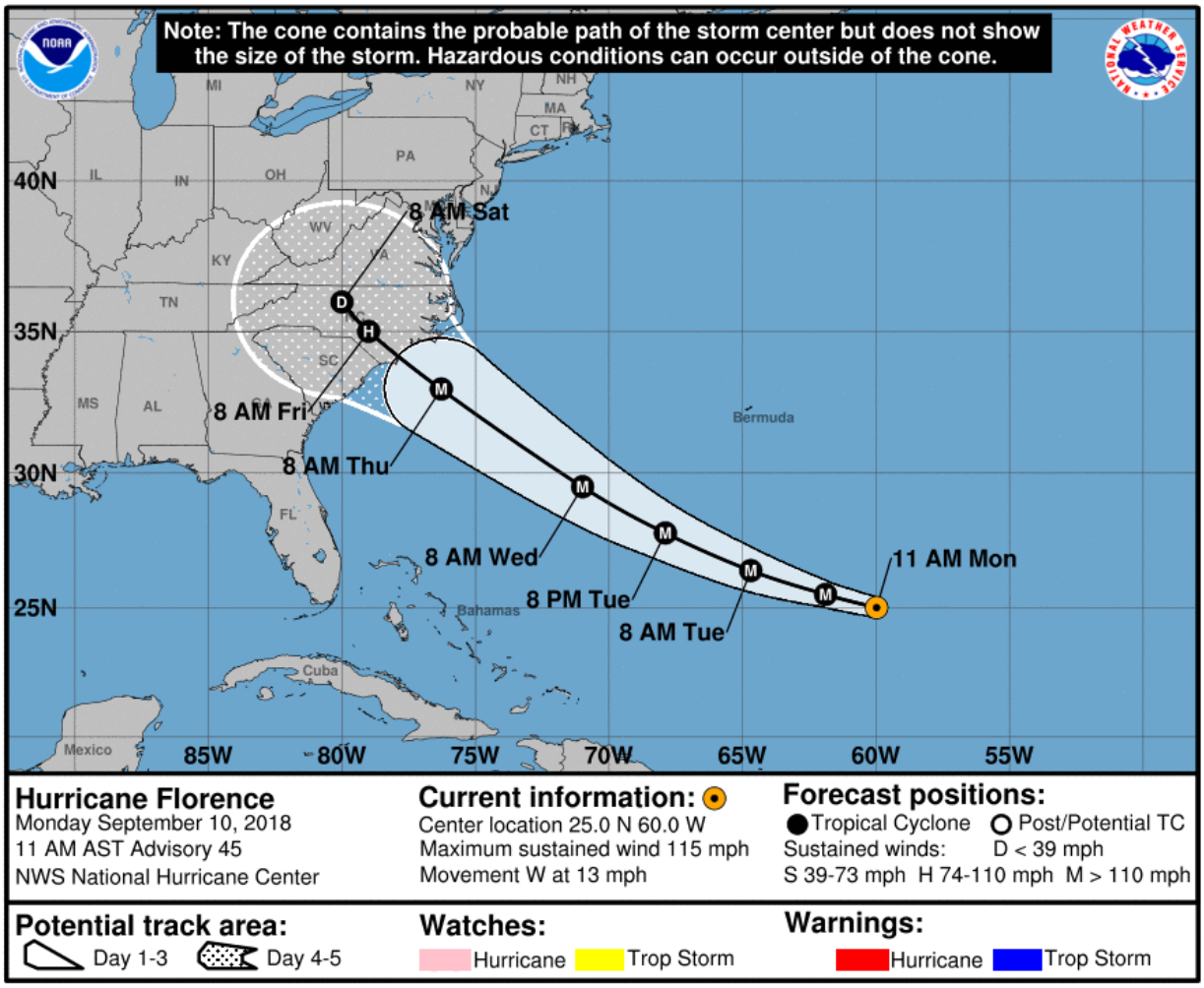
Hurricane Florence could become the storm of record for North Carolina

Currently, the forecast models are tightly clustered around an impact along the North Carolina coast, somewhere in New Hanover County. The forecast cone still includes possible landfall from Myrtle Beach, South Carolina north to Cape Hatteras. The storm track, intensity, and movement after landfall could combine to generate coastal impacts similar to those of Hurricane Hugo (1989) and inland flooding on the scale of Hurricane Floyd (1999). If the projected track and intensity modeling holds, this will be a worst-case scenario storm. All interests in eastern North Carolina and the South Carolina Grand Strand and Pee Dee regions should be taking this storm very seriously. Plan for evacuation now and expect to be without power for days.



Above: Hurricane Florence forecast cone from NOAA National Hurricane Center, as of Monday, September 10, 2018, 11 AM.

We could see record storm surge for North Carolina

In 2012, our program published a paper in the Journal of Coastal Research discussing our National Storm Surge Database and describing all of the factors that impact storm surge heights. Predicting storm surge is much more complicated than simply looking at the Saffir-Simpson Scale. In this case, surge heights will be dependent on a complex interaction between the storm meteorology, storm track, and the geomorphology (shape) of the impacted shoreline. Shore perpendicular (or close) tracks are of greatest

concern. They can push water in front of them for many days and then finish the job as they cross the shoreline perpendicularly (making it difficult for water to escape). Hurricanes Hugo (1989), Hazel (1954), and Katrina (2005) are good examples. Storms that move along the coast or cross obliquely cannot generate the same degree of storm surge: think hurricane Matthew (2016). Finally, the shape of the coast and the width of the continental shelf make a big difference as well. The same storm approaching a concave shoreline (like the middle of the Georgia Bight) will generate a higher storm surge than a storm that is approaching a convex shoreline (like Cape Hatteras). On a concave coast, the water gets pushed towards the middle, accentuating storm surge in those areas.

Hurricane Florence is likely to generate significant storm surge in North Carolina or South Carolina because it meets all of the above criteria (assuming that the projected track/intensity will hold). The storm will approach the coast close to perpendicularly. The northern side of the storm will see onshore winds pushing a large envelope of water. The storm will be traveling straight towards the coast for days, pushing a lot of water in front of it. There are two embayments in the impact area that could focus flood waters and accentuate storm surge heights.

If the storm comes ashore near Cape Fear, North Carolina, the **Onslow Bay** embayment would be in the most dangerous quadrant of the storm. All of the barrier islands in Onslow Bay could experience complete overwash. **Topsail Island**, in the center of that embayment would be particularly exposed. **North Topsail Beach** is at greatest risk because many areas are already vulnerable. Storm surge heights could be expected to exceed previous records (see Table below).

If Florence moves a bit further south than the current track, the **South Carolina Grand Strand** could see record storm surge. A shore perpendicular strike near **Cape Romain** would place **Myrtle Beach and North Myrtle Beach** in the most dangerous quadrant of the storm. Both cities are also in the center of a coastal embayment (Long Bay) that would accentuate surge heights. They are somewhat less vulnerable than Onslow Bay because Myrtle Beach and North Myrtle Beach are not barrier island shorelines. **Cherry Grove** to the north and **Garden City** to the south are on barrier islands and would be at risk for complete overwash. In either scenario, the track of Hurricane Florence, combined with its expected size and strength at landfall and the unique coastal geomorphology of the region, is likely to result in a record storm surge along portions of the warning area. All localities should prepare for a storm surge that exceeds the values shown in the Table below.

Highest storm surge measurements for select locations in projected impact zone.

Location	Storm (Year)	Storm Surge Elevation (Datum)	Type of Measurement Collection Agency
Sunset Beach, NC*	Hazel (1954)	18 feet above MSL	High water mark USACE Wilmington
Carolina Beach, NC	Fran (1996)	13.5 feet above MSL	High water mark (mudline) USACE
Wrightsville Beach, NC	Fran (1996)	11.6 feet above MSL	High water mark (mudline) USGS
Topsail Island, NC	Fran (1996)	14.6 feet above MSL	High water mark (mudline) USACE
Myrtle & North Myrtle Beach, SC	Hugo (1989)	13.9 feet above NGVD	High water mark USGS

*Highest recorded historical storm surge elevation between Cape Lookout, NC and Myrtle Beach, SC.