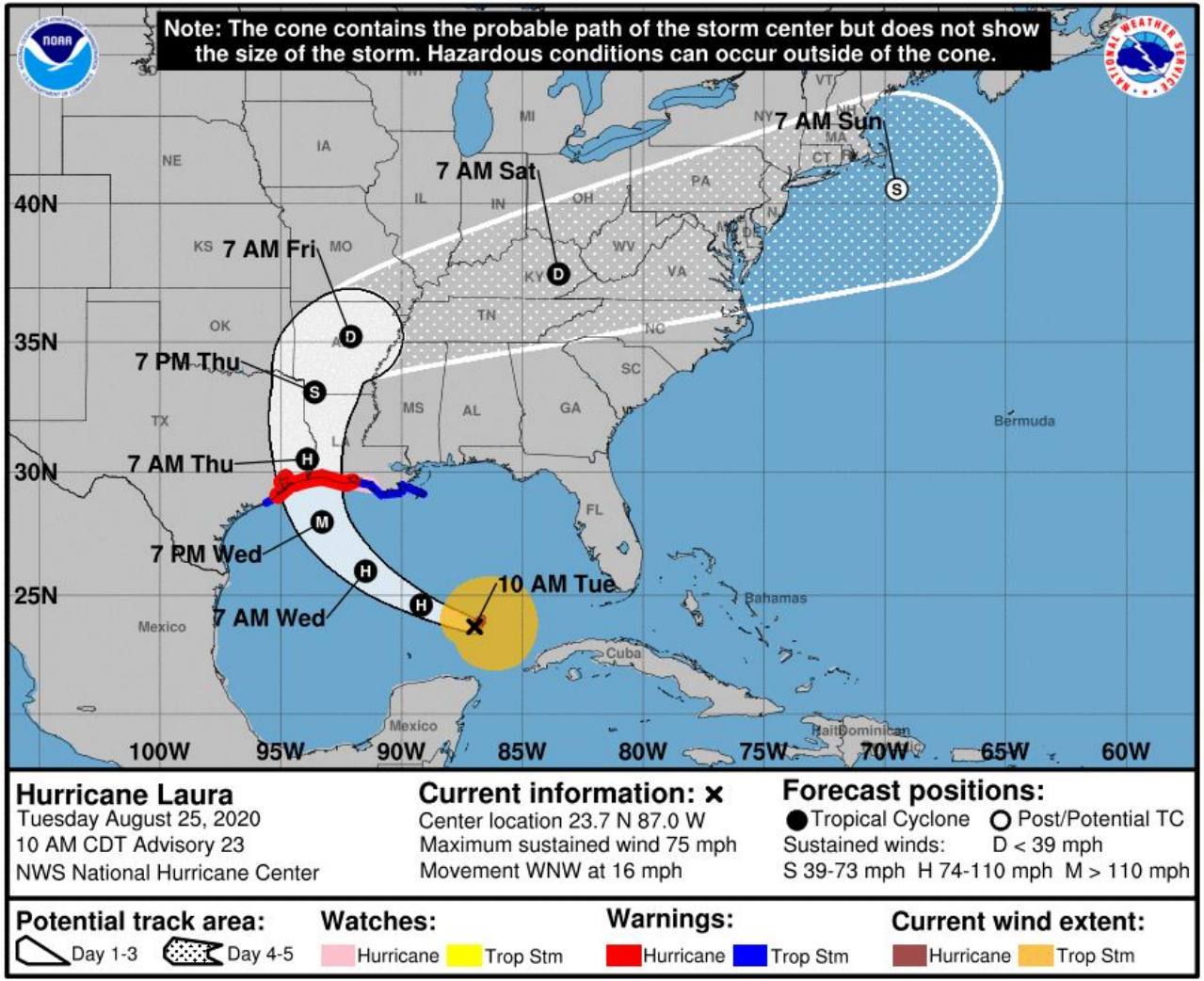


Hurricane Laura
Tuesday August 25, 2020
10 AM CDT Advisory 23
NWS National Hurricane Center

Current information: ×
Center location 23.7 N 87.0 W
Maximum sustained wind 75 mph
Movement WNW at 16 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

This graphic shows an approximate representation of coastal areas under a hurricane warning (red), hurricane watch (pink), tropical storm warning (blue) and tropical storm watch (yellow). The orange circle indicates the current position of the center of the tropical cyclone. The black line and dots show the National Hurricane Center (NHC) forecast track of the center at the times indicated. The dot indicating the forecast center location will be black if the cyclone is forecast to be tropical and will be white with a black outline if the cyclone is forecast to be extratropical. If only an L is displayed, then the system is forecast to be a remnant low. The letter inside the dot indicates the NHC's forecast intensity for that time:

D: Tropical Depression – wind speed less than 39 MPH
S: Tropical Storm – wind speed between 39 MPH and 73 MPH
H: Hurricane – wind speed between 74 MPH and 110 MPH
M: Major Hurricane – wind speed greater than 110 MPH

NHC tropical cyclone forecast tracks can be in error. This forecast uncertainty is conveyed by the track forecast "cone", the solid white and stippled white areas in the graphic. The solid white area depicts the track forecast uncertainty for days 1-3 of the forecast, while the stippled area depicts the uncertainty on days 4-5. Historical data indicate that the entire 5-day path of the center of the tropical cyclone will remain within the cone about 60-70% of the time. To form the cone, a set of imaginary circles are placed along the forecast track at the 12, 24, 36, 48, 60, 72, 96, and 120 h positions, where the size of each circle is set so that it encloses 67% of the previous five years official forecast errors. The cone is then formed by smoothly connecting the area swept out by the set of circles.

It is also important to realize that a tropical cyclone is not a point. Their effects can span many hundreds of miles from the center. The area experiencing hurricane force (one-minute average wind speeds of at least 74 mph) and tropical storm force (one-minute average wind speeds of 39-73 mph) winds can extend well beyond the white areas shown enclosing the most likely track area of the center. The distribution of hurricane and tropical storm force winds in this tropical cyclone can be seen in the Cumulative Wind History Graphic described below.

Considering the combined forecast uncertainties in track, intensity, and size, the chances that any particular location will experience winds of 34 kt (tropical storm force), 50 kt, or 64 kt (hurricane force) from this tropical cyclone are presented in graphical form and in tabular form for selected locations and forecast positions.

Graphics for Atlantic tropical cyclones are normally issued every six hours at 5:00 AM EDT, 11:00 AM EDT, 5:00 PM EDT, and 11:00 PM EDT (or 4:00 AM EST, 10:00 AM EST, 4:00 PM EST, and 10:00 PM EST).

Graphics for Eastern Pacific tropical cyclones are normally issued every six hours at 2:00 AM PDT, 8:00 AM PDT, 2:00 PM PDT, and 8:00 PM PDT (or 1:00 AM PST, 7:00 AM PST, 1:00 PM PST, and 7:00 PM PST).

The graphics also will be updated when intermediate public advisories are issued, and special graphics may be issued at any time due to significant changes in warnings or in the cyclone.

Definition of the NHC Track Forecast Cone

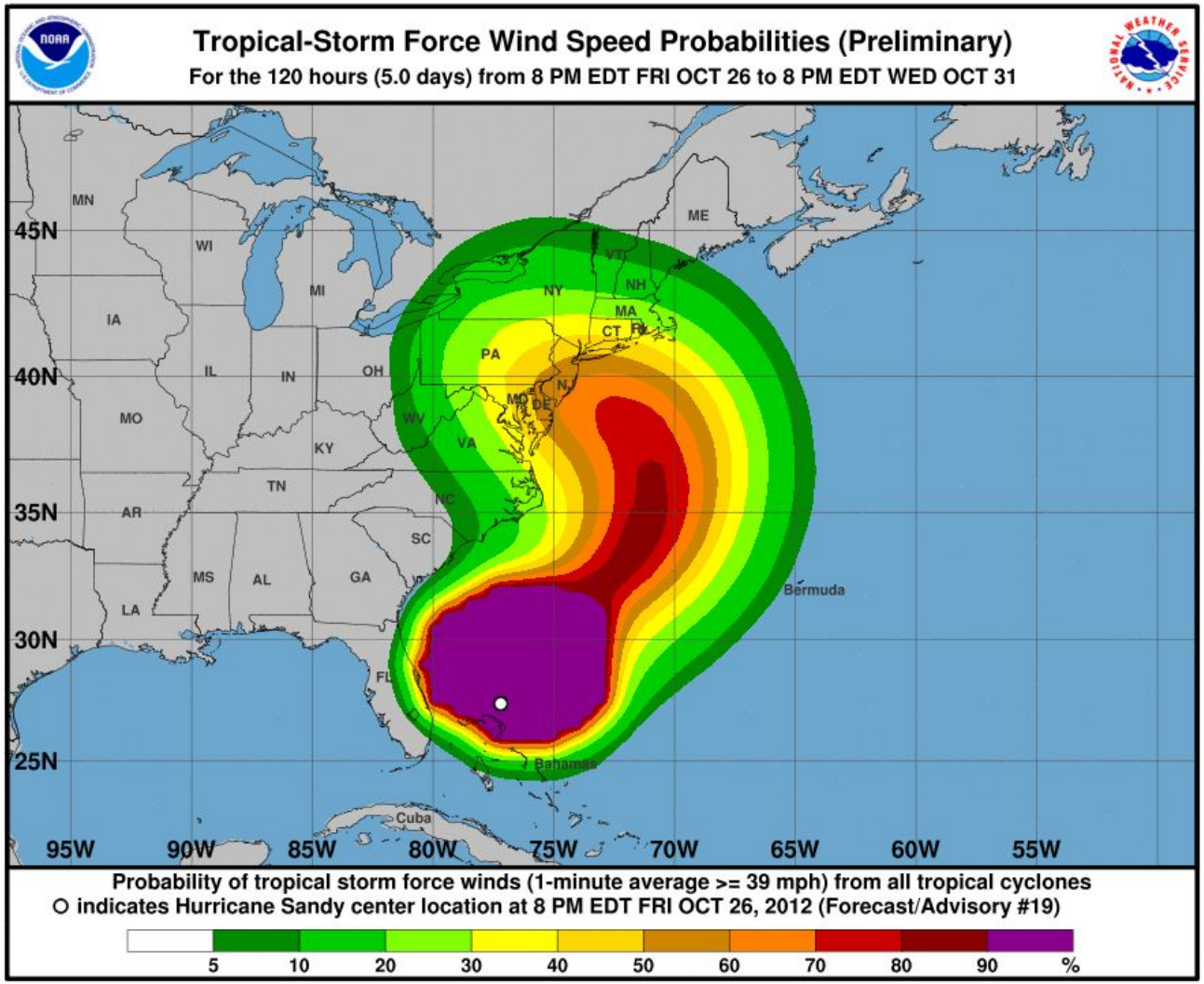
Definition:

The cone represents the probable track of the center of a tropical cyclone, and is formed by enclosing the area swept out by a set of circles (not shown) along the forecast track (at 12, 24, 36 hours, etc). The size of each circle is set so that two-thirds of historical official forecast errors over a 5-year sample fall within the circle. The circle radii defining the cones in 2022 for the Atlantic, Eastern North Pacific, and Central North Pacific basins are given in the table below.

One can also examine historical tracks to determine how often the ***entire*** 5-day path of a cyclone remains completely within the area of the cone. This is a different perspective that ignores most timing errors. For example, a storm moving very slowly but in the expected direction would still be within the area of the cone, even though the track forecast error could be very large. Based on forecasts over the previous 5 years, the entire track of the tropical cyclone can be expected to remain within the cone roughly 60-70% of the time.

Radii of NHC and CPHC forecast cone circles for 2022, based on error statistics from 2017-2021:

Forecast Period *(hours)*	**2/3 Probability Circle, Atlantic Basin** *(nautical miles)*	**2/3 Probability Circle, Eastern North Pacific Basin** *(nautical miles)*	**2/3 Probability Circle, Central North Pacific Basin** *(nautical miles)*
12	26	25	34
24	39	38	49
36	52	51	66
48	67	65	81
60	84	79	95
72	100	93	120
96	142	120	137
120	200	146	156


Tropical-Storm Force Wind Speed Probabilities (Preliminary)
For the 120 hours (5.0 days) from 8 PM EDT FRI OCT 26 to 8 PM EDT WED OCT 31
MN
WI
MI
IA
IL
IN
OH
MO
KY
TN
AR
MS
AL
GA
SC
NC
VA
WV
PA
NY
VT
NH
ME
MA
CT
RI
NJ
MD
DE
LA
FL
45N
40N
35N
30N
25N
95W
90W
85W
80W
75W
70W
65W
60W
55W
Bermuda
Bahamas
Cuba
Probability of tropical storm force winds (1-minute average >= 39 mph) from all tropical cyclones
○ indicates Hurricane Sandy center location at 8 PM EDT FRI OCT 26, 2012 (Forecast/Advisory #19)
5
10
20
30
40
50
60
70
80
90
%

Three types of tropical cyclone wind speed probability values are created for each forecast/advisory package, but not all of these values are distributed or placed on the Internet. For each probability value, the event in question is a sustained (one-minute average) surface (10 m) wind speed of at least a particular threshold value (34 kt...39 mph, 50 kt...58 mph, or 64 kt...74 mph) at a specific location.

Cumulative – These values tell you the overall probability the event will occur sometime during the specified cumulative forecast period (0-6 hours, 0-12, 0-18, etc.) at each specific point. These values are provided in both the text and graphical formats. In the text product, the numbers are in parentheses. The graphical products depict only cumulative values. The text product is transmitted to users via normal NWS dissemination methods. The graphic is available on the internet from the National Hurricane Center and the Central Pacific Hurricane Center.

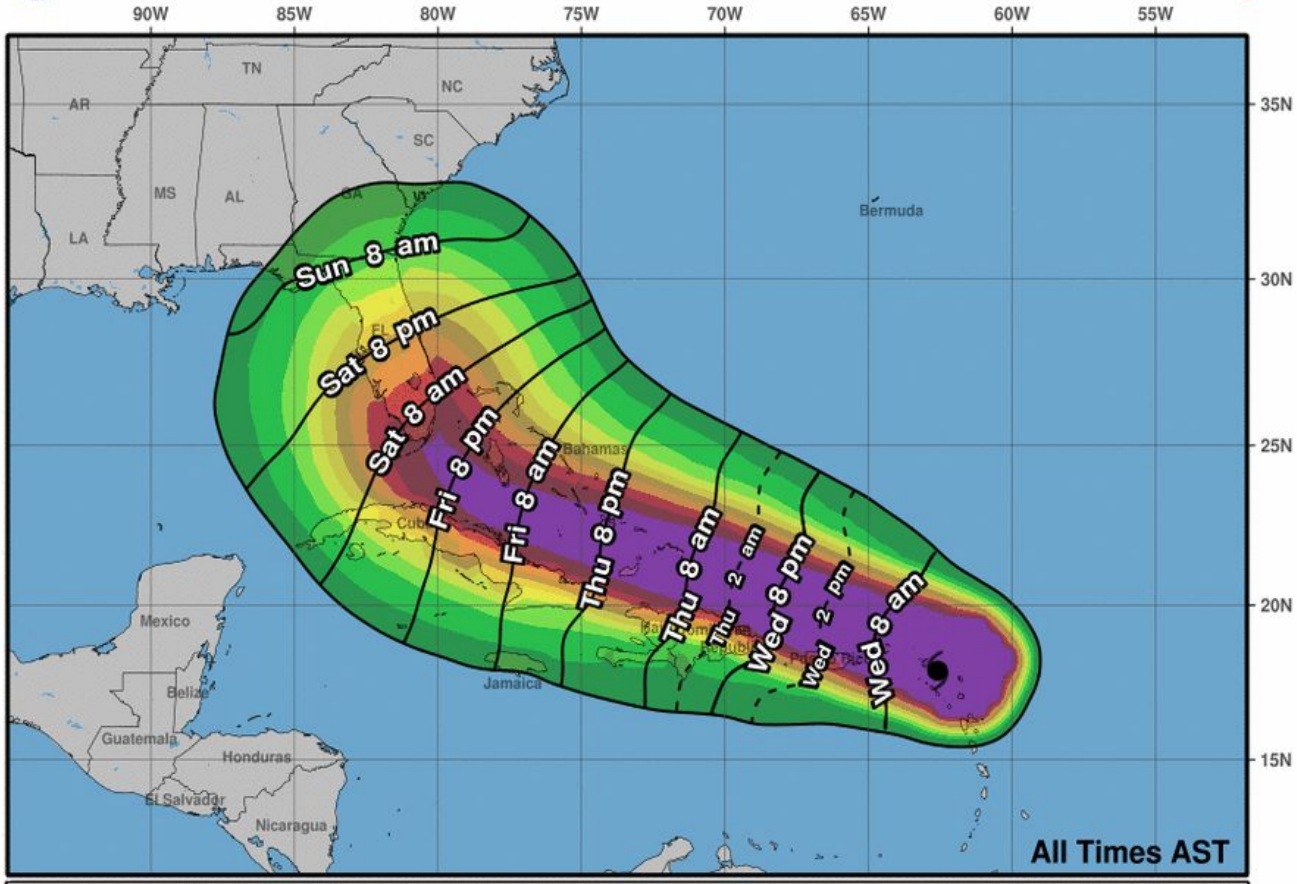
Individual – These values tell you the probability the event will start sometime during the specified individual forecast period (0 - 6 hours, 6-12, 12-18, etc.) at each specific point. These periods are individual, since nothing that occurs before or after the specified period affects the probability. These values are provided only in the text NHC product. They are the values outside of the parentheses (cumulative values are in the parentheses). The term "individual" also makes a clear distinction from the cumulative period values for users.

Graphics for Atlantic tropical cyclones are normally issued every six hours at 5:00 AM EDT, 11:00 AM EDT, 5:00 PM EDT, and 11:00 PM EDT (or 4:00 AM EST, 10:00 AM EST, 4:00 PM EST, and 10:00 PM EST).

Graphics for Eastern Pacific tropical cyclones are normally issued every six hours at 2:00 AM PDT, 8:00 AM PDT, 2:00 PM PDT, and 8:00 PM PDT (or 1:00 AM PST, 7:00 AM PST, 1:00 PM PST, and 7:00 PM PST).

Special graphics may be issued at any time due to significant changes in warnings or in the cyclone.

Earliest Reasonable Arrival Time of Tropical-Storm-Force Winds



Hurricane Irma
Wed. Sep. 6, 2017 5 am AST
Advisory 29

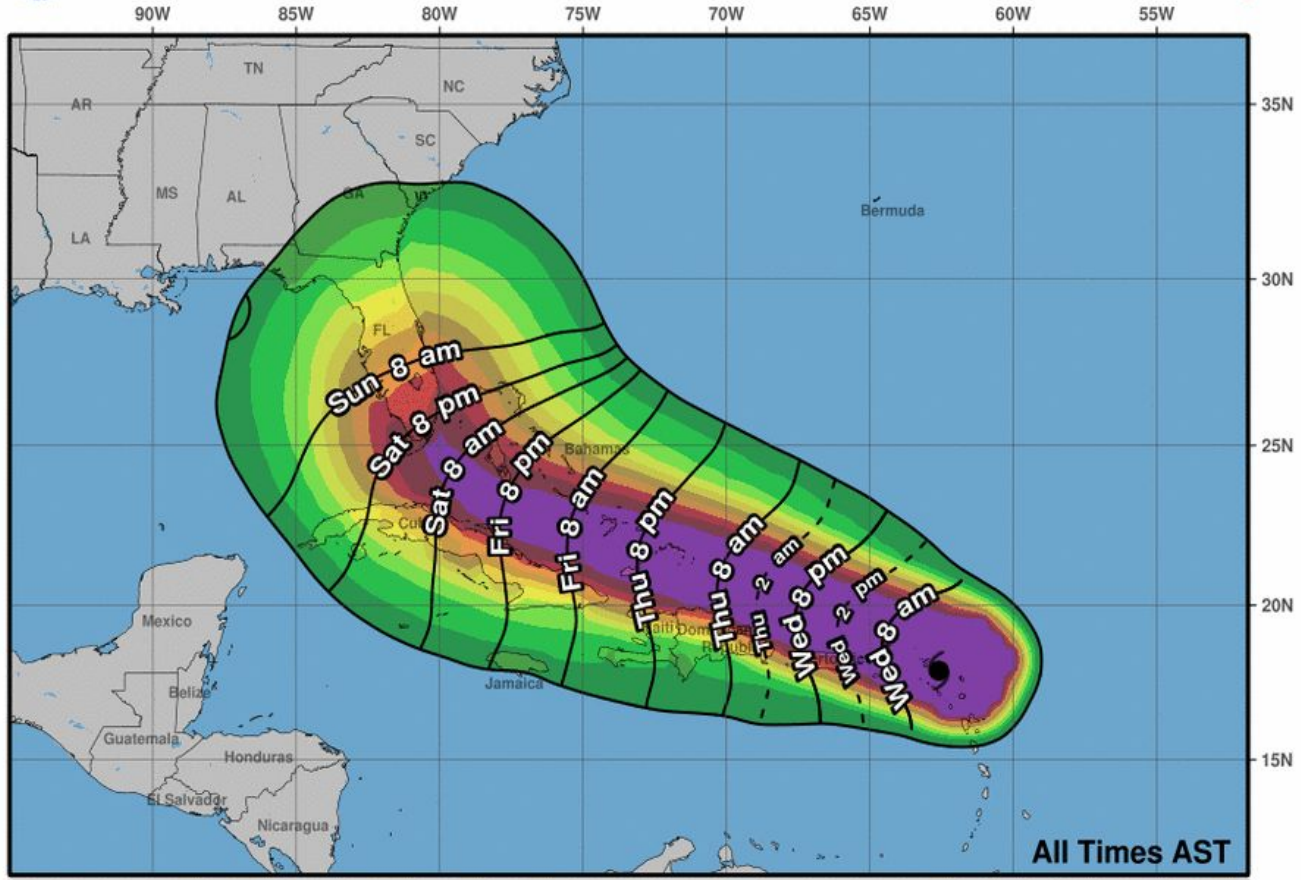
Storm Location & Wind Speed

- < 34 kt (39 mph)
- 34-63 kt (39-73 mph)
- ≥ 64 kt (74 mph)

5-day chance of receiving sustained 34+ kt (39+ mph) winds

5 10 20 30 40 50 60 70 80 90 100 %

Most Likely Arrival Time of Tropical-Storm-Force Winds



Hurricane Irma
Wed. Sep. 6, 2017 5 am AST
Advisory 29

Storm Location & Wind Speed

- < 34 kt (39 mph)
- 34-63 kt (39-73 mph)
- ≥ 64 kt (74 mph)

5-day chance of receiving sustained 34+ kt (39+ mph) winds

5 10 20 30 40 50 60 70 80 90 100 %

The anticipated arrival of sustained tropical-storm-force winds from a tropical cyclone is a critical threshold for coastal communities. For example, emergency managers use this information to determine when to begin and complete coastal evacuations, while the public needs to know when to prepare their homes or businesses and get supplies. Once sustained tropical-storm-force winds begin, such preparations usually become too dangerous or difficult. Historically, many decision makers have inferred the arrival of sustained tropical-storm-force winds from NHC products deterministically, without accounting for tropical cyclone track or size uncertainty. The risk in not factoring in these uncertainties is that communities may have less time to prepare if a tropical cyclone speeds up or increases in size beyond NHC's initial forecasts.

To better meet users' needs, NHC has developed a set of graphics that depict when sustained tropical-storm-force winds from an approaching tropical cyclone could arrive at individual locations. The maps were developed and tested using social science techniques, including one-on-one telephone interviews, focus groups, and surveys with emergency managers, broadcast meteorologists, and NWS meteorologists to gather opinions on the idea, content, and design of the products.

Two versions of the Arrival of Tropical-Storm-Force Winds Graphic are available on the NHC website for all tropical cyclones, post-tropical cyclones, and potential tropical cyclones for which NHC is issuing advisories:

1. Earliest Reasonable Arrival Time: the primary graphic, which identifies the time window that users at individual locations can safely assume will be free from tropical-storm-force winds. Specifically, this is the time before which there is no more than a 1-in-10 (10 percent) chance of seeing the onset of sustained tropical-storm-force winds – the period during which preparations should ideally be completed for those with a low tolerance for risk.

2. Most Likely Arrival Time: the graphic that identifies the time before or after which the onset of tropical-storm-force winds is equally likely. This graphic would be more appropriate for users who are willing to risk not having completed all their preparations before the storm arrives.

Additionally, three-day versions of these graphics are also available. These versions provide time of arrival information through the first 72 hours of the forecast. The three-day graphics are intended to help aid in viewing the timing details through 72 h when the forecast track has an usually lengthy extent.

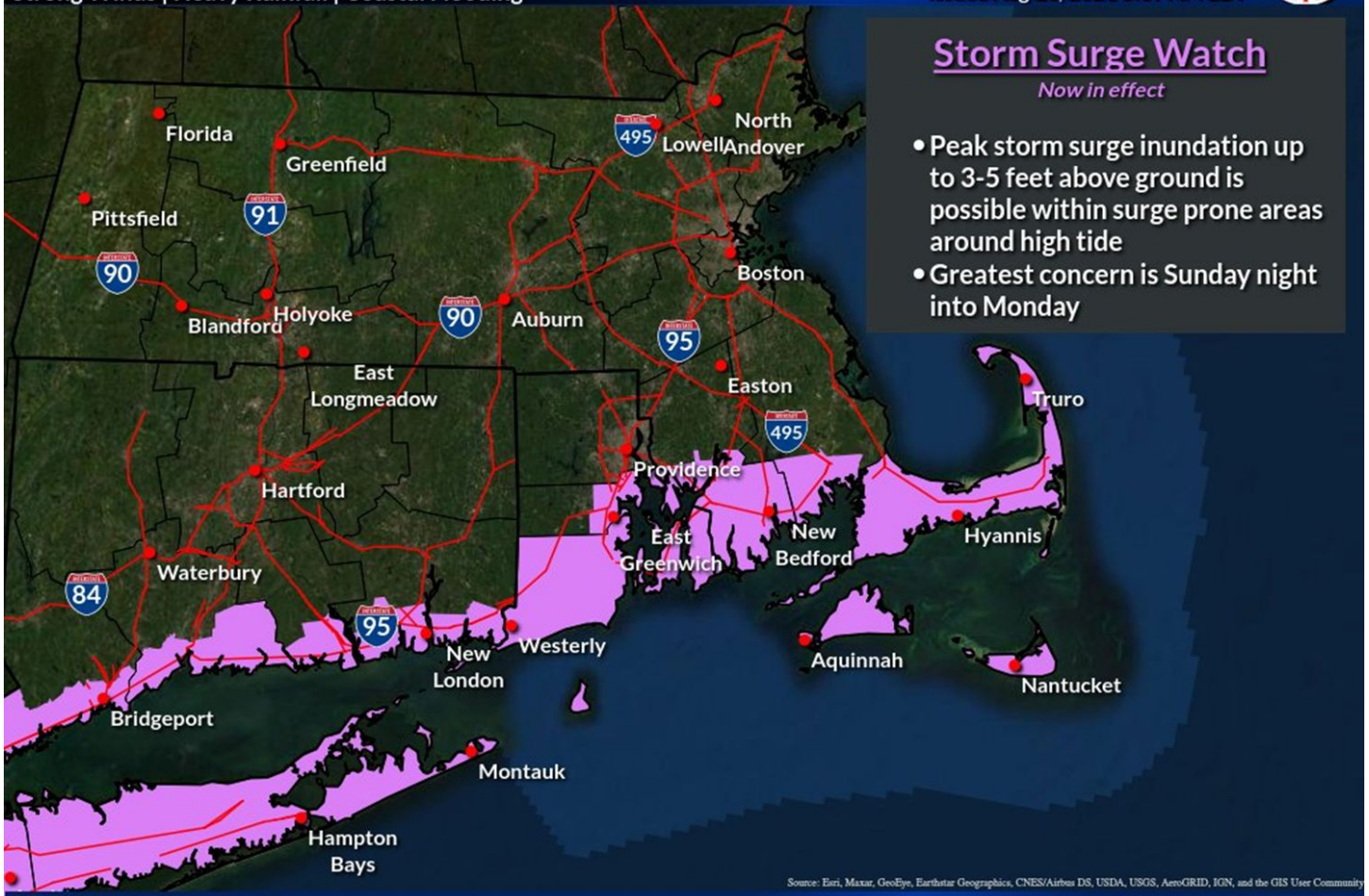
Note: **A more detailed description of the arrival time of tropical-storm-force wind graphics is also available.**

Graphics for Atlantic tropical cyclones are normally issued every six hours at 5:00 AM EDT, 11:00 AM EDT, 5:00 PM EDT, and 11:00 PM EDT (or 4:00 AM EST, 10:00 AM EST, 4:00 PM EST, and 10:00 PM EST).

Tropical Storm Henri

Strong Winds | Heavy Rainfall | Coastal Flooding

Weather Forecast Office
Boston/Norton, MA
Issued Aug 20, 2021 5:39 AM EDT



Storm Surge Watch

Now in effect

- Peak storm surge inundation up to 3-5 feet above ground is possible within surge prone areas around high tide
- Greatest concern is Sunday night into Monday

Storm Surge Warning

Storm Surge Watch

Storm Surge Warning:

A storm surge warning is defined as the danger of life-threatening inundation from rising water moving inland from the shoreline somewhere within the specified area, generally within 36 hours, in association with a tropical, subtropical, or post-tropical cyclone. The warning may be issued earlier when other conditions, such as the onset of tropical storm-force winds, are expected to limit the time available to take protective actions for surge (e.g., evacuations). The warning may also be issued for locations not expected to receive life-threatening inundation, but which could potentially be isolated by inundation in adjacent areas.

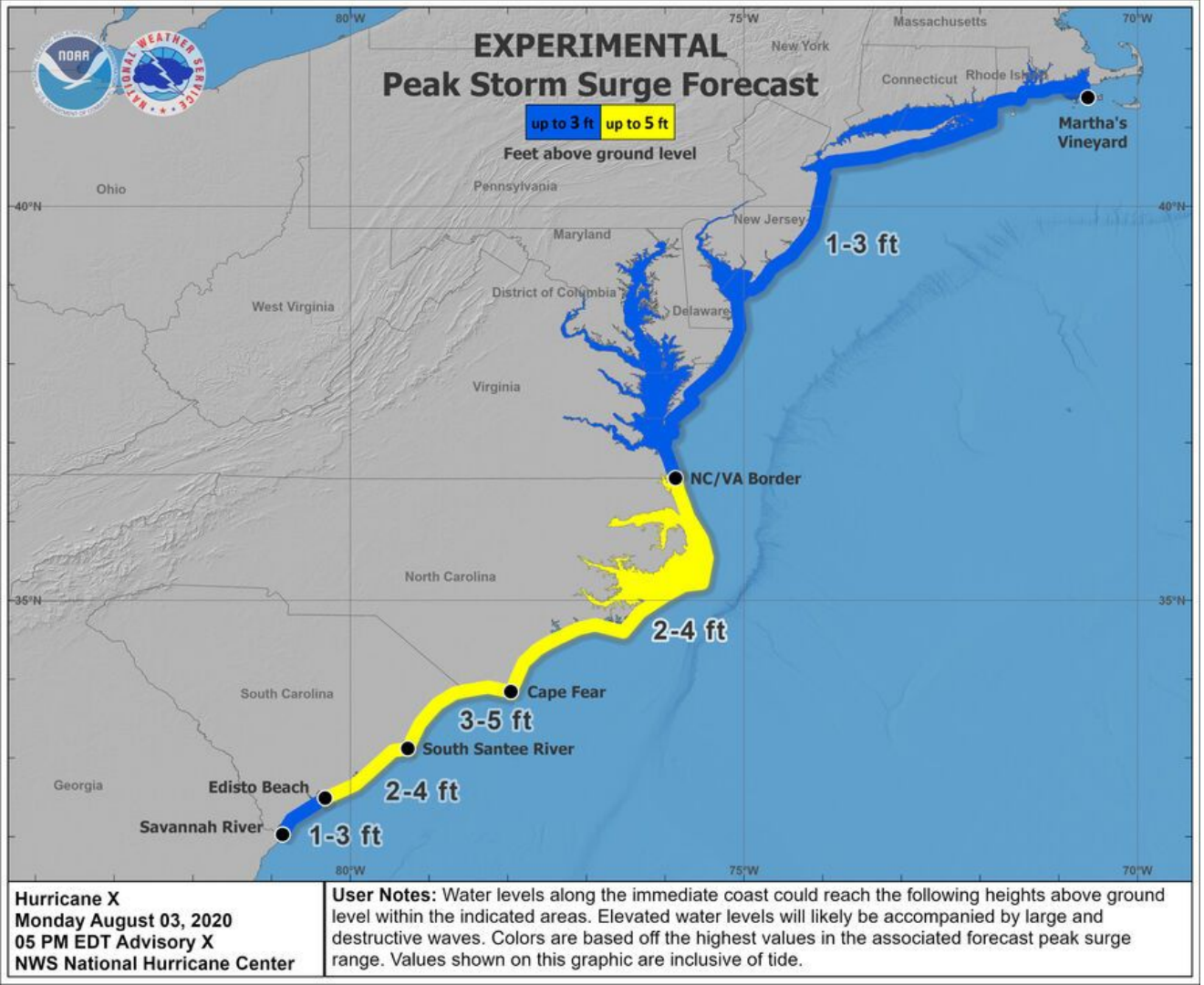
Storm Surge Watch:

A storm surge watch is defined as the possibility of life-threatening inundation from rising water moving inland from the shoreline somwhere within the specified area, generally within 48 hours, in association with a tropical, subtropical, or post-tropical cyclone. The watch may be issued earlier when other conditions, such as the onset of tropical storm-force winds, are expected to limit the time available to take protective actions for surge (e.g., evacuations). The watch may also be issued for locations not expected to receive life-threatening inundation, but which could potentially be isolated by inundation in adjacent areas.

Storm surge is rising water moving inland from the shoreline, pushed onshore by the force of the wind. This prototype storm surge watch/warning graphic identifies locations most at risk for life-threatening inundation from storm surge, displaying areas that would qualify for inclusion under a storm surge watch or warning product that is under development by the National Weather Service. A storm surge warning would mean that there is a danger of life-threatening inundation from rising water moving inland from the shoreline somewhere within the specified area, generally within 36 hours. A storm surge watch would mean that life-threatening inundation is possible somewhere within the specified area, generally within 48 hours.

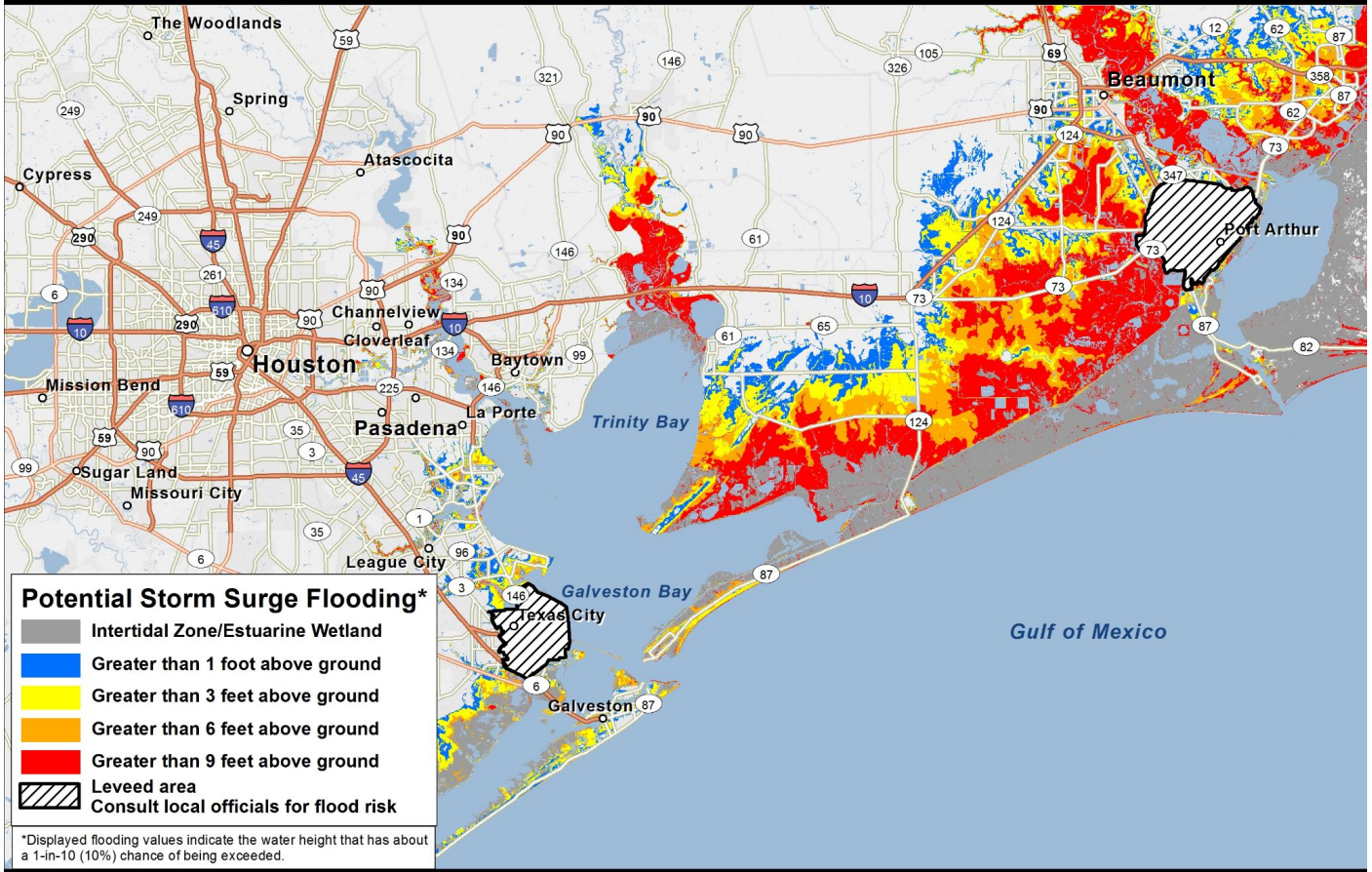
Due to forecast uncertainty, the actual areas that experience life-threatening inundation may differ from the areas shown on this map. In addition, during this developmental period, the graphic may not always be available or updated in a timely manner. All persons, regardless of whether or not they are in the highlighted areas shown by the graphic, should promptly follow evacuation orders and other instructions from local emergency management officials. Upon completion of development, formal public review and comment will be solicited for both this graphic and the experimental storm surge watch/warning. The comment period is expected to take place in 2016, with operational implementation planned in 2017, if approved.

This graphic is part of the suite of products issued for active tropical cyclones every six hours at 0300, 0900, 1500, and 2100 UTC. NHC will attempt to make this graphic available at those times whenever life-threatening inundation from storm surge is possible along any portion of the Gulf or Atlantic coasts of the continental United States within 48 hours. However, during the developmental period, the availability or timeliness of this product cannot be guaranteed.



NHC is providing an experimental graphic that depicts the expected storm surge inundation values for the United States Gulf and Atlantic coasts, Puerto Rico, and the U.S. Virgin Islands that are provided in the tropical cyclone public advisory (TCP). These values represent the peak height the water could reach above normally dry ground somewhere within the specified areas. This graphic will be made available on the NHC webpage

Hurricane X



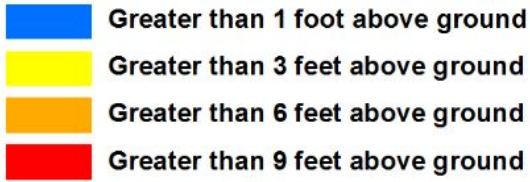
National Hurricane Center
Storm Surge Unit

2. Product Description

The Potential Storm Surge Flooding Map is a new operational product that depicts the risk associated with coastal flooding from storm surge associated with tropical cyclones. Developed over the course of several years in consultation with social scientists, emergency managers, broadcast meteorologists, and others, this map shows:

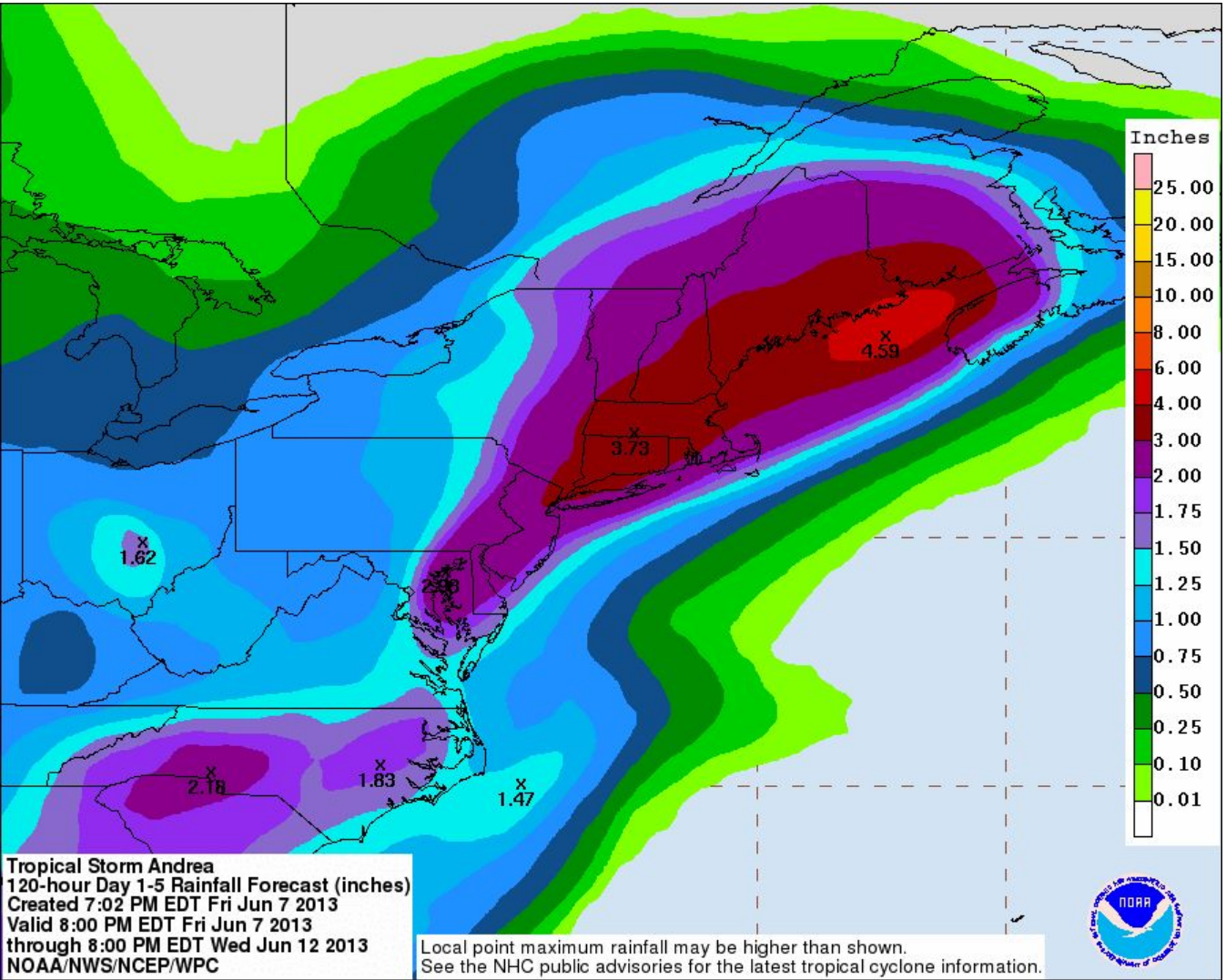
- Geographical areas where inundation from storm surge could occur
- The heights, above ground, that water could reach in those areas

The geographic areas of possible storm surge flooding and the potential height of water above ground for a given storm are represented by different colors on the map based on water level:

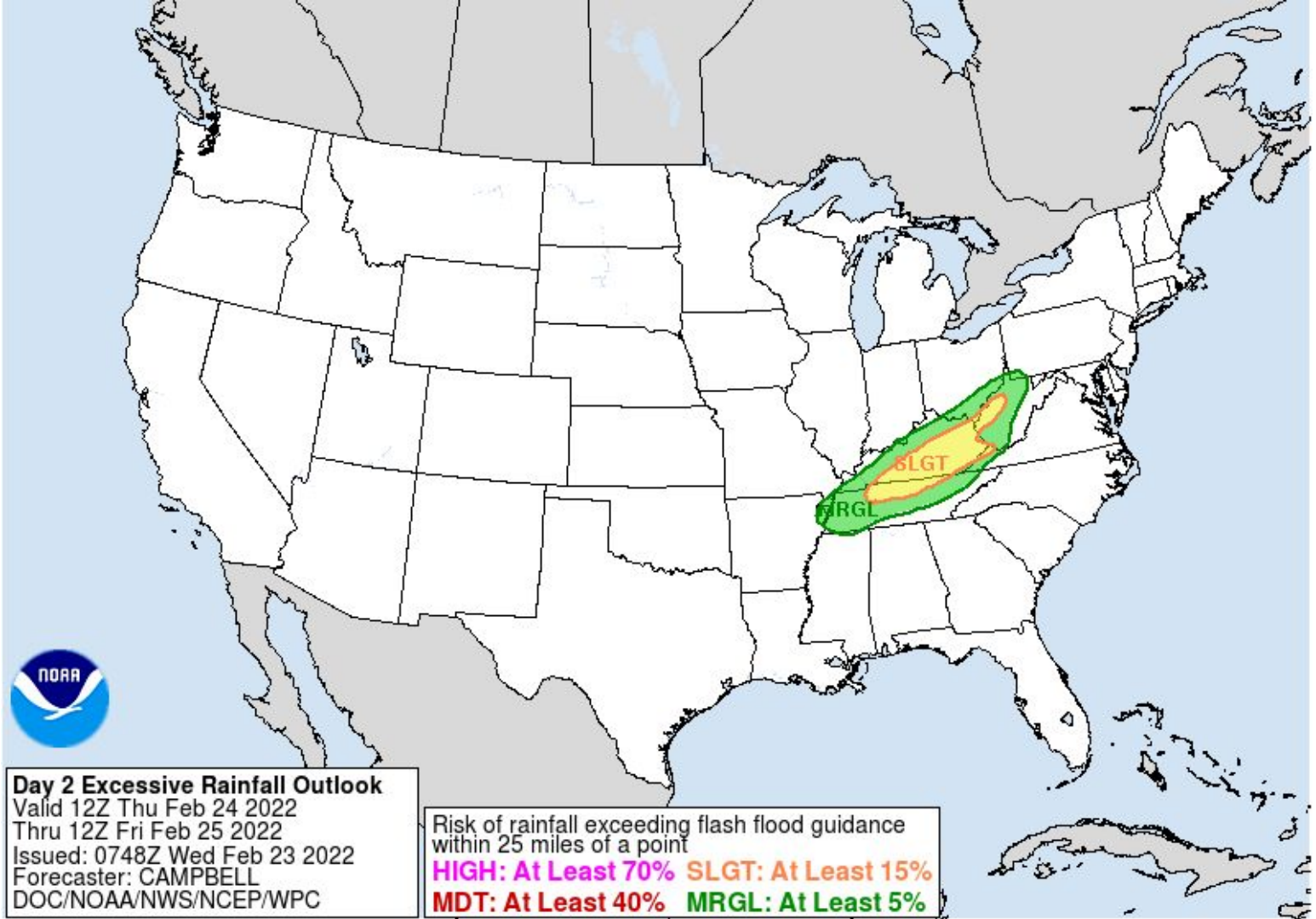


The Potential Storm Surge Flooding Map shows geographical areas where inundation from storm surge could occur and how high above ground the water could reach in those areas. The map is based on the latest forecast track and intensity of the tropical cyclone, and takes into account likely forecast errors. The shading represents inundation levels that have a 10 percent chance of being exceeded, which can therefore be thought of as representing a reasonable worst-case scenario for any individual location. The first map will usually be issued at the same time as the initial hurricane watch, or in some cases, with a tropical storm watch. The map is subject to change every six hours in association with every new NHC full advisory package.

This graphic is part of a suite of products issued for active cyclones every six hours at 0300, 0900, 1500, and 2100 UTC, whenever a hurricane watch or hurricane warning, and in some cases, a tropical storm watch or warning, is in effect for any portion of the Gulf or Atlantic coasts of the continental United States. Due to the processing time required to produce the map, there will generally be a delay of an hour or more in the posting of this graphic to the NHC web site, or soon after the availability of the Probabilistic Tropical Cyclone Storm Surge and Tide products.



This graphic is created by the NWS/NCEP Weather Prediction Center (WPC) and shows rainfall potential for the United States when a tropical cyclone threatens land. The graphic is displayed as a Quantitative Precipitation Forecast (QPF), which shows rainfall totals for a specified time period, based on forecaster discretion.



Day 2 Excessive Rainfall Outlook
Valid 12Z Thu Feb 24 2022
Thru 12Z Fri Feb 25 2022
Issued: 0748Z Wed Feb 23 2022
Forecaster: CAMPBELL
DOC/NOAA/NWS/NCEP/WPC

Risk of rainfall exceeding flash flood guidance within 25 miles of a point
HIGH: At Least 70% SLGT: At Least 15%
MDT: At Least 40% MRGL: At Least 5%

In the Excessive Rainfall Outlooks, the Weather Prediction Center (WPC) forecasts the probability that rainfall will exceed flash flood guidance (FFG) within 40 kilometers (25 miles) of a point. Gridded FFG is provided by the twelve NWS River Forecast Centers (RFCs) whose service areas cover the lower 48 states. WPC creates a national mosaic of FFG, whose 1, 3, and 6-hour values represent the amount of rainfall over those short durations which it is estimated would bring rivers and streams up to bankfull conditions. WPC estimates the likelihood that FFG will be exceeded by assessing environmental conditions (e.g. moisture content and steering winds), recognizing weather patterns commonly associated with heavy rainfall, and using a variety of deterministic and ensemble-based numerical model tools that get at both the meteorological and hydrologic factors associated with flash flooding. The ERO is a highly collaborative product and benefits from the input of meteorologists and hydrologists among the WFOs, RFCs, and National Water Center.

The risk of excessive rainfall is expressed both probabilistically and categorically according to the table below.

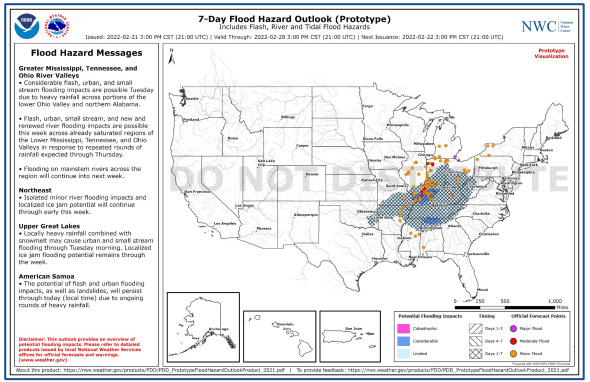
Risk Category	Probability of Rainfall Exceeding Flash Flood Guidance Within 40 km (25mi) of a Point
Marginal (MRGL)	At Least 5%
Slight (SLGT)	At Least 15%
Moderate (MDT)	At Least 40%
High (HIGH)	At Least 70%

Flood Hazard Outlook (FHO)

Status: Prototype

- High level, **“Heads Up”** infographic conveying potential flood impacts for the next seven days. It is intended to provide comprehensive and consistent messaging for various flood hazard impacts (e.g., flash, urban, small stream, riverine and tidal flooding) including by not limited to forecast information from Weather Forecast Offices (WFOs), River Forecast Centers (RFCs), Weather Prediction Center (WPC), and the National Water Center (NWC).

- **Audience:** National & Regional Level Briefers
- **Current availability**: nwcchat/ NWC Google Site
  (*internal to NWS*)
  National, Daily @ 2100Z (will issue 2x a day if there is tropical)
  Tropical, Twice Daily @ 2100Z & 1130Z
- **Future availability**: Website 2x a day / GIS Service
- Becoming experimental: Summer 2022 / GIS Service



Flood Hazard Outlook (FHO)

Category Definitions

Limited Impact

Base flash flooding and/or minor river flooding is expected

- *Flash flooding with base to isolated considerable IBW tags. In general, minimal or no widespread property damage, but possibly some public threat (e.g., inundation of roads). Local water rescues may occur, but are limited to evacuations of cutoff areas or isolated swift water rescues.*
- *Minor to isolated moderate riverine flooding. Minor riverine flooding is defined as minimal or no property damage, but possible some public threat (e.g., inundation of roads)*

Considerable Impact

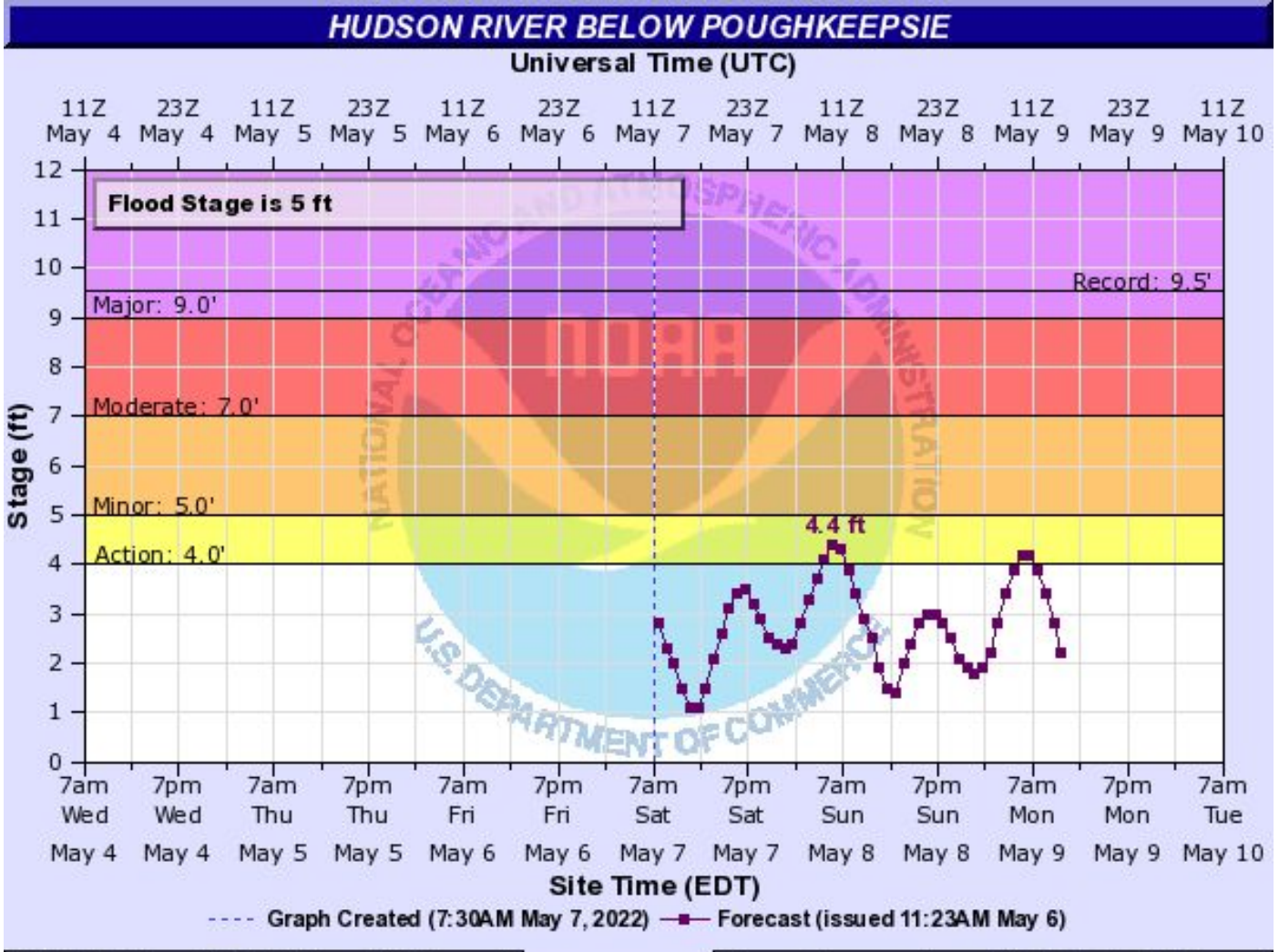
Significant flash flooding and/or moderate river flooding is expected

- *Flash flooding with numerous considerable IBW tags is possible. Impacts include widespread inundation of roads and structures, evacuations of people and/or transfer of property to higher elevations. Numerous swift/high water rescues may be possible. Moderate some inundation of structures and roads near streams, evacuations of people and/or transfer of property to higher elevations.*
- *Widespread moderate to scattered major riverine flooding is possible. Moderate riverine flooding is defined as some inundation of structures and roads near streams, evacuations of people and/or transfer of property to higher elevations.*
- *Messaging of widespread, life threatening flooding that may occur and that urgent actions may be needed to prepare for flooding.*

Catastrophic Impact

Exceedingly rare and widespread flash flooding and/or major river flooding is expected

- *Flash flooding with considerable IBW tags is likely, with multiple catastrophic tags possible. Impacts include extensive inundation and/or destruction of roads and structures, significant evacuations of people and/or transfer of property to higher elevations. Water rescues of a significant number of persons is likely and overwhelming of area and regional resources is possible (ie. rooftops rescues).*
- *Widespread major riverine flooding, with "floods of record" possible. Major riverine flooding is defined as extensive inundation of structures and roads, significant evacuations of people and/or transfer of property to higher elevations.*
- *Messaging includes high end, life threatening flooding with significant disruptions to daily life likely.*


HUDSON RIVER BELOW POUGHKEEPSIE
Universal Time (UTC)
11Z May 4
23Z May 4
11Z May 5
23Z May 5
11Z May 6
23Z May 6
11Z May 7
23Z May 7
11Z May 8
23Z May 8
11Z May 9
23Z May 9
11Z May 10
Flood Stage is 5 ft
Record: 9.5'
Major: 9.0'
Moderate: 7.0'
Minor: 5.0'
Action: 4.0'
4.4 ft
Stage (ft)
12
11
10
9
8
7
6
5
4
3
2
1
0
7am Wed May 4
7pm Wed May 4
7am Thu May 5
7pm Thu May 5
7am Fri May 6
7pm Fri May 6
7am Sat May 7
7pm Sat May 7
7am Sun May 8
7pm Sun May 8
7am Mon May 9
7pm Mon May 9
7am Tue May 10
Site Time (EDT)
Graph Created (7:30AM May 7, 2022)
Forecast (issued 11:23AM May 6)
POUN6(plotting HGIRG) "Gage 0" Datum: 0'
Observations courtesy of US Geological Survey

Action Stage - the stage which; when reached by a rising stream, lake, or reservoir represents the level where the NWS or a partner/user needs to take some type of mitigation action in preparation for possible significant hydrologic activity. The appropriate action is usually defined in a weather forecast office (WFO) hydrologic services manual. Action stage can be the same as forecast issuance stage (see forecast issuance stage)

Minor flooding - minimal or no property damage, but possibly some public threat.

Moderate Flooding - some inundation of structures and roads near stream. Some evacuations of people and/or transfer of property to higher elevations.

Major Flooding - extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

Record Flooding - flooding which equals or exceeds the highest stage or discharge at a given site during the period of record keeping.

Stage - level of the water surface in a river measured with reference to some datum.

Flow - volume of water passing a given point per unit of time.

kcfs - measurement of water flow equivalent to 1000 cubic feet of water passing a given point for an entire second.