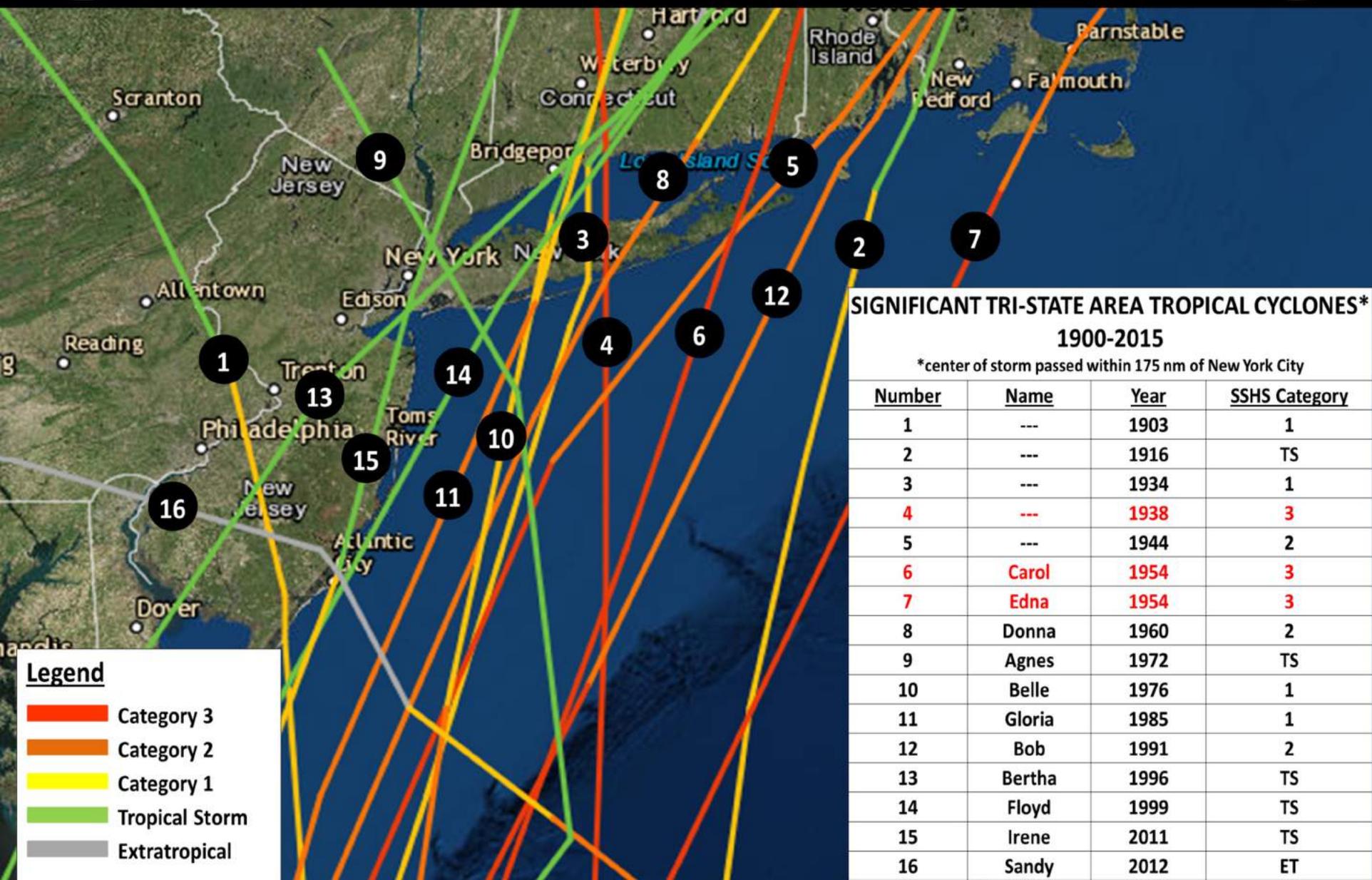
Track and Speed

- Average Track: North-Northeast
- Average Forward Speed: 30-35 mph
 - 1938 (51 mph), Gloria (41 mph), Bob (31 mph), Sandy (20 mph)

In most cases, once the storm is along the East Coast, decisions need to be near **completion!**



Significant Tri-State Area Tropical Cyclones 1900-2015



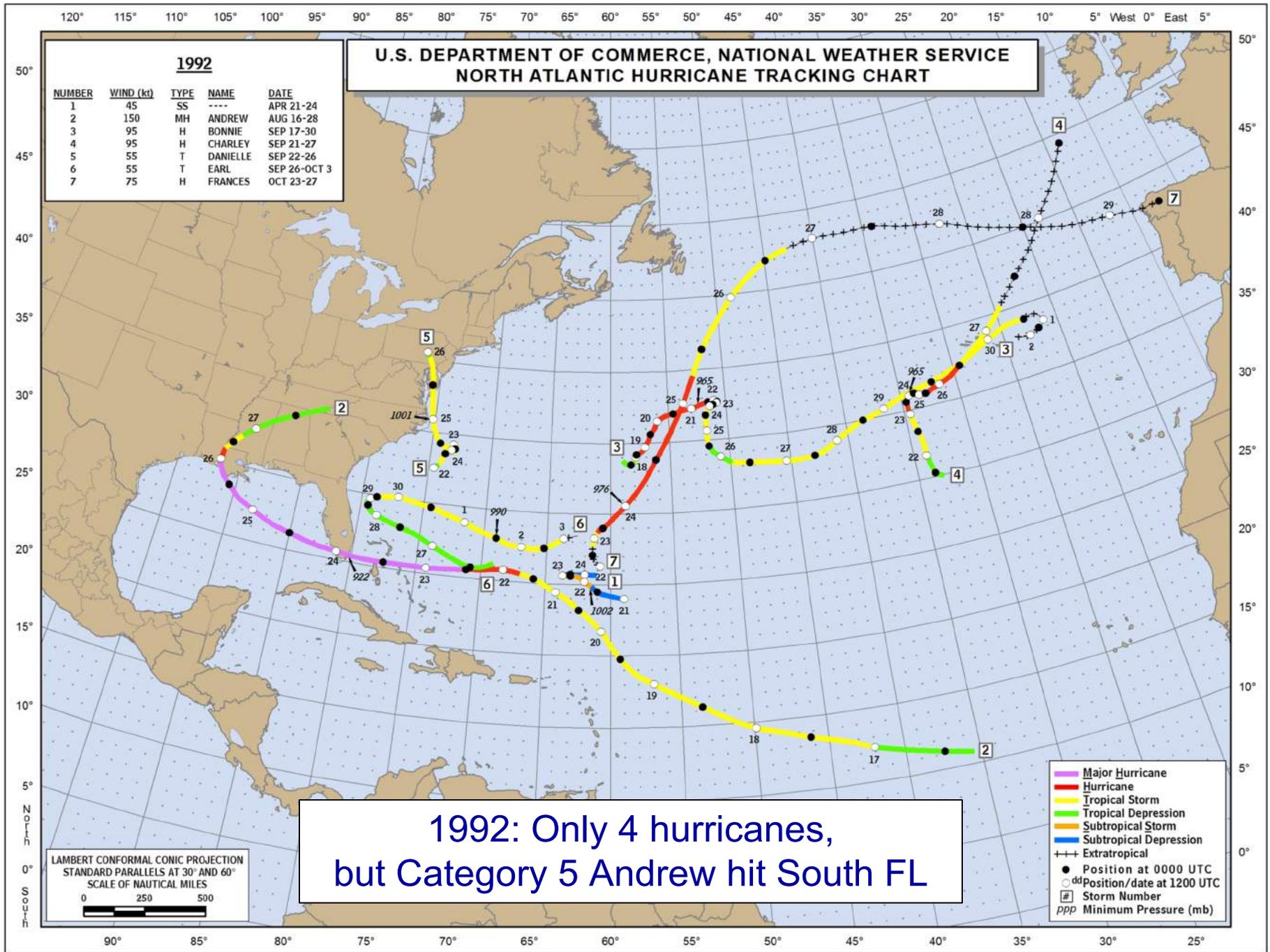
**SIGNIFICANT TRI-STATE AREA TROPICAL CYCLONES*
1900-2015**

*center of storm passed within 175 nm of New York City

<u>Number</u>	<u>Name</u>	<u>Year</u>	<u>SSHS Category</u>
1	---	1903	1
2	---	1916	TS
3	---	1934	1
4	---	1938	3
5	---	1944	2
6	Carol	1954	3
7	Edna	1954	3
8	Donna	1960	2
9	Agnes	1972	TS
10	Belle	1976	1
11	Gloria	1985	1
12	Bob	1991	2
13	Bertha	1996	TS
14	Floyd	1999	TS
15	Irene	2011	TS
16	Sandy	2012	ET

Legend

- █ Category 3
- █ Category 2
- █ Category 1
- █ Tropical Storm
- █ Extratropical



1992

NUMBER	WIND (kt)	TYPE	NAME	DATE
1	45	SS	----	APR 21-24
2	150	MH	ANDREW	AUG 16-28
3	95	H	BONNIE	SEP 17-30
4	95	H	CHARLEY	SEP 21-27
5	55	T	DANIELLE	SEP 22-26
6	55	T	EARL	SEP 26-OCT 3
7	75	H	FRANCES	OCT 23-27

**U.S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART**

LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 250 500

**1992: Only 4 hurricanes,
but Category 5 Andrew hit South FL**

- Major Hurricane
- Hurricane
- Tropical Storm
- Tropical Depression
- Subtropical Storm
- Subtropical Depression
- Extratropical
- Position at 0000 UTC
- Position/date at 1200 UTC
- # Storm Number
- ppp Minimum Pressure (mb)

U.S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE
NORTH ATLANTIC HURRICANE TRACKING CHART

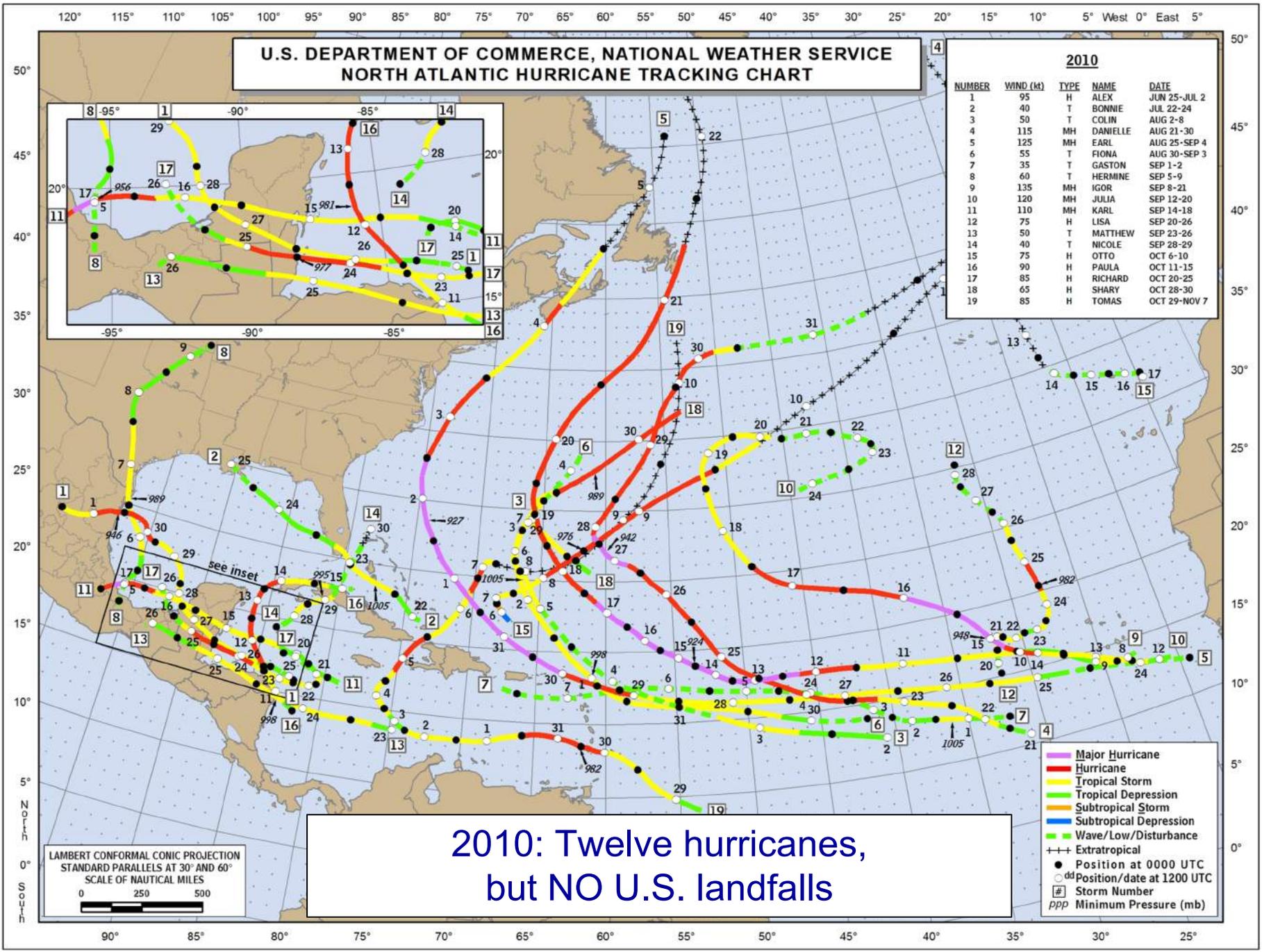
2010

NUMBER	WIND (kt)	TYPE	NAME	DATE
1	95	H	ALEX	JUN 25-JUL 2
2	40	T	BONNIE	JUL 22-24
3	50	T	COLIN	AUG 2-8
4	115	MH	DANIELLE	AUG 21-30
5	125	MH	EARL	AUG 25-SEP 4
6	55	T	FIONA	AUG 30-SEP 3
7	35	T	GASTON	SEP 1-2
8	60	T	HERMINE	SEP 5-9
9	135	MH	IGOR	SEP 8-21
10	120	MH	JULIA	SEP 12-20
11	110	MH	KARL	SEP 14-18
12	75	H	LISA	SEP 20-26
13	50	T	MATTHEW	SEP 23-26
14	40	T	NICOLE	SEP 28-29
15	75	H	OTTO	OCT 6-10
16	90	H	PAULA	OCT 11-15
17	85	H	RICHARD	OCT 20-25
18	65	H	SHARY	OCT 28-30
19	85	H	TOMAS	OCT 29-NOV 7

2010: Twelve hurricanes,
but NO U.S. landfalls

LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS AT 30° AND 60°
SCALE OF NAUTICAL MILES
0 250 500

- Major Hurricane
- Hurricane
- Tropical Storm
- Tropical Depression
- Subtropical Storm
- Subtropical Depression
- Wave/Low/Disturbance
- +++ Extratropical
- Position at 0000 UTC
- Position/date at 1200 UTC
- # Storm Number
- ppp Minimum Pressure (mb)





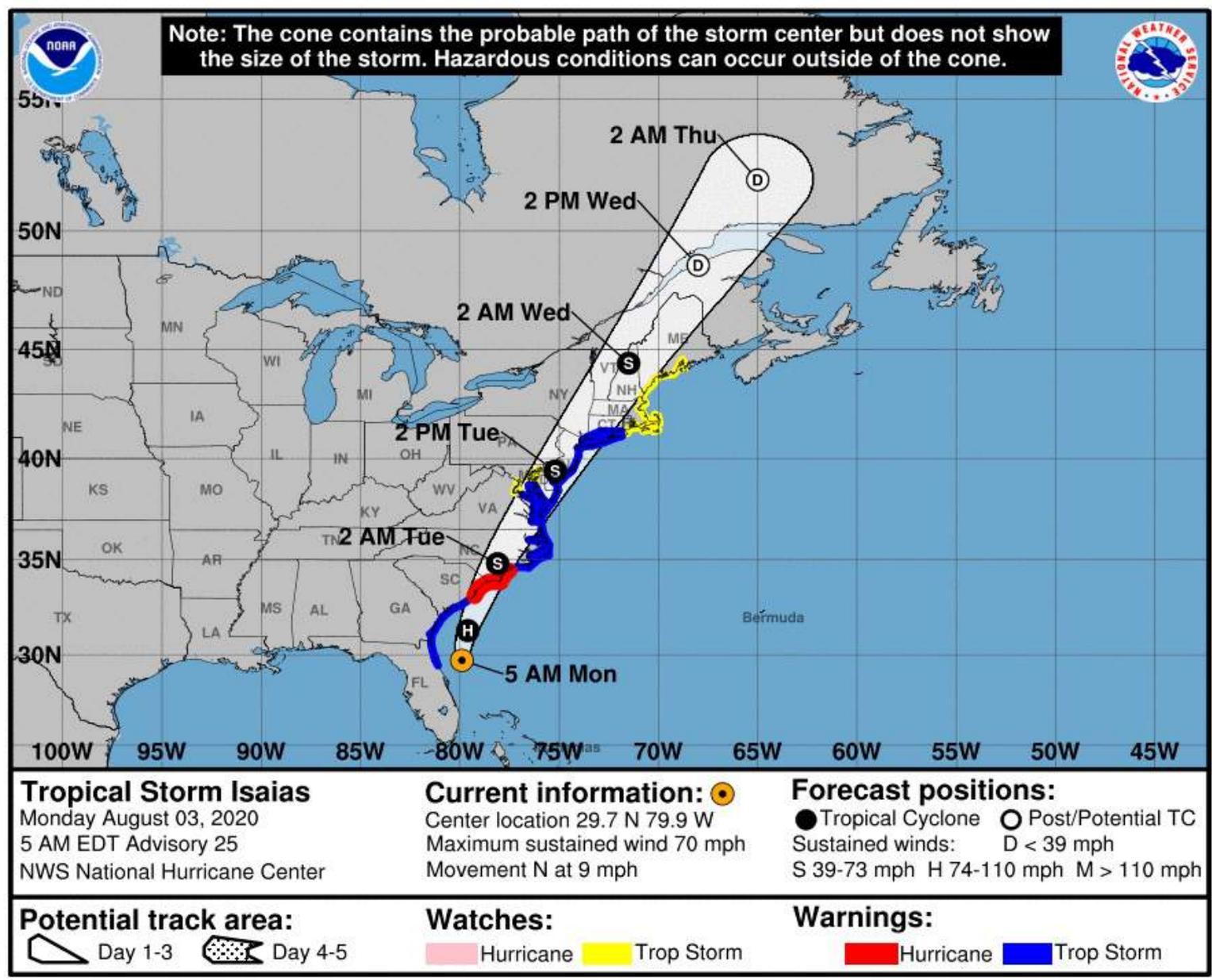
What's the Point?

In the grand scheme of things, numbers are not really important because...

it only takes ONE storm in your community to make it a bad season!



NHC Watch/Warning Philosophy



TC Watch/Warning Definitions

- Hurricane Watch
 - Hurricane conditions are *possible* somewhere within the watch area, generally within 48 hours
- Hurricane Warning
 - Hurricane conditions are *expected* somewhere within the warning area, generally within 36 hours
- The lead time for hurricane watch/warning issuance is tied to the arrival time of *tropical storm force winds*



TC Watch/Warning Definitions

- Tropical Storm Watch
 - Tropical storm conditions are *possible somewhere* within the watch area, generally within 48 hours
- Tropical Storm Warning
 - Tropical storm conditions are *expected somewhere* within the warning area, generally within 36 hours





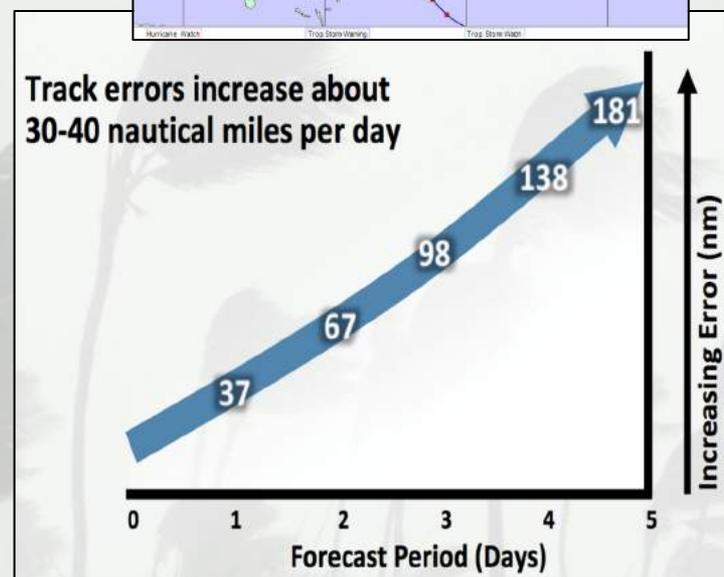
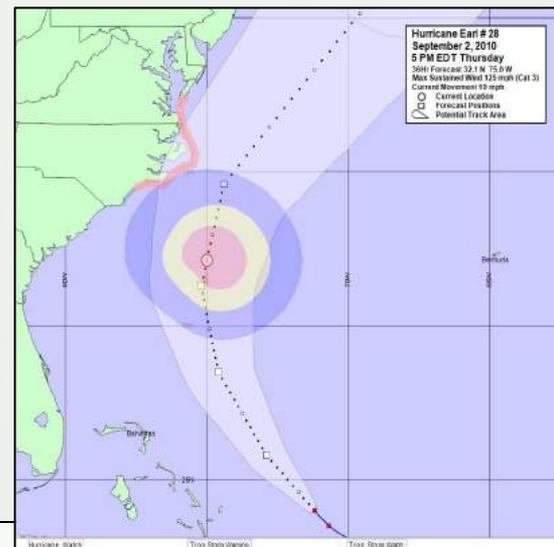
Definition Differences



- These definitions may be different than those used in other programs (e.g., winter) where the probability of occurrence is “very high” before a warning is issued for example
- However, it is somewhat analogous to a tornado warning polygon
 - Within the warning polygon, a tornado is not expected *everywhere*, but the risk of a tornado is high enough for all locations in the polygon that a warning is necessary
- Warnings can (and often should) exist for zones that do not have those wind speeds explicitly forecast
- Watches can remain in place for uncertainty of occurrence, not just timing
 - An area close to but outside the forecast TS wind radii could stay in a TS watch for the entire event
 - TS Warning and Hurricane Watch can be in effect at the same time for the same location

Determining Watch/Warning Placement and Timing

- NHC makes the track, intensity, and wind radii forecast
- NHC forecaster uses the official forecast and an assessment of the uncertainty in track, intensity, and size forecasts to determine the placement of watches and warnings
- Timing is tied to the anticipated arrival of tropical-storm-force winds



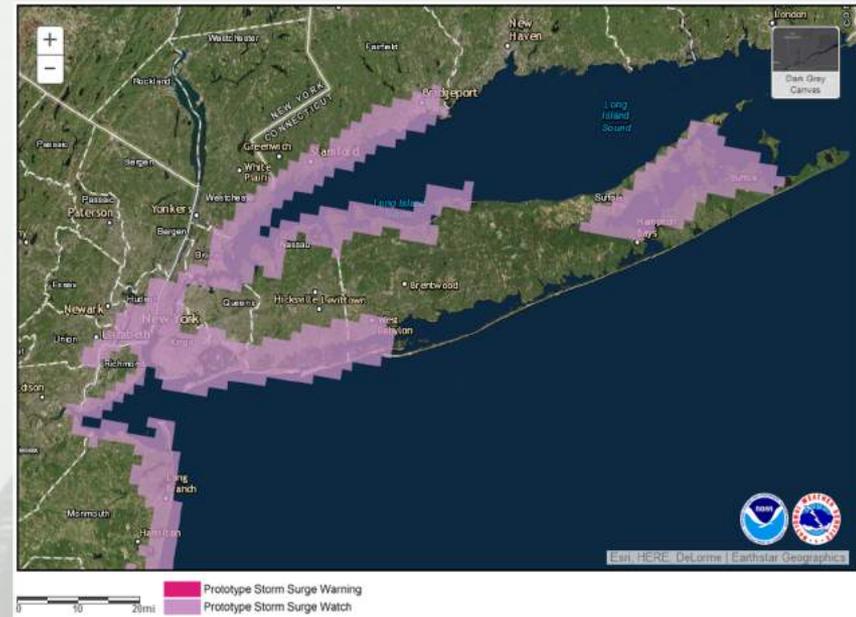
Storm Surge Watch/Warning

- **Storm Surge Warning**

The *danger* of life-threatening inundation from rising water moving inland from the shoreline somewhere within the specified area, generally within *36 hours*.

- **Storm Surge Watch**

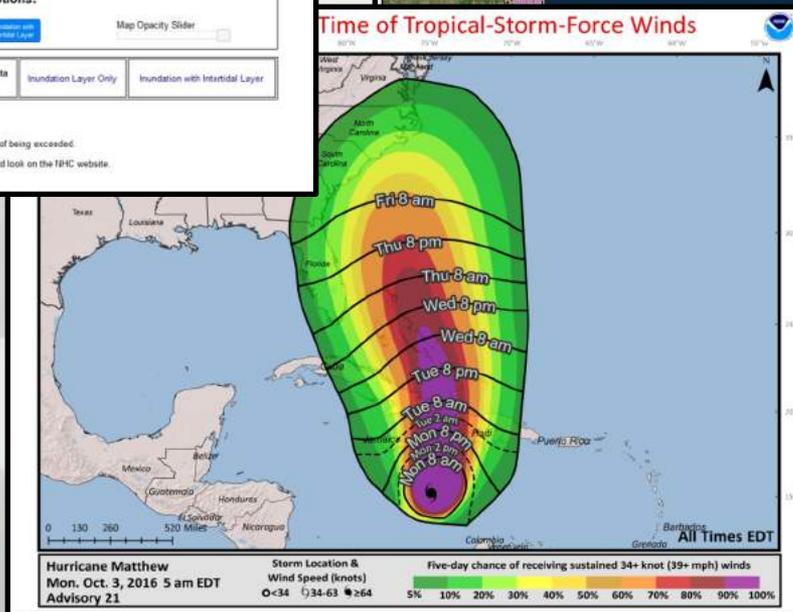
The *possibility* of life-threatening inundation from rising water moving inland from the shoreline somewhere within the specified area, generally within *48 hours*.



*Became Operational in 2017



Key NWS Tropical Products and Services for the 2021 Hurricane Season

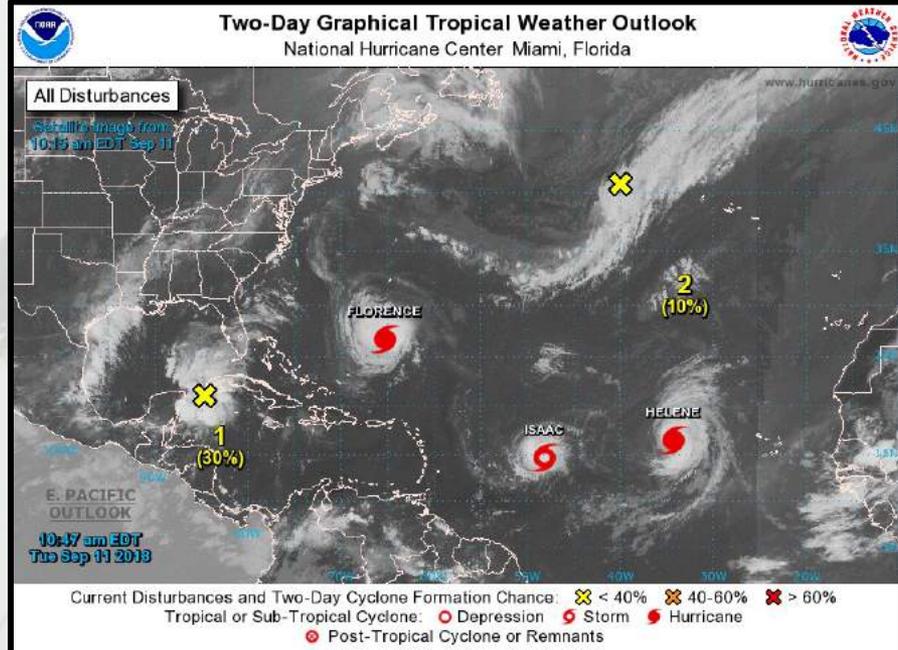
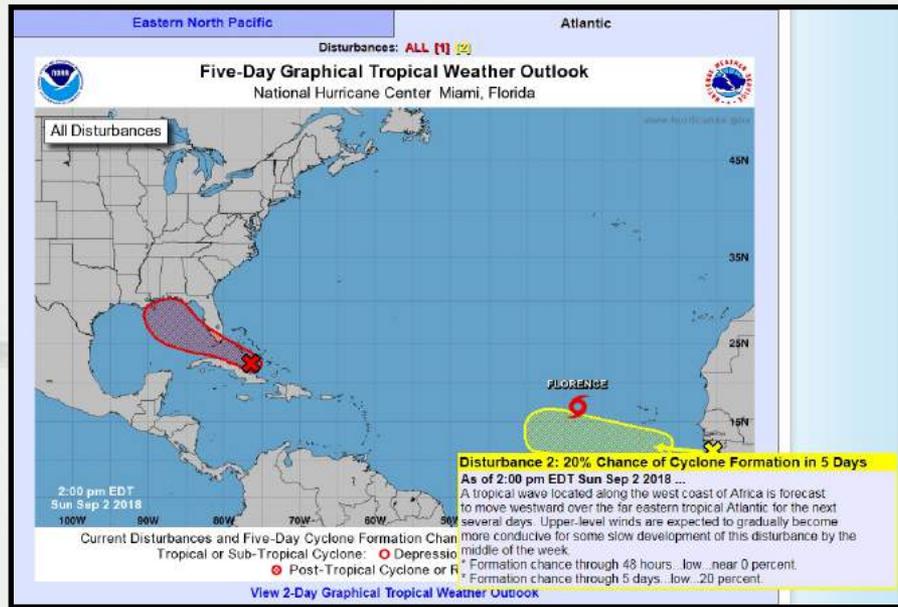




Tropical Weather Outlook



- **Tropical Weather Outlook**
 - Describes the potential for tropical cyclone formation
 - Indicates the likelihood of formation over the next 2 to 5 days
 - **Yellow** – chance of development <40%
 - **Orange** – chance of development 40-60%
 - **Red** – chance of development >60%





5 Day NHC Forecast Track



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.

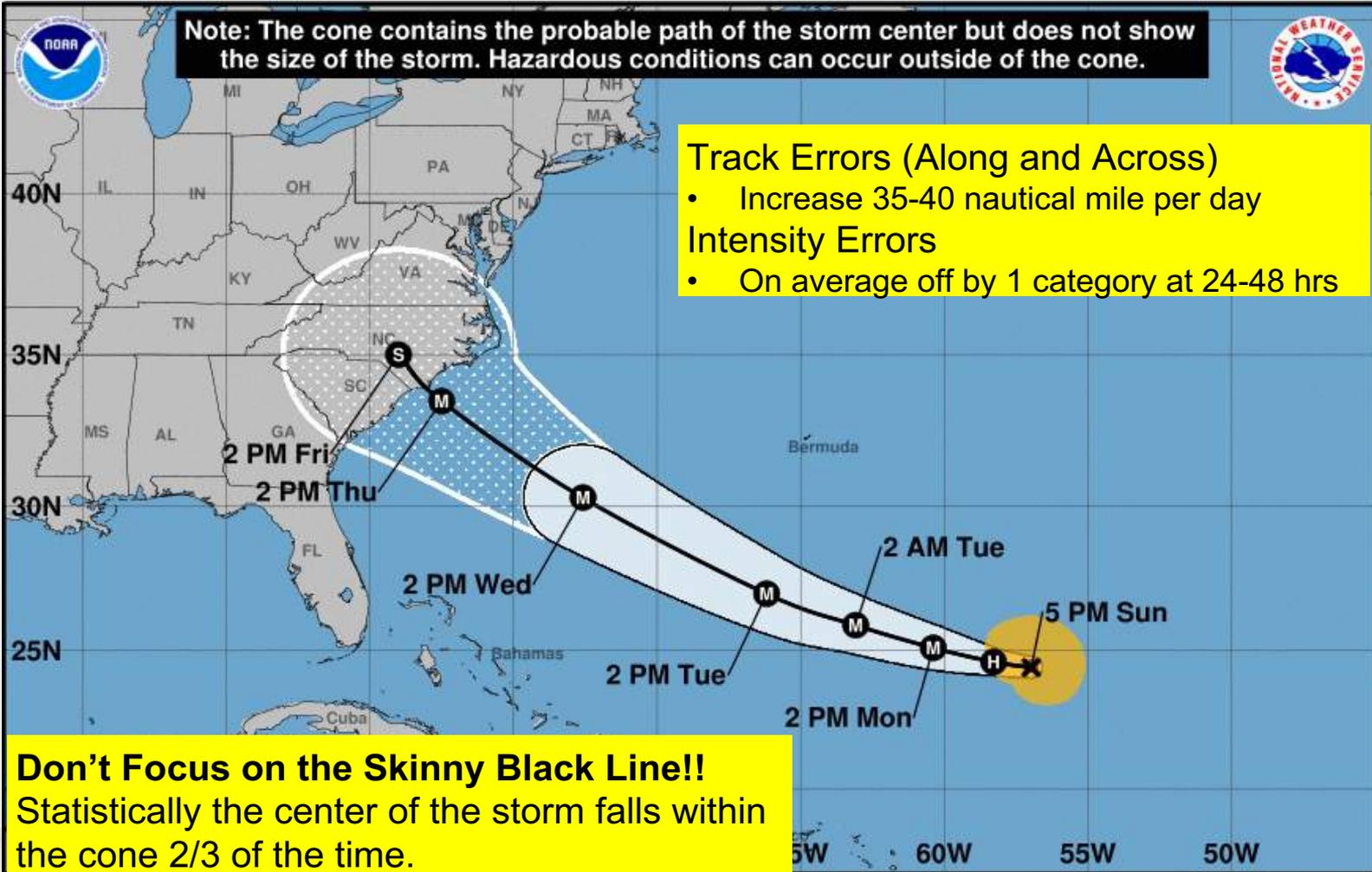


Track Errors (Along and Across)

- Increase 35-40 nautical mile per day

Intensity Errors

- On average off by 1 category at 24-48 hrs



Don't Focus on the Skinny Black Line!!
Statistically the center of the storm falls within the cone 2/3 of the time.

Hurricane Florence
 Sunday September 09, 2018
 5 PM AST Advisory 42
 NWS National Hurricane Center

Current information: x
 Center location 24.4 N 57.0 W
 Maximum sustained wind 85 mph
 Movement W at 7 mph

Forecast positions:
 ● Tropical Cyclone ○ Post/Potential TC
 Sustained winds: D < 39 mph
 S 39-73 mph H 74-110 mph M > 110 mph

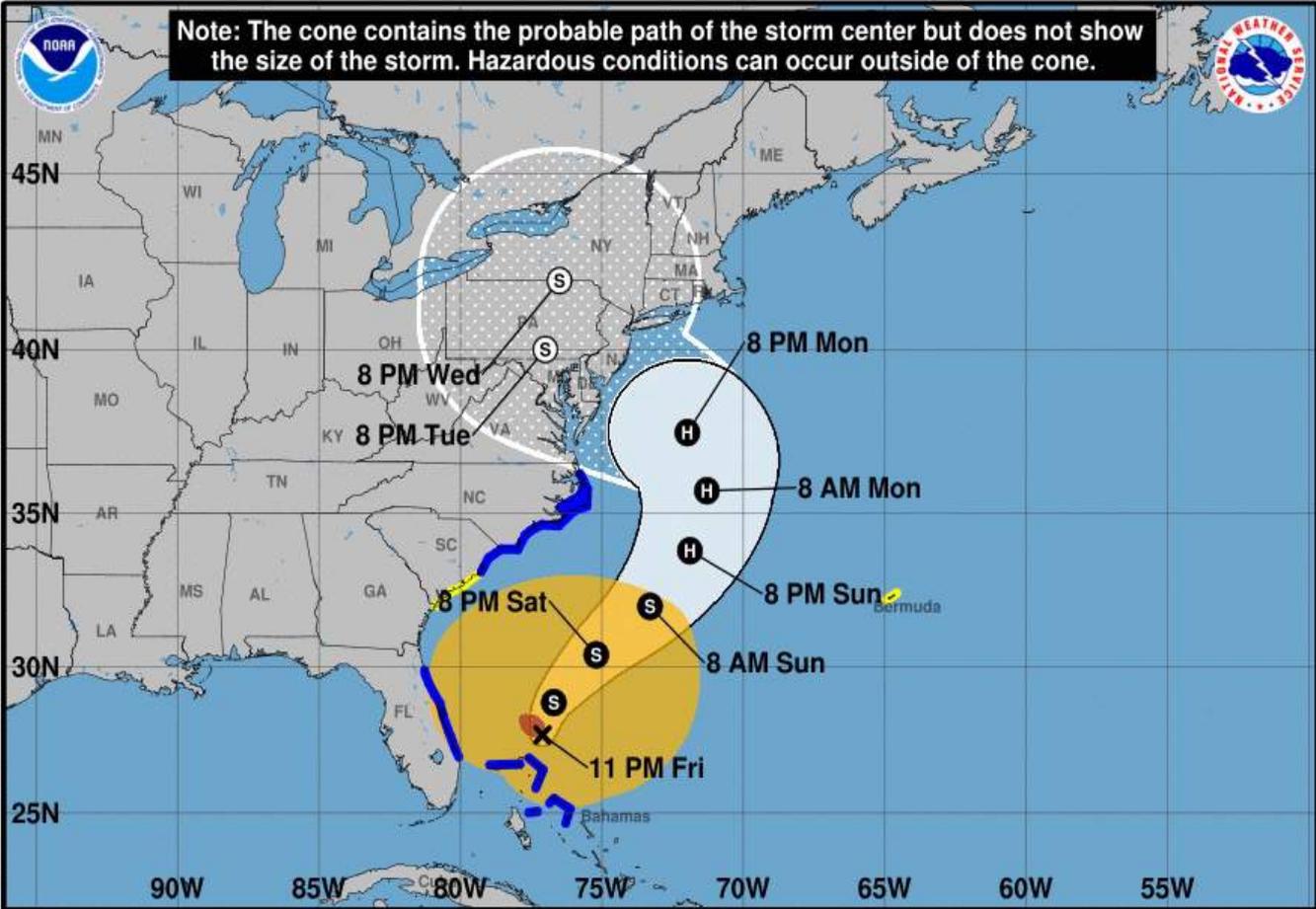
Potential track area: Day 1-3 Day 4-5	Watches: Hurricane Trop Stm	Warnings: Hurricane Trop Stm	Current wind extent: Hurricane Trop Stm
--	--	---	--



Forecast Information



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.

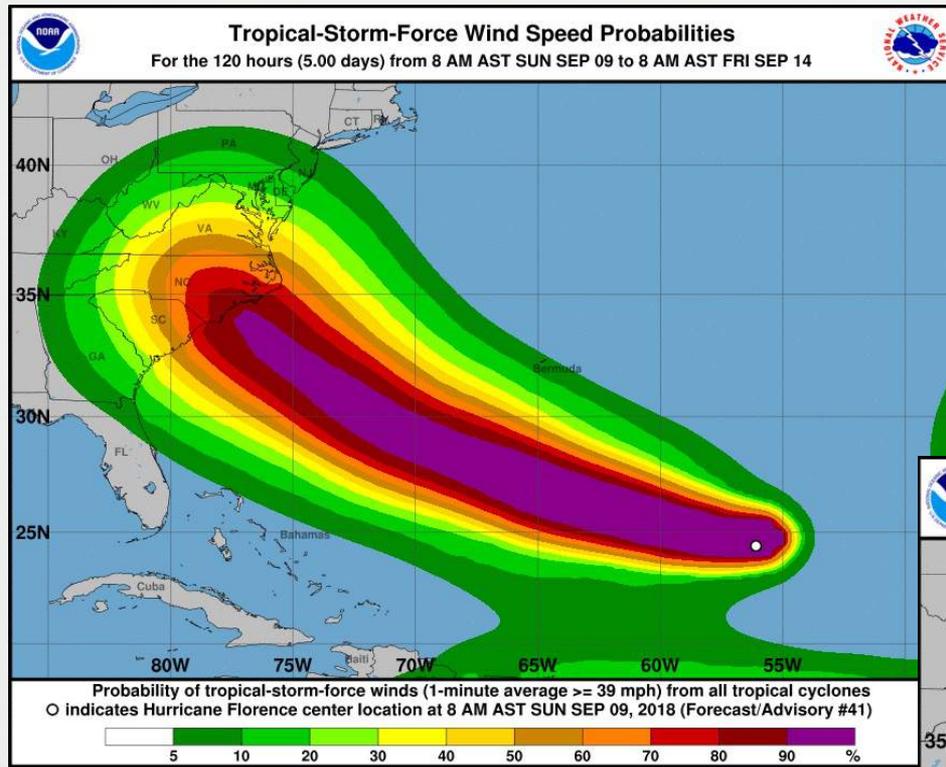


Impacts can and will likely occur outside the cone

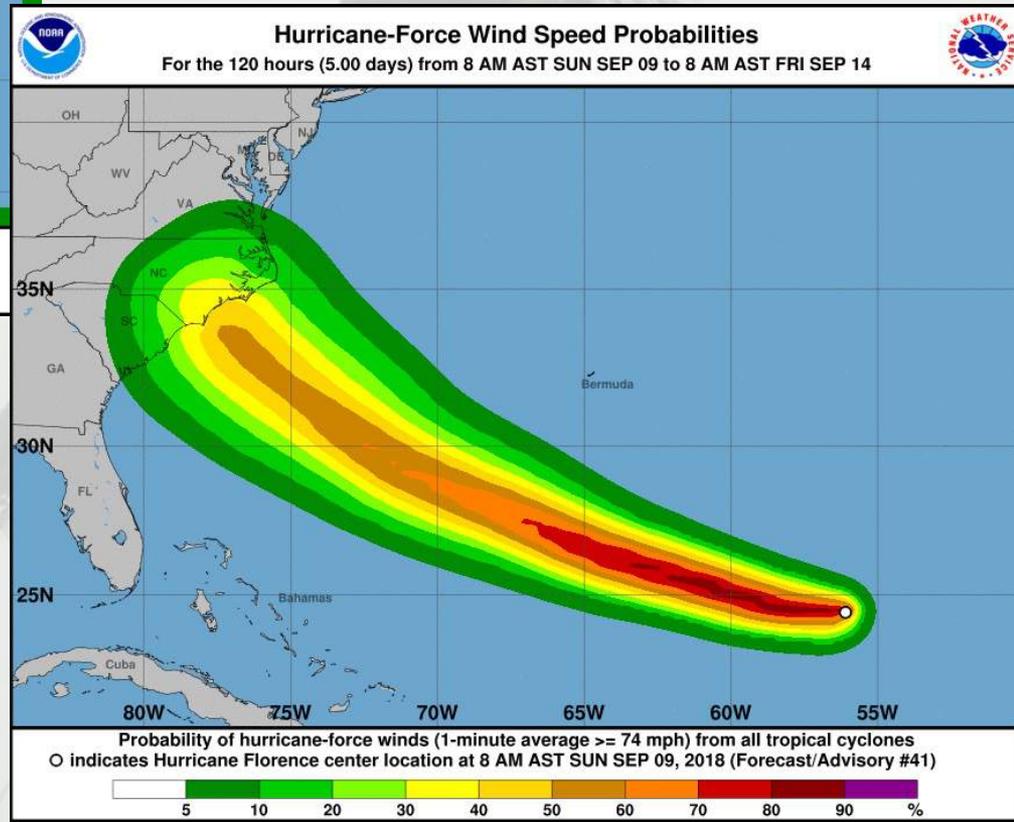
Hurricane Sandy Friday October 26, 2012 11 PM EDT Advisory 19 NWS National Hurricane Center		Current information: x Center location 27.7 N 77.1 W Maximum sustained wind 75 mph Movement N at 7 mph		Forecast positions: ● Tropical Cyclone ○ Post/Potential TC Sustained winds: D < 39 mph S 39-73 mph H 74-110 mph M > 110 mph	
Potential track area: Day 1-3 (solid line) Day 4-5 (dotted line)	Watches: Hurricane (pink) Trop Stm (yellow)	Warnings: Hurricane (red) Trop Stm (blue)	Current wind extent: Hurricane (brown) Trop Stm (orange)		



5 Day Wind Speed Probabilities



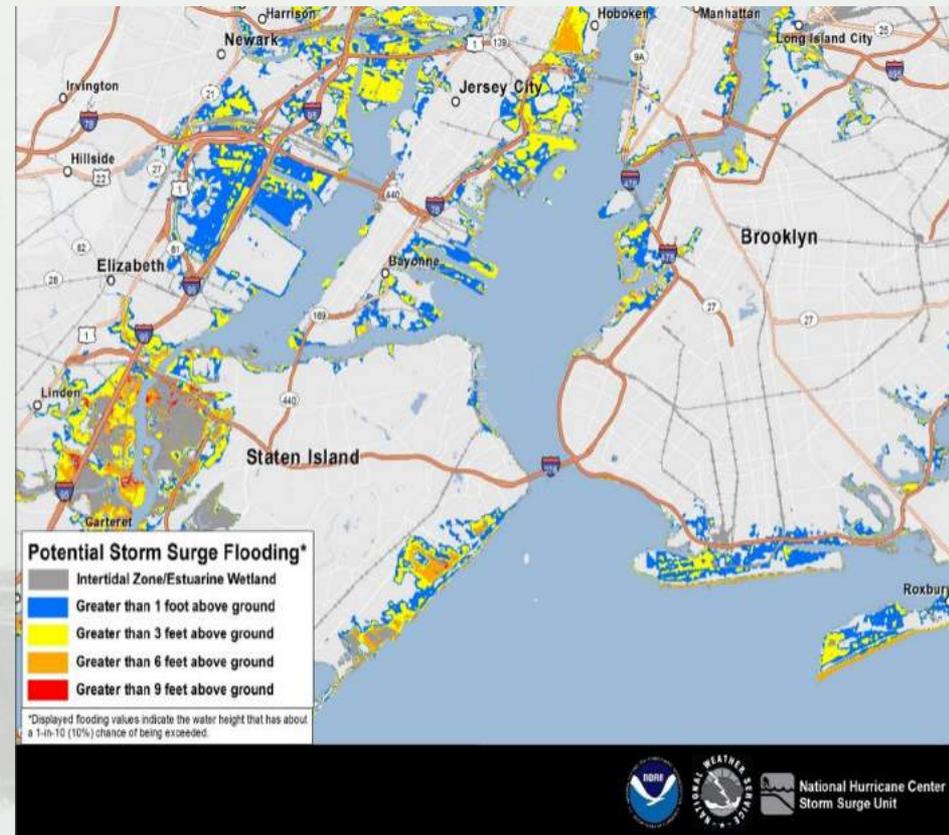
Cumulative Wind Speed Probabilities-
Tell decision makers the chances that the event will happen at any point on the map within 5 days.





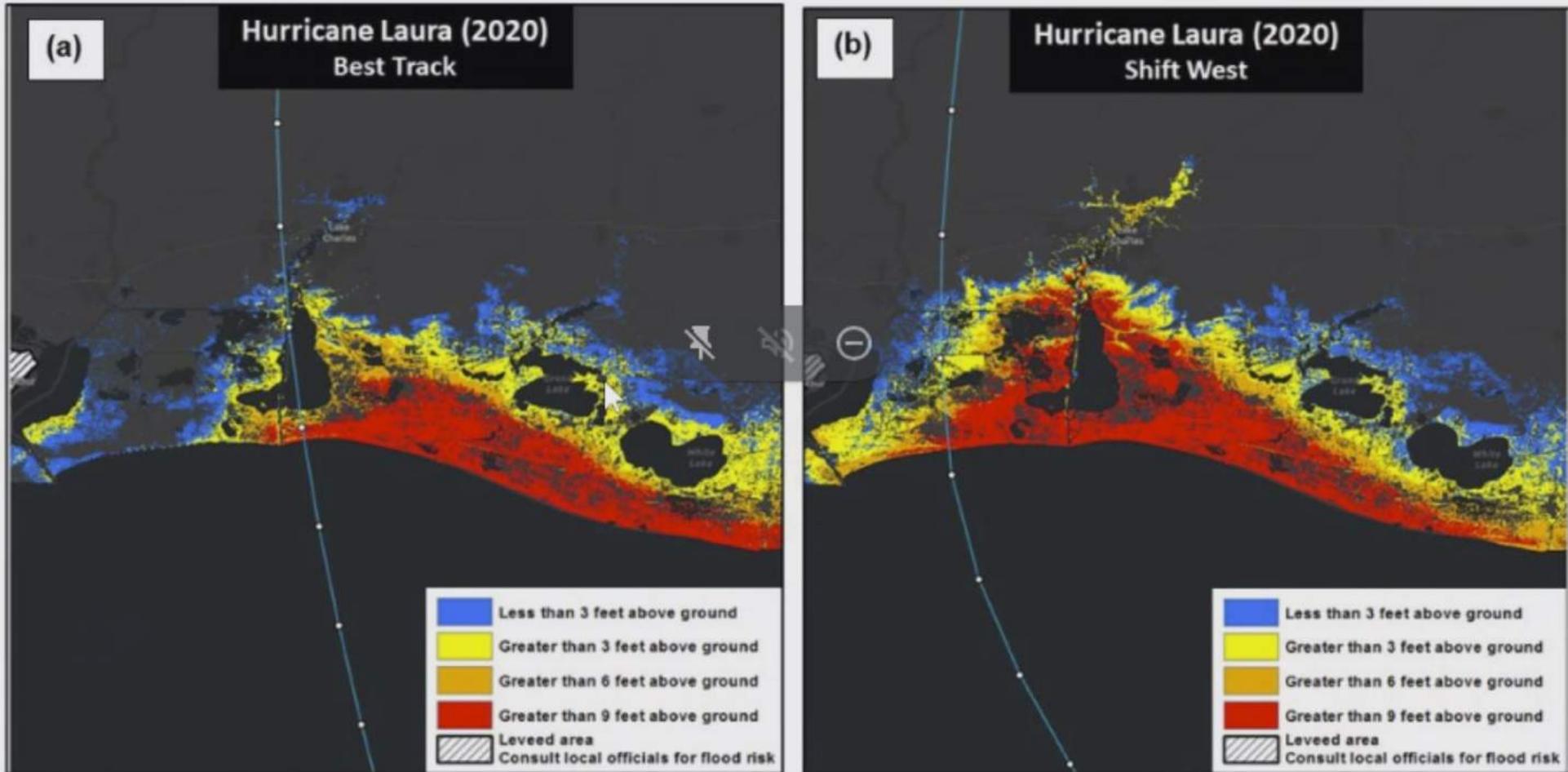
Map of Potential Storm Surge

- Provides a quantitative risk assessment for decision makers.
- Shows height above ground that the water could reach.
- Depicts the reasonable worst-case scenario at any individual location.
- Shows inundation levels that have a 10% chance of being exceeded.
- First map issued at the same time as the initial hurricane watch or in some cases, with a tropical storm watch.
- Available about 60 to 90 minutes following the advisory release.



Small Shifts BIG Changes

A lesson from Hurricane Laura



- A 20-mile westward shift in track would've brought >9 feet surge into Lake Charles, LA.



Communicating Storm Surge Impacts

Experimental Peak Storm Surge Forecast Graphic – 48 hours out



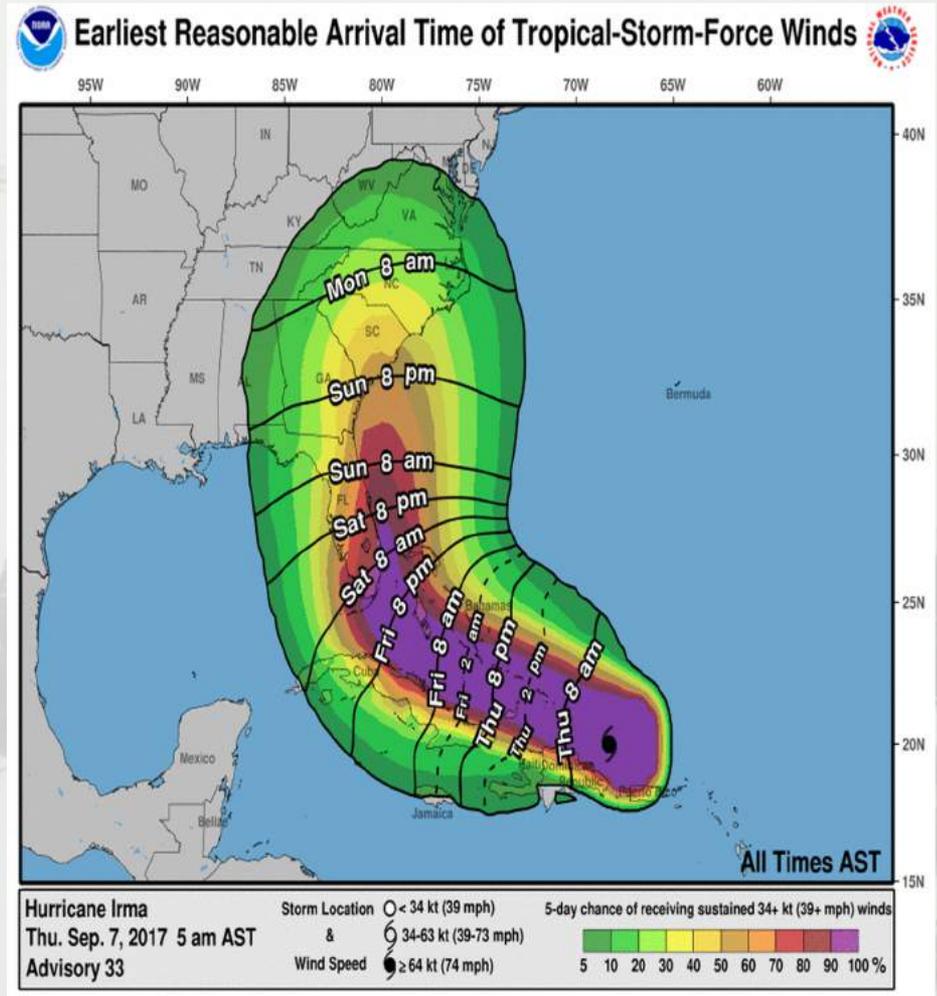
- Visual representation of the peak height the water is expected to reach above normally dry ground somewhere within the specified area.
- Forecaster determined based on objective guidance
- Assumes peak storm surge occurs at high tide

*Started in 2020

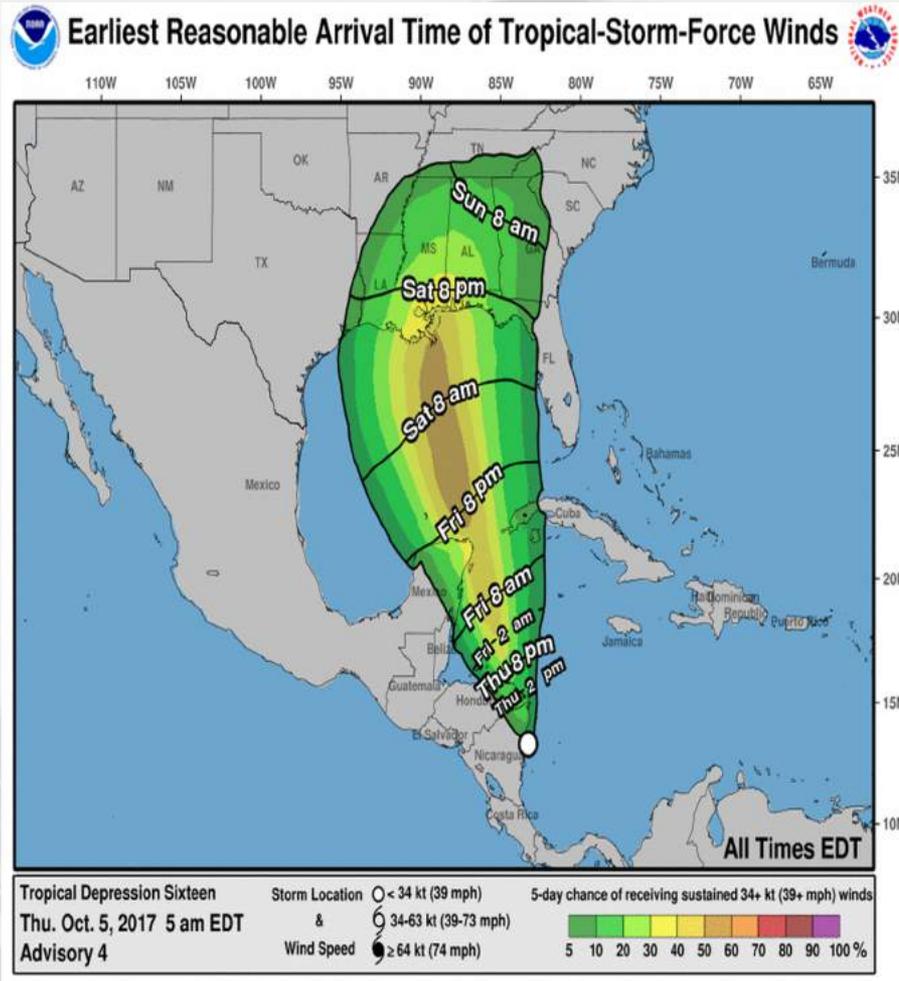
Time of Arrival Graphics

NHC Arrival Timing Graphics

- Preparations become dangerous once winds reach TS force
- Graphics account for forecast uncertainty (track/intensity/size)
- “Earliest Reasonable” graphic - best for users with low tolerance for risk
- “Most Likely” graphic - best for explaining when all preparations should be completed prior to onset of dangerous conditions



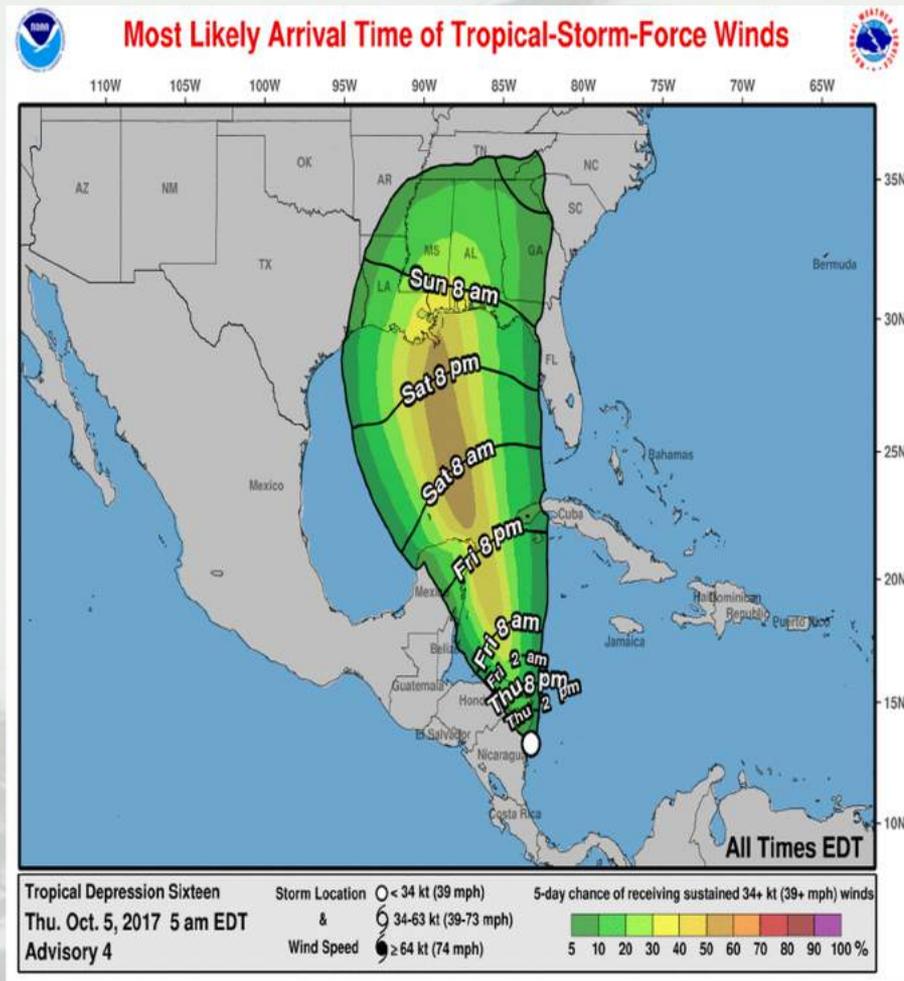
Time of Arrival Graphics



- Shows earliest reasonable arrival time of TS winds (black contours) and cumulative tropical storm-force-wind speed probabilities (colors)
- Identifies the time window that users at individual locations can safely assume will be free from TS winds
 - ≤ 10% chance of seeing sustained TS winds before the indicated time
- Best for users with low tolerance for risk

Earliest Reasonable Arrival of TS Winds

Time of Arrival Graphics



- Shows most likely arrival time of TS winds (black contours) and cumulative TS wind speed probabilities (colors)
- Shows the time before or after which the onset of sustained TS winds is equally likely
- For this example it means “There is a 50% chance of tropical storm-force-winds in Southeast Louisiana arriving prior to or after 8 pm Saturday.”

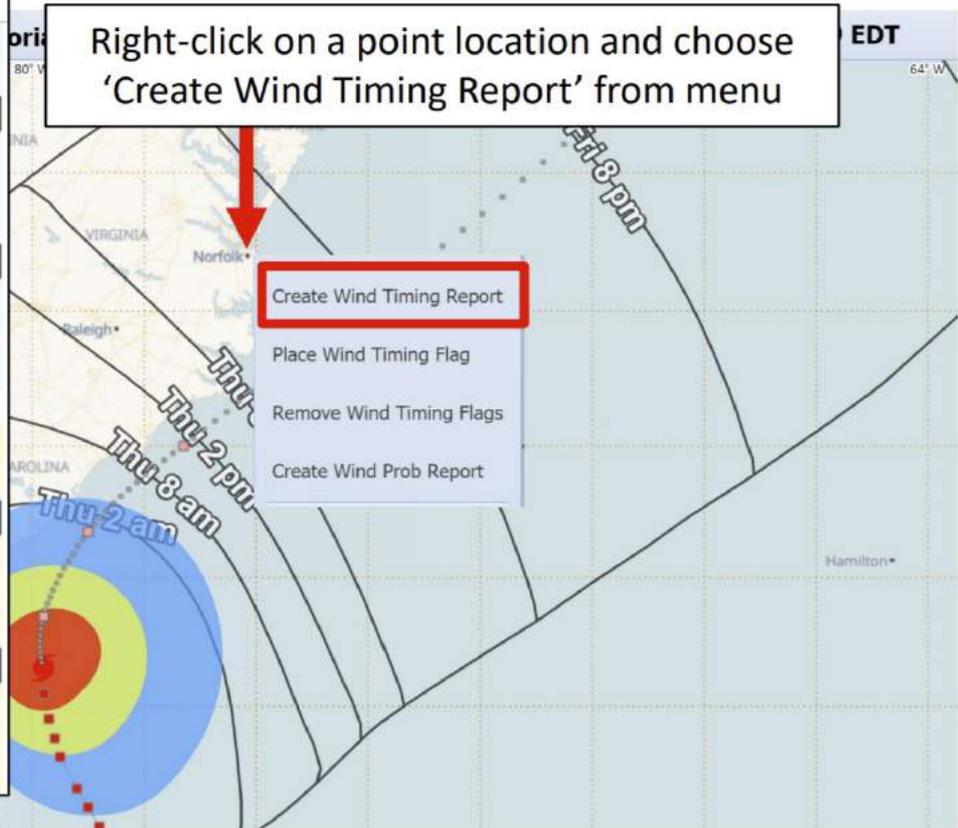
Most Likely Arrival of TS Winds

Time of Departure

This report is relative to the following location: lon: -76.13, lat: 36.84

Tropical Storm (34kt/39mph)				
			5 day total WSP	38%
TIME OF ARRIVAL	DATE	DAY	HOURS	
Earliest Reasonable	9/5 7PM EDT	Thursday	26	
Most Likely	9/6 6AM EDT	Friday	37	
Deterministic	9/6 6AM EDT	Friday	37	
TIME OF DEPARTURE	DATE	DAY	HOURS	
Most Likely	9/6 5PM EDT	Friday	48	
Latest Reasonable	9/7 1AM EDT	Saturday	56	
Deterministic	9/6 5PM EDT	Friday	48	

Strong Tropical Storm (50kt/58mph)				
			5 day total WSP	6%
TIME OF ARRIVAL	DATE	DAY	HOURS	
Earliest Reasonable	9/6 4AM EDT	Friday	35	
Most Likely	9/6 10AM EDT	Friday	41	
Deterministic	No Data	No Data	No Data	
TIME OF DEPARTURE	DATE	DAY	HOURS	
Most Likely	9/6 3PM EDT	Friday	46	
Latest Reasonable	9/6 7PM EDT	Friday	50	
Deterministic	No Data	No Data	No Data	



- Shows approximate end times to Tropical Storm Force Winds
- New Tool for Decision Making
- Available at Hurrevac.com (need have an account)



Where do we Find these products?

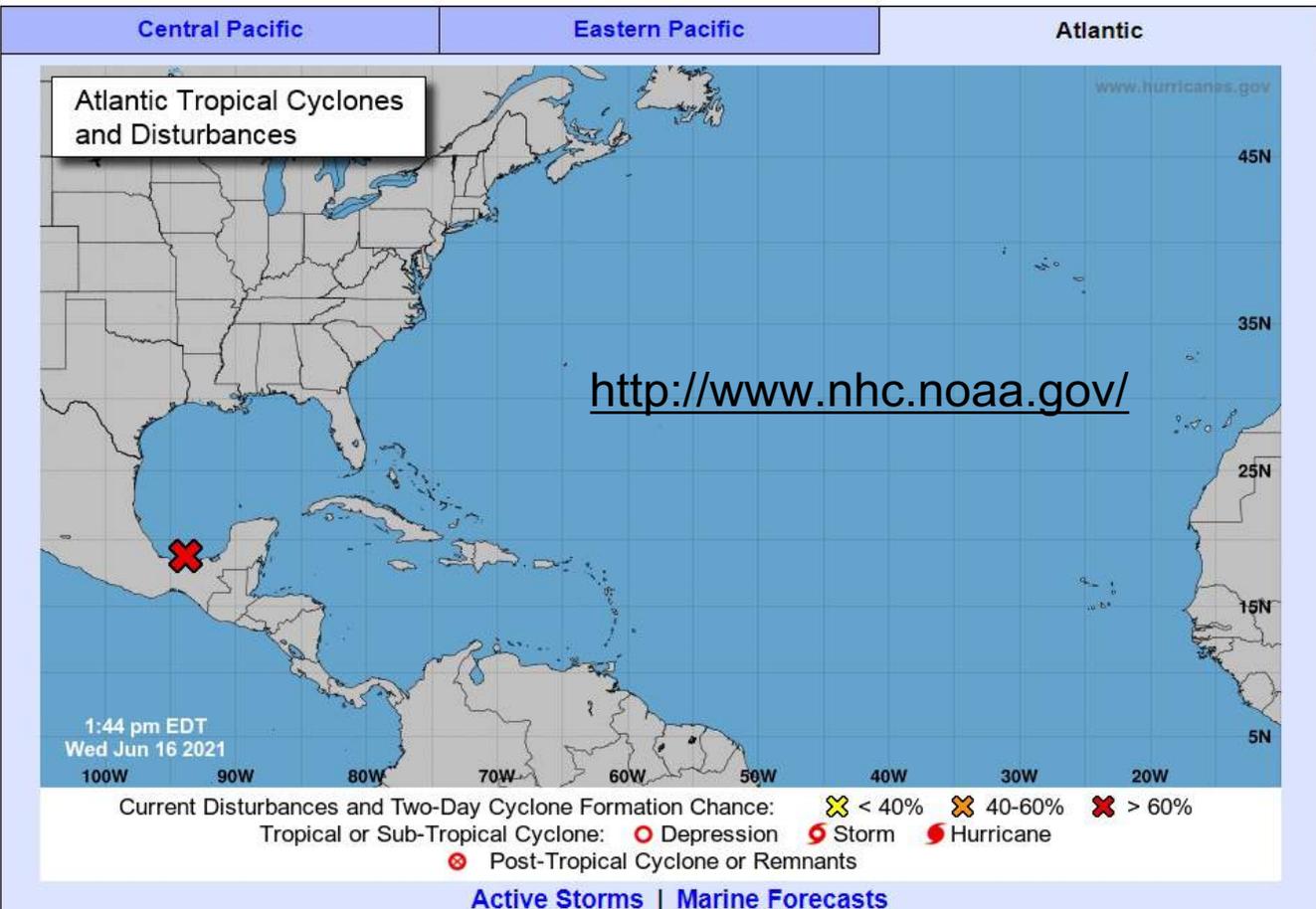


  **NATIONAL HURRICANE CENTER and CENTRAL PACIFIC HURRICANE CENTER**
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

ANALYSES & FORECASTS ▾ DATA & TOOLS ▾ EDUCATIONAL RESOURCES ▾ ARCHIVES ▾ ABOUT ▾ SEARCH ▾

Top News of the Day... [view past news](#) Last update Wed, 16 Jun 2021 18:32:02 UTC

- Last advisory issued on Carlos
- NOAA predicts another active Atlantic hurricane season
- Near- or below-normal 2021 hurricane season predicted for the Central Pacific
- Hurricane Preparedness 2021



Where do we find these products?

<http://www.weather.gov/nyc>

- Headlines
- Map detailing hazards in effect (Point and Click for Forecast and Hazard Information)
- Link to Local Tropical Weather Page

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HOME FORECAST PAST WEATHER SAFETY INFORMATION EDUCATION NEWS SEARCH ABOUT

Local forecast by "City, ST" or ZIP code
Enter location ... Go

News Headlines
• [Regional Weather Summary](#)

Location Help

NWS Forecast Office New York, NY
Weather office New York, NY

New York, NY
Weather Forecast Office

Current Hazards Current Conditions Radar Forecasts Rivers and Lakes Climate and Past Weather Local Programs

Click on the map below to zoom in.

There are no watches, warnings, or advisories at this time.

Last Map Update: Tue, Sep. 15, 2015 at 2:19:28 pm EDT

Radar Current Weather Rivers & Lakes Satellite Weather Information Display Forecast Maps

Hour by Hour Forecast Text Forecasts Forecast Discussion Weather Hazard Briefing Submit a Storm Report Skywarn



NWS New York Tropical Page



Welcome to the NWS New York, NY Tropical Weather Page

[Weather.gov](#) > [New York, NY](#) > Welcome to the NWS New York, NY Tropical Weather Page

New York, NY
Weather Forecast Office

[Current Hazards](#) [Current Conditions](#) [Radar](#) [Forecasts](#) [Rivers and Lakes](#) [Climate and Past Weather](#) [Local Programs](#)

Outlook

Threats and Impacts

Satellite

Radar

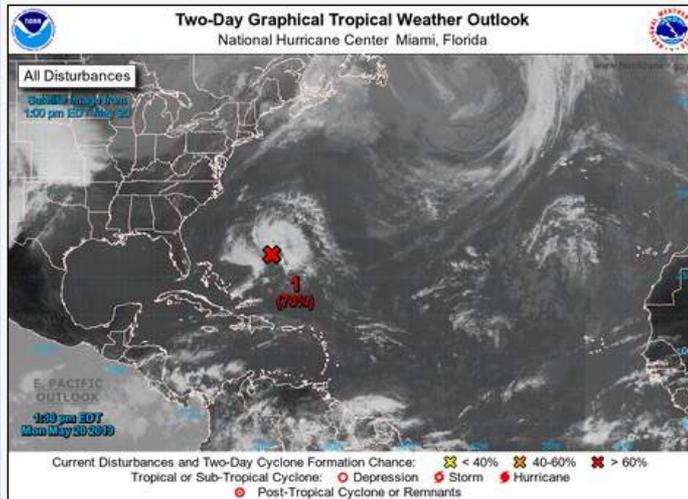
Social Media

Preparedness

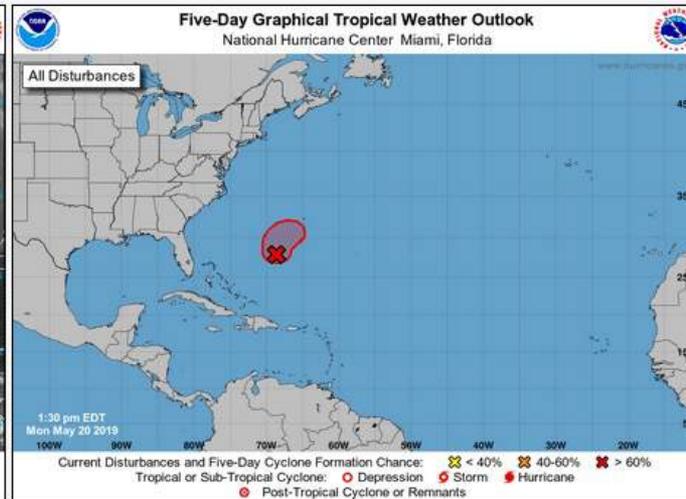
Links

There are currently no active storms in the North Atlantic, Caribbean Sea, or Gulf of Mexico.

Local Briefing from the National Weather Service office in New York



[Product Description](#)



[Product Description](#)

Click each image above to view the full-size image.

Special Tropical Weather Outlook
NWS National Hurricane Center Miami FL
130 PM EDT Mon May 20 2019

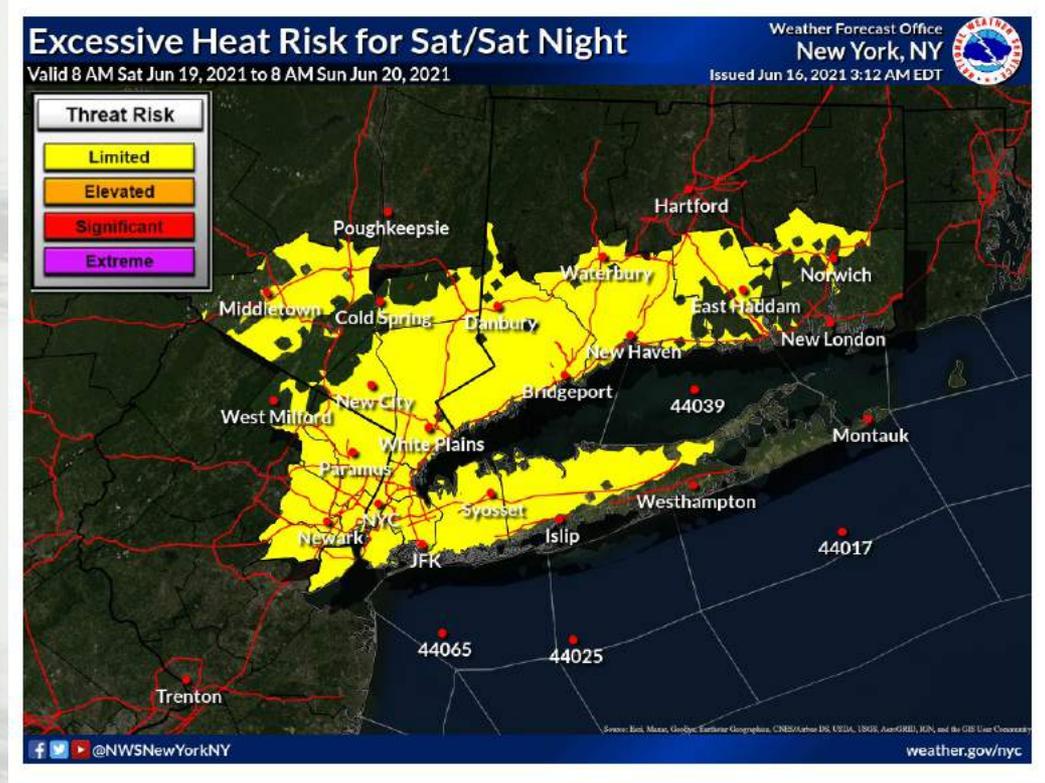
<https://www.weather.gov/okx/tropical>

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

Showers and thunderstorms associated with a broad area of low pressure located several hundred miles southwest of Bermuda are showing signs of organization. Although recent satellite wind data suggest that the system currently lacks a well-defined center of circulation, environmental conditions are expected to be conducive for the formation of a short-lived subtropical or tropical cyclone later today or tonight. Conditions are forecast to become unfavorable for further development by late Tuesday, and the disturbance is expected to merge with a cold front on Wednesday.

Graphical Hazardous Weather Outlook

- First assessment of potential hazards
- Working on how to use this for messaging during tropical systems to be consistent with the HTI



Public **Marine**

24 Hr Hazard Risks	Day 1	Thu	Fri	Sat	Sun	Mon	Tue
High Surf	Green	Green					
Rip Current	Yellow	Yellow					
Marine Hazard	Yellow	Yellow	Orange	Orange	Yellow	Yellow	Orange

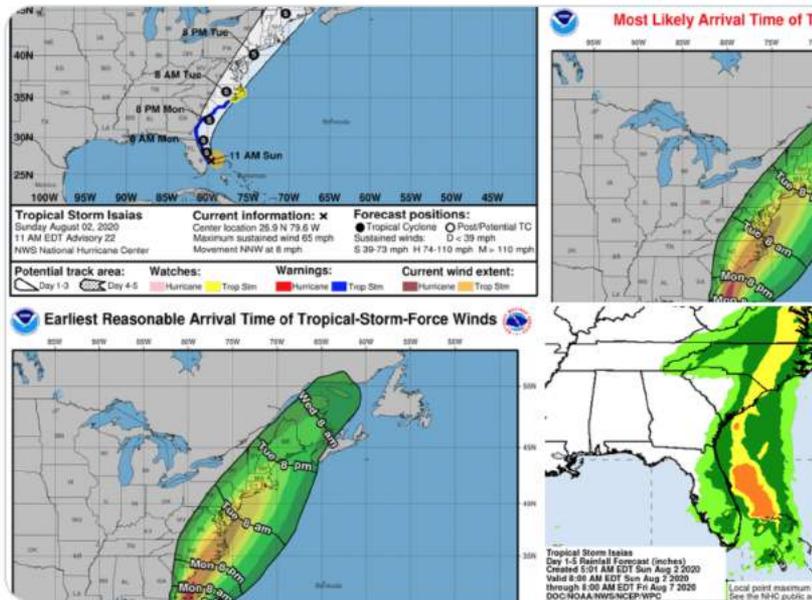


Social Media



NWS New York NY
@NWSNewYorkNY

The latest #Isaias track from National Hurricane Center takes it over the area Tue morning. 30-40% chance of tropical storm force winds most likely beginning Tue evening, but could start as early as late Tue afternoon. 2-4" of rainfall for much of the ar



11:46 AM · Aug 2, 2020 · Twitter Web App



NWS New York NY
@NWSNewYorkNY

Here is our latest overview of impacts for Tropical Storm Isaias. Tropical Storm Watches and Warnings are issued for the entire region with heavy rain, coastal flooding, and strong winds being just some of the expected threats through Tuesday evening. #NYwx #NJwx #CTwx



9:39 AM · Aug 3, 2020 · Twitter Web App

Becoming a Weather-Ready Nation Relies on the NWS

Connecting Forecasts to Decisions Based on Impact-Based Decision Support Services

Generating forecasts and warnings



Connecting those forecasts/warnings with partner decision-making process



Impact-based
Decision
Support
Services



The best hydrometeorological forecasting in the world

Practice, practice, practice!



Develop relationships / know partner needs



Embed



Realizing Intrinsic Value and Mission Success

Trust



“Ready, Responsive, Resilient”



Contact US



- David Wally, Tropical Team Lead and Lead Meteorologist david.wally@noaa.gov
- Nelson Vaz, Warning Coordination Meteorologist
nelson.vaz@noaa.gov
- Ross Dickman, Meteorologist In Charge
i.ross.dickman@noaa.gov