# Storm Forecast Summary: 2013 Atlantic Hurricane Season

**Prepared for the City of Stamford, Connecticut**

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## Storm Forecast Summary

The 2013 Atlantic hurricane season[1] is expected to be very active. Storm forecast experts call for "well above-average activity this year," and as such, say there is an above-average chance that a major hurricane (i.e., Category 3-4-5) will make landfall within the U.S. Atlantic coastal/Caribbean regions (Klotzbach & Gray, 2013). This type of storm forecast is not uncommon: of the past 18 hurricane seasons, 12 seasons were classified as above-average and 8 were classified as very active (NOAA, 2013a).

### Number and Type of Predicted Storms

For the 2013 hurricane season, scientists predict a 70% chance[2] of:

- 13-20 named storms,
- 7-11 hurricanes, and
- 3-6 major hurricanes (i.e., Category 3-4-5) (NOAA, 2013b).

To put this predicted activity in context, the averages for recent hurricane seasons, between 1995 and 2012, are as follows: 15 named storms, 8 hurricanes, and 4 major hurricanes (NOAA, 2013a). A larger difference exists between this season's predicted activity and long-term averages. The averages between 1981 and 2010 are as follows: 12 named storms, 6 hurricanes, and 3 major hurricanes (NOAA, 2013b).

### Landfall Probabilities

Storm forecast experts say there is an 86% chance of a Category 1-2 hurricane making landfall on the Atlantic coast this season (Klotzbach & Gray, 2013). They also estimate a 72% chance of a Category 3-4-5 hurricane making landfall (Klotzbach & Gray, 2013). Over the past century, the landfall probability of a major hurricane (i.e., Category 3-4-5) has been 52% (Klotzbach & Gray, 2013). Precisely predicting landfall is not possible because landfall depends on local weather patterns (e.g., wind speed and direction, atmospheric pressure) at the time of the storm's approach. Local weather patterns are predictable only when the storm is within several days of making landfall (NOAA, 2013a). In general, however, the more active a hurricane season is, the greater the chances are that a hurricane will make landfall.

Regardless of this or past years' landfall probabilities, it is important to remember that hurricane disasters can occur whether or not a season is classified as active (NOAA, 2013a).

### Local Impact Probabilities

Connecticut ranks number 10 for states most likely to be impacted by hurricanes this season (Klotzbach & Gray, 2013). There is a 12% chance that a Category 1-2 hurricane will impact the state of Connecticut, and a 3% chance that a Category 3-4-5 hurricane will impact the state (Klotzbach & Gray, 2013). These probabilities are higher than the long-term averages of 7% and 2%, respectively (Klotzbach & Gray, 2013). While in any single hurricane season it is unlikely that Connecticut will feel the effects of a hurricane, it only takes one strong storm or hurricane to devastate the area.

## Climate Factors Influencing the 2013 Storm Forecast

Seasonal storms and hurricanes are considered weather; these are caused by the way the atmosphere behaves in the short term. Climate differs from weather – it is the behavior of the atmosphere over a long period of time, typically 30 years. Long-term climate trends inherently affect short-term storm forecasts. This season's forecast is influenced by three main climate factors:

1) Ongoing atmospheric conditions that have been causing increased Atlantic hurricane activity since about 1995;
2) Sustained above-average sea surface temperatures in the region of the Atlantic Ocean where most storms form; and
3) The likely (55% chance) continuation of ENSO-neutral conditions (NOAA, 2013a). (ENSO stands for El Niño/Southern Oscillation and is a climate pattern that can strongly affect Atlantic hurricane activity (Gray, 1984; Bell & Chelliah, 2006).[3])

## Past Storm Forecasts and Observed Activity

It is helpful to compare past storm forecasts with actual, observed activity to get an idea of how accurate this season's forecast might be. Seasonal forecasts and observed activity for the past three years (i.e., 2012, 2011, and 2010) are summarized below.

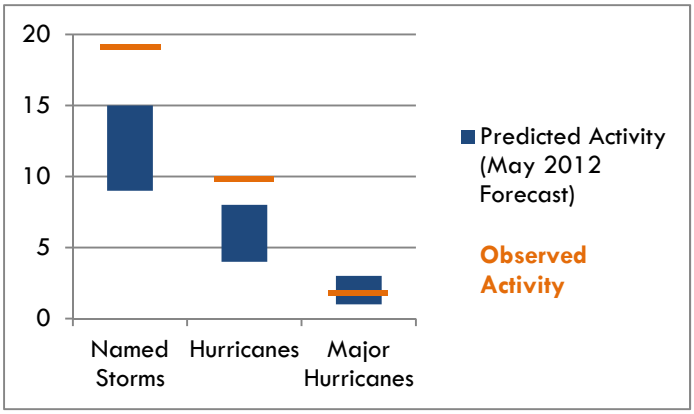
[1] The Atlantic hurricane season begins in June and runs through November. Peak months of the season are August, September, and October.

[2] A 70% chance means that in 7 out of 10 hurricane seasons with similar climate conditions, the specified type of activity is expected to occur.

[3] ENSO has two phases: El Niño (the warm phase) and La Niña (the cool phase). El Niño conditions tend to suppress hurricane development and thus make a season less active, while La Niña conditions tend to encourage hurricane development and therefore make a season more active (NOAA, 2013a). These two phases alternate every 2-7 years with neutral conditions occurring in between.

### 2012

NOAA scientists predicted near-normal hurricane activity for the 2012 Atlantic hurricane season (Bell et al., 2012). They estimated a 70% chance of 9-15 named storms, 4-8 hurricanes, and 1-3 major hurricanes (Bell et al., 2012). The observed storm activity was as follows: 19 named storms, 10 hurricanes, and 2 major hurricanes (Bell et al., 2012). Overall, NOAA scientists under-predicted the strength of the 2012 hurricane season (see graph below) (Bell et al., 2012). This under prediction was due, in part, to the developing El Niño phase that abruptly and unexpectedly ended (Bell et al. 2012). Had the El Niño phase persisted as expected, it may have reduced Atlantic hurricane activity like scientists predicted.

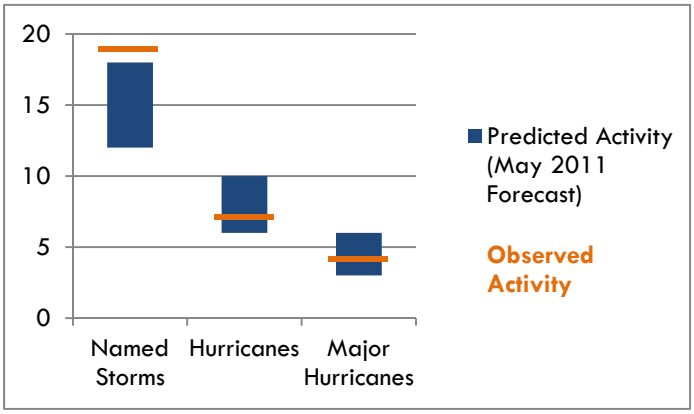



Storm forecast experts predicted a 64% chance of a Category 1-2 hurricane making landfall on the Atlantic coast, and a 48% chance of a Category 3-4-5 hurricane making landfall (Klotzbach & Gray, 2012). During the 2012 season, 1 Category 1-2 hurricane (Hurricane Isaac) made landfall and no Category 3-4-5 hurricanes made landfall. Despite the substantial damage caused by Superstorm Sandy, this storm was classified as "post-tropical" at the time it made landfall, and therefore does not count as a hurricane landfall for the 2012 Atlantic hurricane season (Klotzbach & Gray, 2012).

### 2011

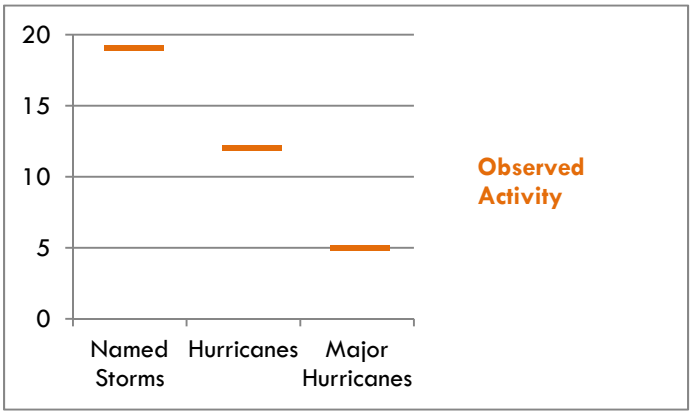
For the 2011 Atlantic hurricane season, NOAA scientists predicted above-normal activity (Bell et al., 2011). They estimated a 70% chance of 12-18 named storms, 6-10 hurricanes, and 3-6 major hurricanes (Bell et al., 2011). The observed storm activity was as follows: 19 named storms, 7 hurricanes, and 4 major hurricanes (see graph on upper right) (Bell et al., 2011). The La Niña phase present throughout 2011 contributed to the above-normal activity of the Atlantic hurricane season. In general, NOAA scientists were on-target with their seasonal storm predictions.

Storm forecast experts predicted an 86% chance of a Category 1-2 hurricane making landfall on the Atlantic coast, and a 72% chance of a Category 3-4-5 hurricane making landfall (Klotzbach & Gray, 2011). During the 2011 season, 1 Category 1-2 hurricane (Hurricane Irene) made landfall and no Category 3-4-5 hurricanes made landfall.




### 2010

NOAA scientists predicted above-normal hurricane activity for the 2010 Atlantic hurricane season, and suggested it could be one of the more active seasons on record (Bell et al., 2010). Scientists did not issue frequency ranges for named storms, hurricanes, and major hurricanes in 2010. The observed storm activity was as follows: 19 named storms, 12 hurricanes, and 5 major hurricanes (see graph below) (Bell et al., 2010). Similar to 2011, the La Niña phase present during 2010 contributed to the above-normal seasonal storm activity.




Storm forecast experts predicted an 89% chance of a Category 1-2 hurricane making landfall on the Atlantic coast, and a 76% chance of a Category 3-4-5 hurricane making landfall (Klotzbach & Gray, 2010). Despite the high levels of predicted and observed storm activity, the United States experienced no hurricane landfalls. This makes the 2010 Atlantic hurricane season the most active season on record to produce no U.S. hurricane landfalls (Bell et al., 2010).

## Forecasting Seasonal Storm Activity

Seasonal storm forecasts are made using statistical models. First, these models are tested for hindcast skill:

scientists input past data and examine the forecast results of the model. If the model produces results that are consistent with actual, observed past storm activity, the model is said to be "skilled" at hindcasting. The assumption is that a model that is skilled at hindcasting therefore will be skilled at forecasting. This assumption is valid only if the atmosphere behaves in the future the way it has in the past (Klotzbach & Gray, 2013). As our climate continues to change because of the greenhouse gases we keep emitting, we may see the atmosphere behave differently from the way is has in the past.

## Resources

Atlantic Hurricane Outlook and Summary Archive. NOAA Climate Prediction Center. Available at: http://www.cpc.ncep.noaa.gov/products/outlooks/hurricane-archive.shtml.

Atlantic Hurricane Season Outlook. NOAA Climate Prediction Center. Forthcoming forecast to be issued in early August of 2013. Will be available at: http://www.cpc.ncep.noaa.gov/products/outlooks/.

Tropical Meteorology Project's Forecasts. The Tropical Meteorology Project, Colorado State University. Available at: http://tropical.atmos.colostate.edu/forecasts/. Forthcoming forecast to be issued in early August of 2013.

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