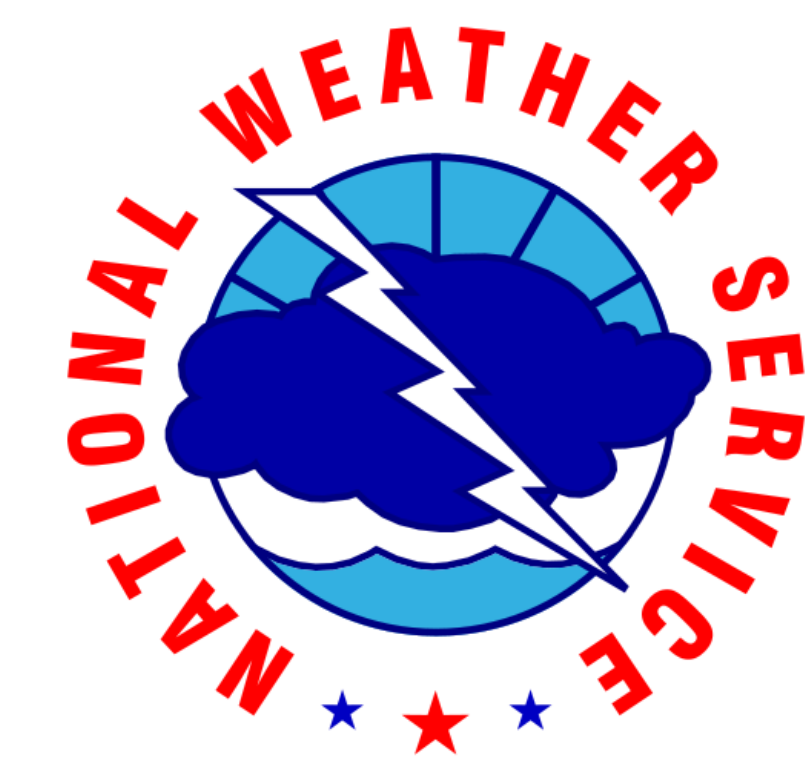


# Forecasting Precipitation Return Intervals

## Rethinking How We Communicate High Impact Precipitation Events



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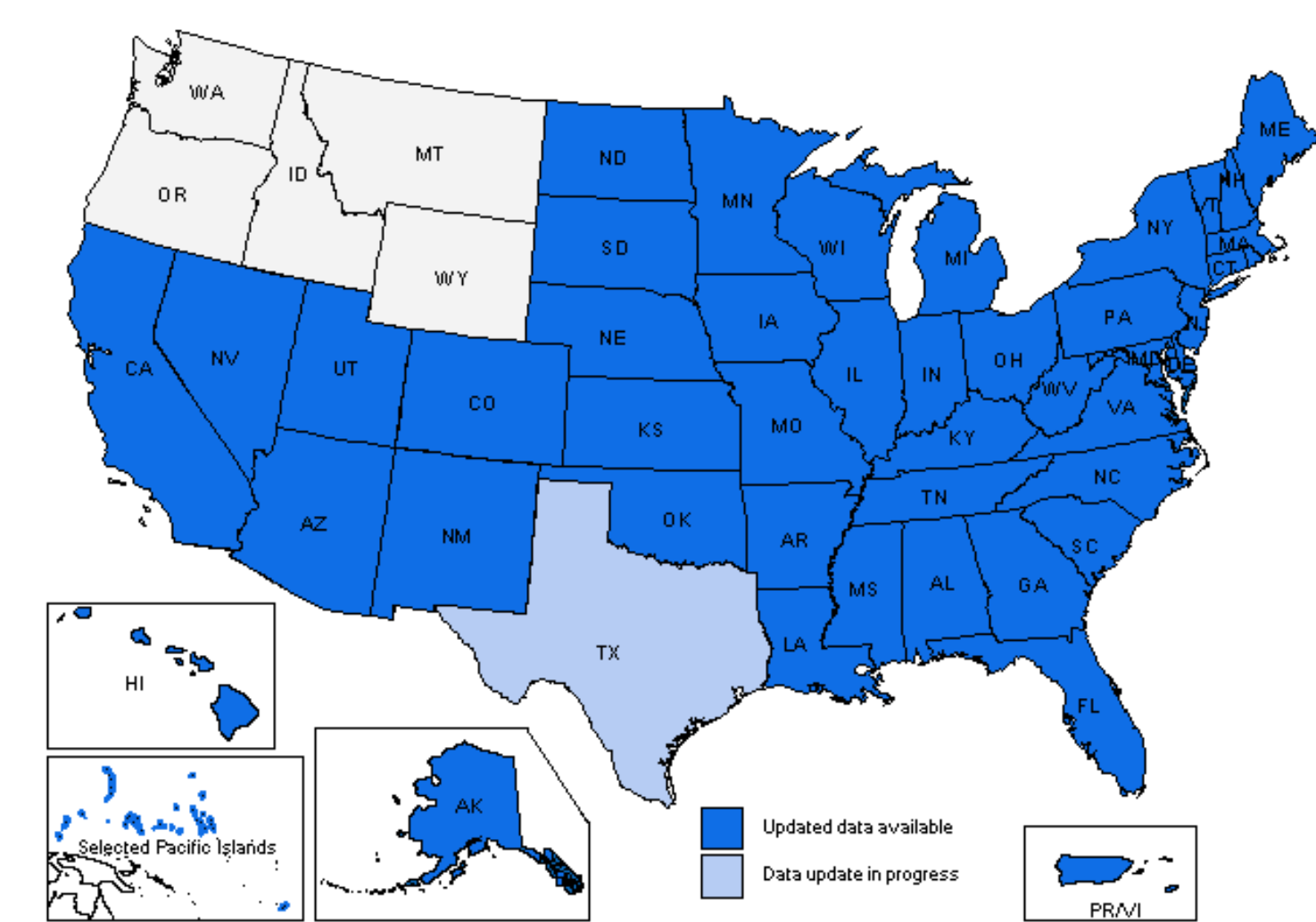
### Introduction

Forecasting and communicating precipitation forecasts is a multi-faceted challenge to the operational forecaster. The age-old question "What does this forecast mean to me?" is especially applicable to Quantitative Precipitation Forecasts (QPF), as the forecast units are a vague concept that don't easily relate to the average user. Climatology adds another potential source for confusion, as an inch of rain can lead to drastically different results depending on location and precipitation duration.

NOAA's Atlas 14 dataset can aid in forecasting and communicating high-impact precipitation events. Atlas 14 is an extensive catalog of precipitation frequency estimates across much of the Continental United States, and NOAA provides these datasets in Geographic Information System (GIS) format.

Combining QPF with precipitation frequency estimates yields a Return Interval Forecast, which calibrates the traditional precipitation forecast based on precipitation duration and climatology. The resultant product can provide core users and partners a much better idea of where the locations of greatest impact will be, along with the level of flooding-related impact.

### Method



**NOAA's ATLAS 14**  
Precipitation Frequency Data Server

<http://hdsc.nws.noaa.gov/hdsc/pfds/>

Note that data is unavailable for portions of the continental United States

NOAA's ATLAS 14 datasets are freely available in Geographic Information Systems (GIS) raster format. This data is available in many durations, including some that are directly relatable to NCEP model precipitation forecasts. In such cases: a simple subtraction calculation is made between the NCEP model and its direct Atlas 14 dataset. If the resultant value is 0 or negative, a 0 is assigned. If the resultant value is above 0, the Precipitation Return Interval is assigned.

### NCEP Model Datasets

- HRRR: 15-minute, 1-hour
- NAM 4km: 1-hour, 3-hour
- ARW: 1-hour, 3-hour
- NMM: 1-hour, 3-hour
- GFS: 3-hour, 6-hour, 12-hour, 24-hour

### Access

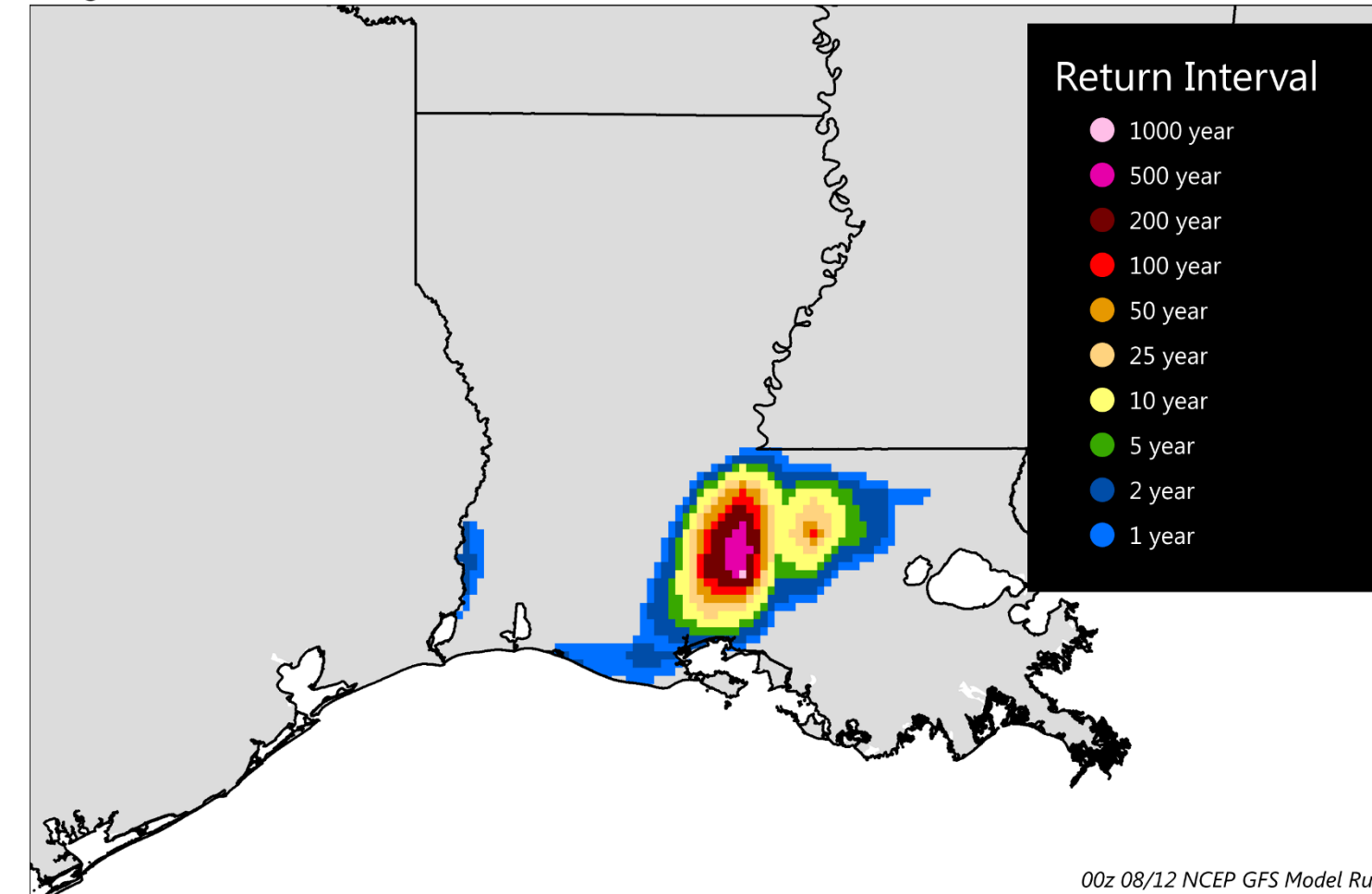
Forecast Precipitation Return Intervals will soon be available via the Weather Archive Visualization Environment (WAVE). This program is available to NWS employees, and is a part NOAA's vLab.

### Louisiana Flood

August 12-13, 2016

#### Forecast Precipitation Return Interval

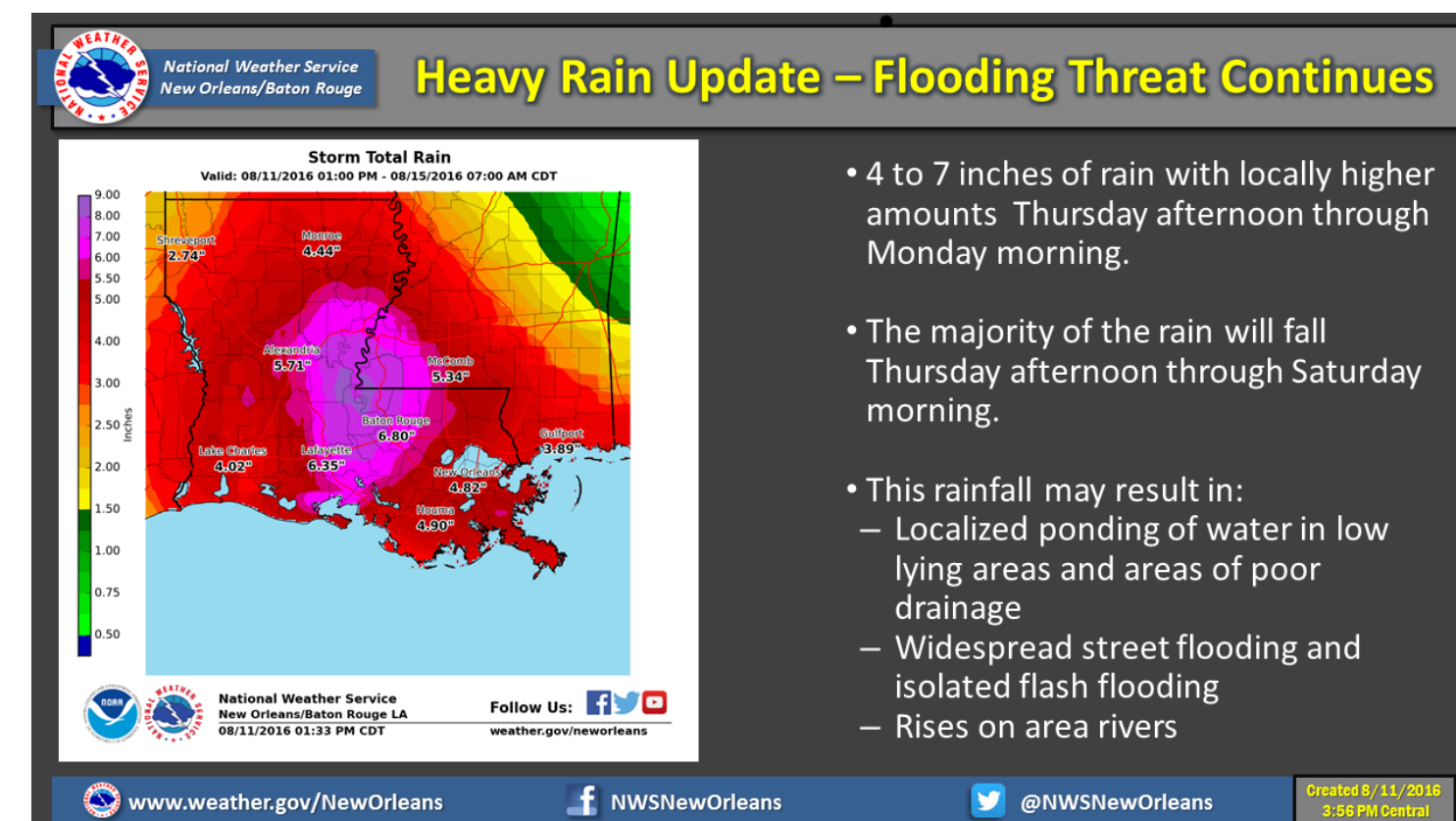
August 12-13, 2016



#### Forecast Precipitation Return Interval

August 12, 2016, 00z GFS model run

This model run projected a 500-year Precipitation Return Interval in central Louisiana.



#### Quantitative Precipitation Forecast

An excessive amount of rainfall was projected across much of Louisiana, with heaviest rainfall in central LA.

Image: NWS Slidell



#### Impacts

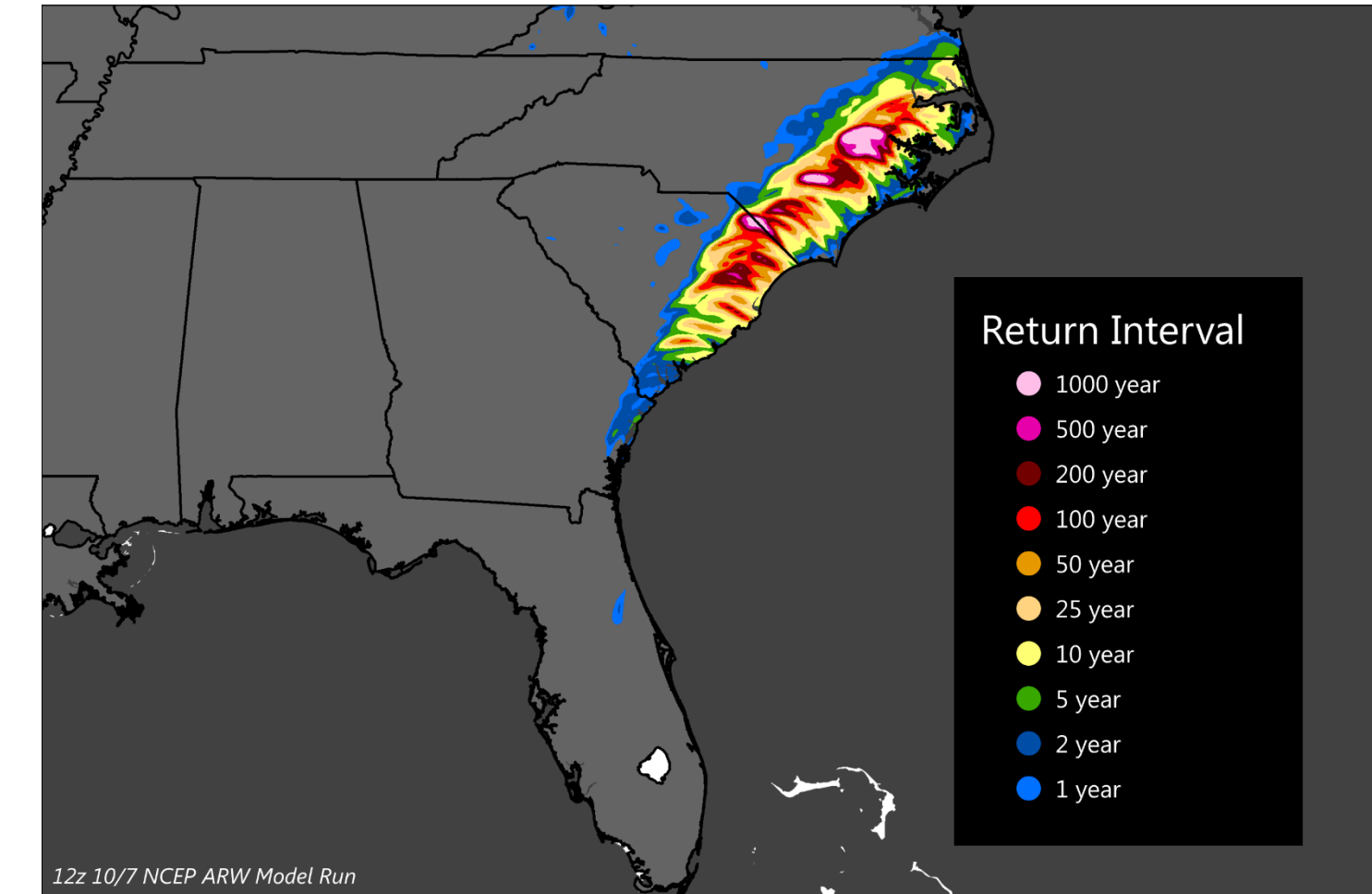
- 13 Deaths
- \$10-15 billion property damage
- 30,000+ evacuations
- 146,000 damaged homes
- Levee breaks

### Hurricane Matthew

October 7-9, 2016

#### Forecast Precipitation Return Interval

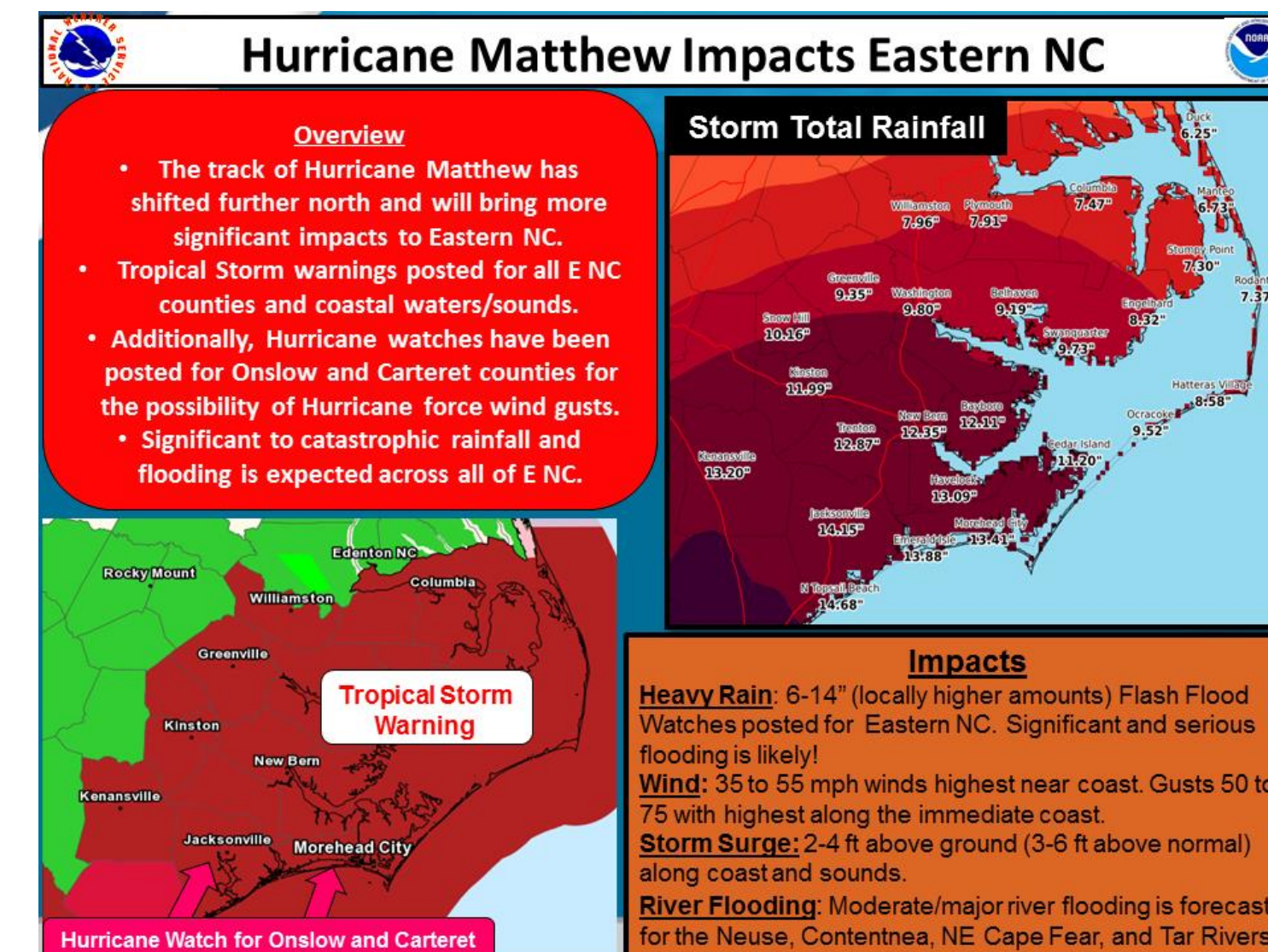
October 7-9, 2016



#### Forecast Precipitation Return Interval

October 7, 2016, 12z ARW model run

This model run projected a 1000-year Precipitation Return Interval in portions of east-central North Carolina.



#### Quantitative Precipitation Forecast

An excessive amount of rainfall was projected across much of the Atlantic seaboard.

Image: NWS Morehead City



#### Impacts (focus on North Carolina)

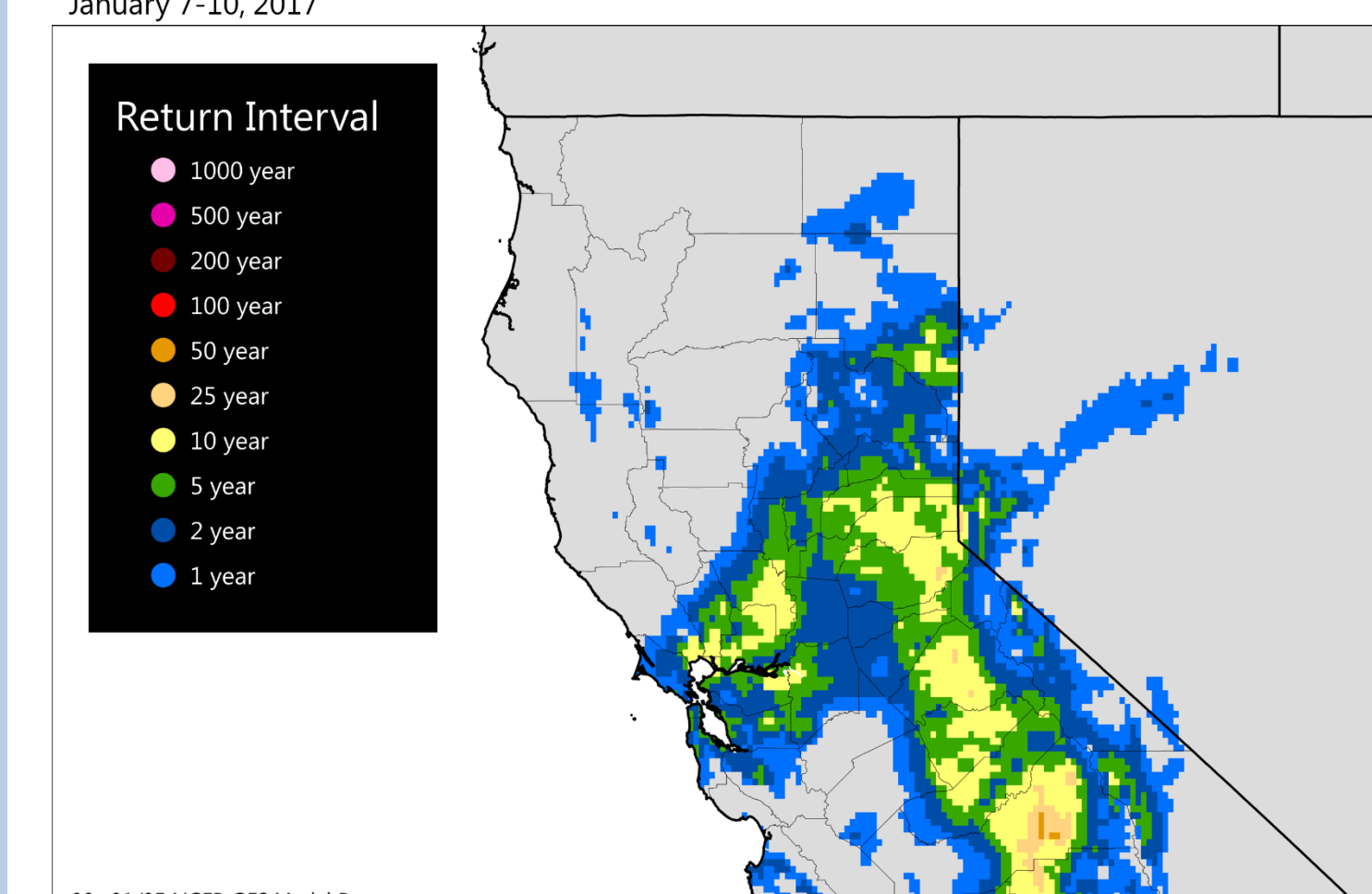
- 28 Deaths
- \$1.5 billion property damage
- 680,000+ power outages
- 100,000 damaged structures

### California Flood

January 7-10, 2017

#### Forecast Precipitation Return Interval

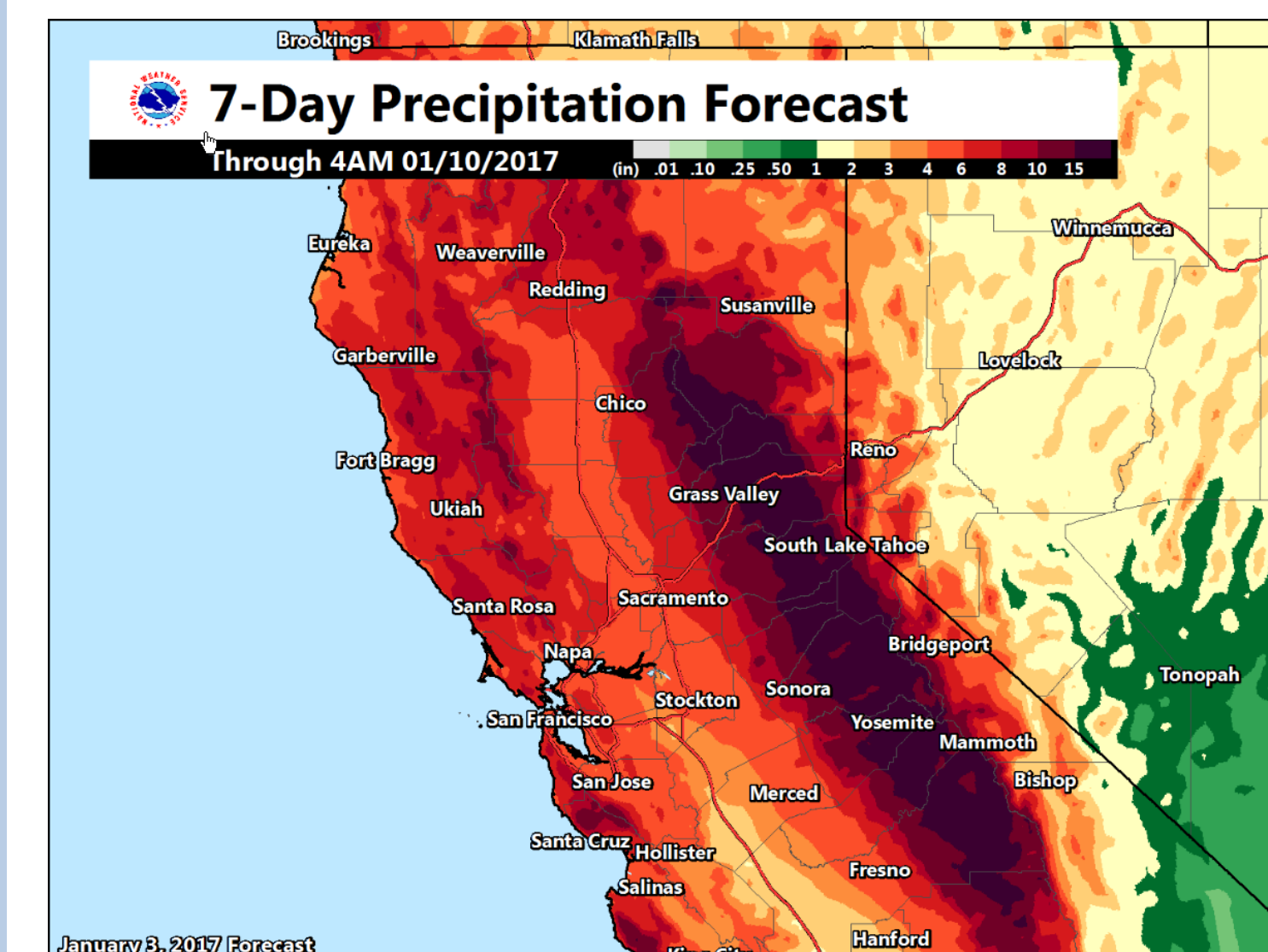
January 7-10, 2017



#### Forecast Precipitation Return Interval

January 5, 2017, 00z GFS model run

This model run projected a 25-year Precipitation Return Interval in portions of northern and central California.



#### Quantitative Precipitation Forecast

An excessive amount of rainfall was projected across much of northern and central California, heaviest over the Sierra Nevada.

Image: NWS Sacramento



#### Impacts

- 2 Deaths
- 500+ evacuations
- Dozens of washed out roads
- Dozens of road closures due to rock/mud slides
- 1 levee failure, multiple levee breaches

### Other Examples

#### Storm Stats: January 7-9, 2017

An atmospheric river will take aim for California this weekend with heavy precipitation, high snow levels and soils that are already saturated from recent storms. Precipitation starts Saturday, but the brunt of the storm will be Sunday & Monday.

**How normal is this?**  
Precipitation totals are forecast to be:  
• once in a 10-25 year storm for areas SOUTH of 1:80  
• once in a 5-10 year storm for areas near and NORTH of 1:80

**When was the last time we saw flooding like this?**  
Free-flowing rivers have not seen this type of flooding since December 2005

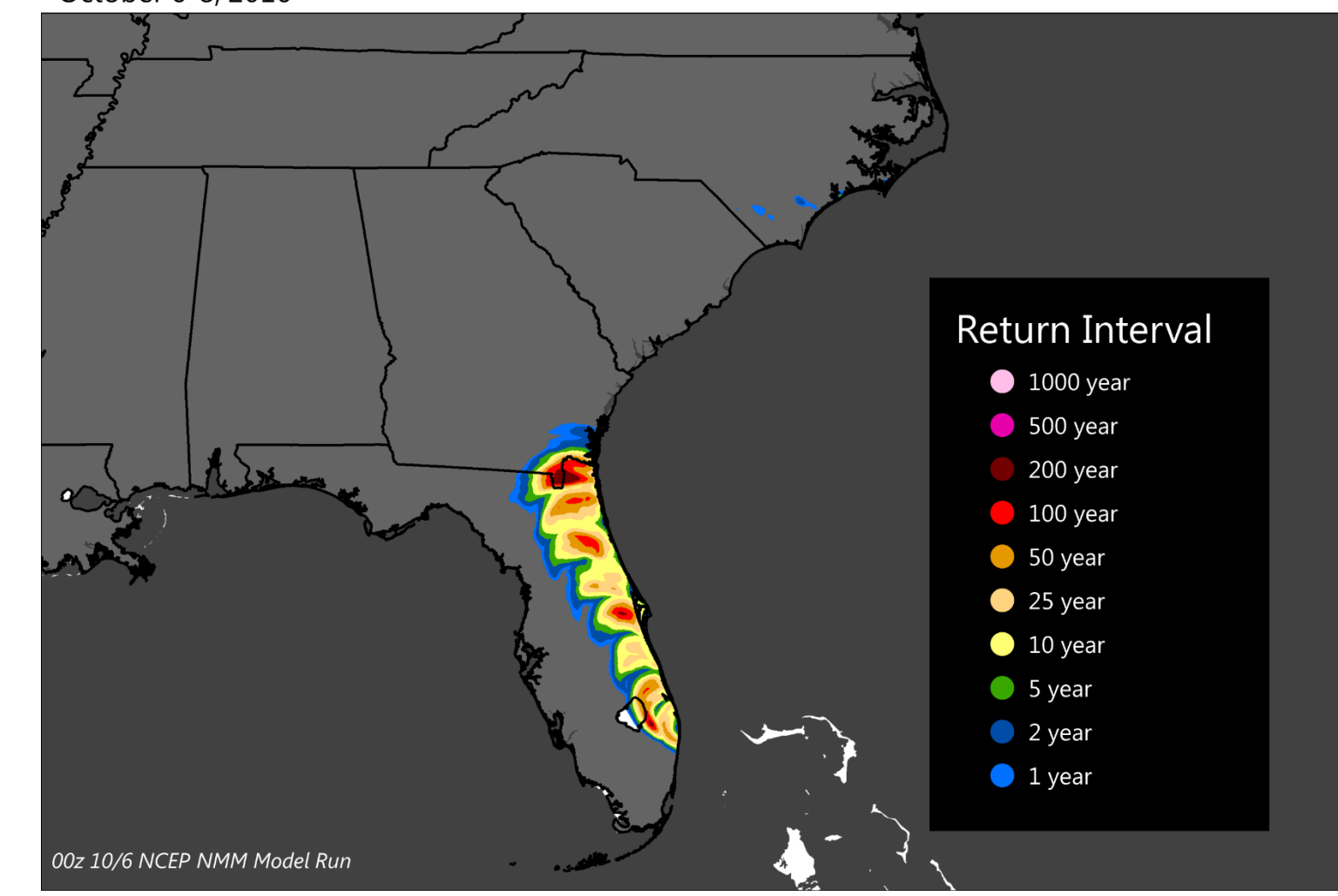
**Sierra Stats**  
Precipitation totals in the Sierra are forecast to be approximately TWICE the monthly average for January.

#### Communicating Forecast Precipitation Return Interval

January 7-9, 2017, California Flood

#### Forecast Precipitation Return Interval

October 6-8, 2016



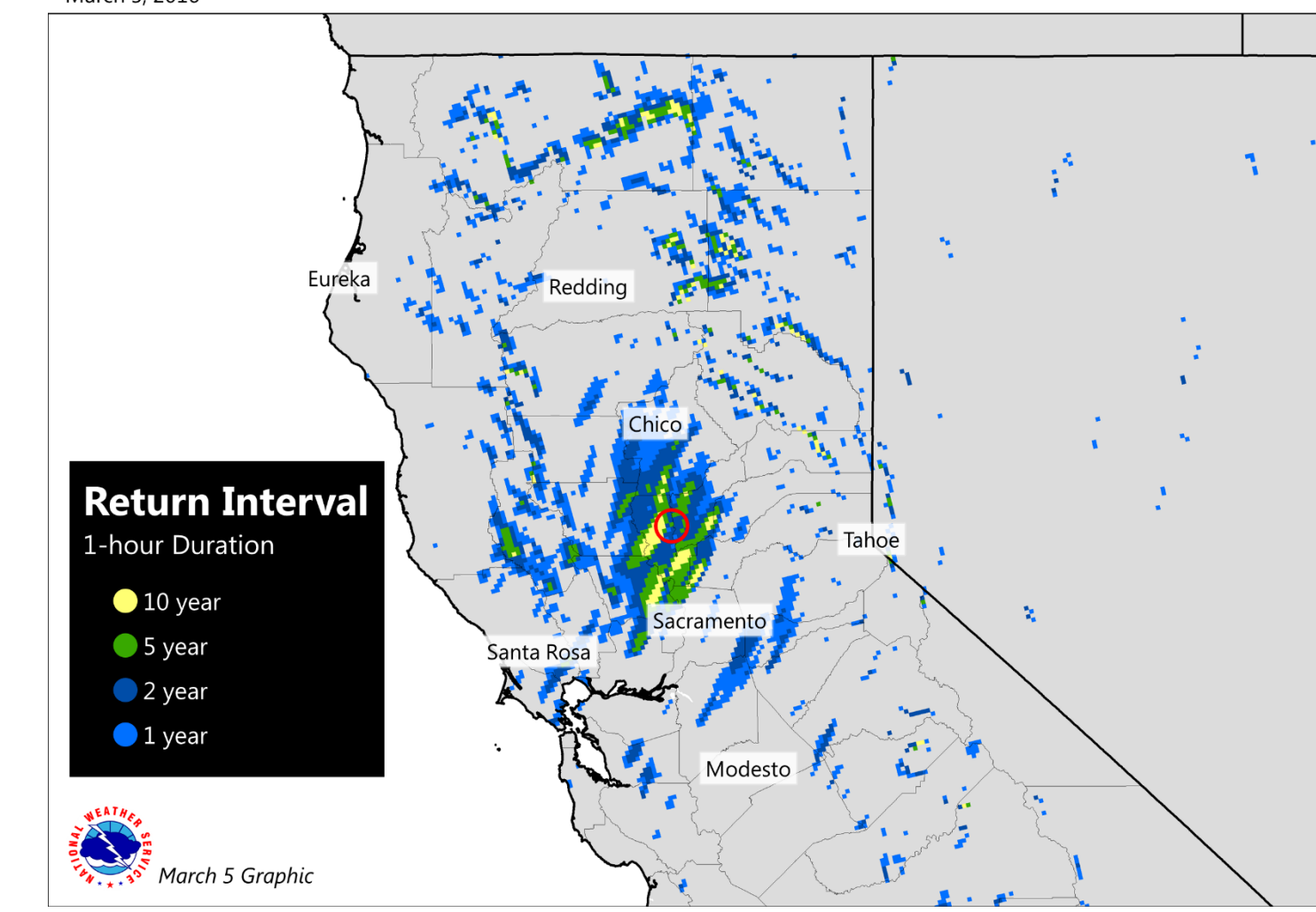
#### Forecast Precipitation Return Interval

October 6, 2016, 00z ARW model run

Hurricane Matthew as it skirted along the Florida coastline

#### Forecast Return Interval - HRRR

March 5, 2016



#### Forecast Precipitation Return Interval

March 5, 2016, 00z HRRR model run

A line of thunderstorms made its way through Northern California. A highway experienced flash flooding, resulting in 1 roadway fatality.