



**IRENE UPDATE (8/24/11 – 1:00 pm)**

Tropical cyclone models have come into consensus and remained relatively stationary for the past 24 hours regarding *Irene* – both in terms of intensity and track. If the predictions hold true, then the center of a waning Major Hurricane Category 3 or a Category 2 hurricane will just miss Cape Lookout and Cape Hatteras – sometime Saturday afternoon and evening (Fig. 1). Although *Isabel* (2003) had a more southeast approach and was once a Category 5 hurricane (see Fig. 2), *Irene's* position and perhaps intensity is similar despite a more southerly/southwest approach. The take home message for *Isabel* was two-fold; (1) Bogue Banks was only 35 miles west of the eye, but sustained minimal beach damage and virtually no structural damage. (2) The windfield and storm surge associated with *Isabel* however produced record flooding Down East. The following are several variables we will closely watch, and of the five listed below; the tide factor and angle of approach are something to pay particular attention to.

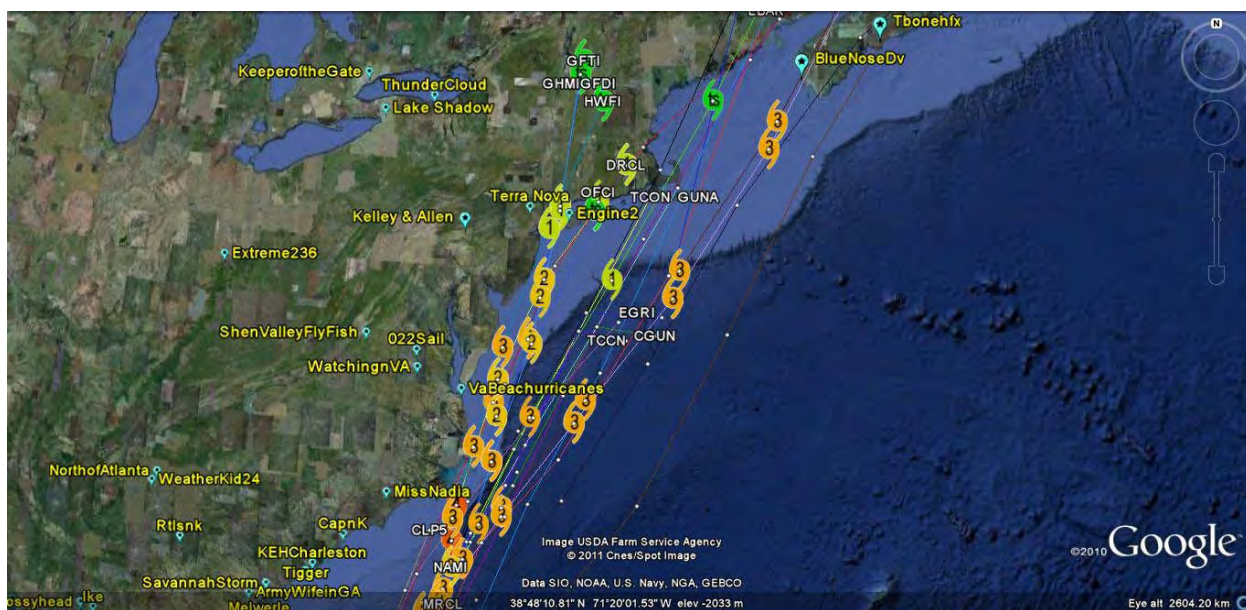


Fig. 1 – Projected track and intensity (8/24/11) for *Irene*.

**(1) Angle of approach (East v. West)** – This is probably the most important variable. The northeast quadrant is where the storm surge and highest winds reside. If an area of the County is situated west of the eye, then the damages are less (*Isabel* example cited above). Conversely, if we are located on the east side of the eye, then we take the brunt of the storm. Wind directions also play an important role in this “angle of approach” variable. Quite possibly, it is better to be positioned west of the center of a category 3 or 4 landfall hurricane than east of a minimal category 1 hurricane.

One just has to look at the differences in *Isabel* and *Floyd* (1999) for an illustration of this point - Bogue Banks was roughly 75 miles east of *Floyd* (1999) and the island incurred significant damage. Hurricane *Hazel* (1954) crossed land near the NC/SC border and Bogue Banks also incurred significant damage – again east of the cyclone.

**Irene** – As mentioned above, it's very close – but we (Bogue Banks) should be on the more “favorable” west side of the cyclone, plus the winds will **generally** be pushing offshore rather than onshore based on the SW to NE trending direction of the path.

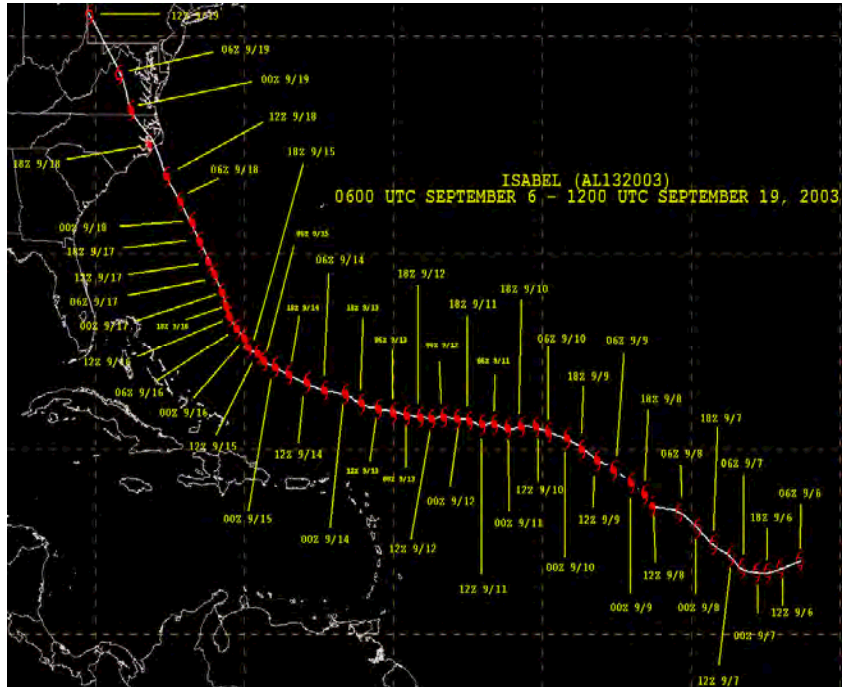


Fig. 2 – Track of hurricane *Isabel* (2003). notice landfall location.

**(2) Intensity** – We’re all aware of the “1 to 5” Saffir-Simpson scale, which is based upon wind speeds utilizing the U.S. 1-minute average. A category 1 hurricane has winds ranging from 74 to 95 miles per hour (mph), category 2 ranges from 96 to 100 mph, category 3 ranges from 111 to 130 mph, category 4 ranges from 131 to 155 mph, and a category 5 hurricane has sustained winds exceeding 155 mph. A hurricane is considered “major” if it reaches Category 3 status or higher.

**Irene** – As mentioned above, *Irene* is predicted to become a Major Hurricane (Cat. 3), and the threats of bigger storm surges and more wind are a big concern.

**(3) Duration** – This can be an important variable. A slow-moving cyclone, besides surficially exposing islands, estuarine shorelines, and adjacent waters to the elements for an extended amount of time, also allows long period swells and higher waves to impact the area. A very slow moving cyclone also allows several high tides to pass, which can accentuate interior flooding impacts (rain and wind driven flooding on the sounds). *Ophelia* (2005 – sound side erosion) and *Floyd* (1999 - record rains and flooding inland) are great examples of what a slow moving storm can do.

**Irene** – *Irene* is predicted to have an “average” rate of forward motion.

**(4) Predicted Storm Surge** – Storm surge is caused by; (a) the lift of water as the cyclonic low pressure acts like a straw, mounding the water upwards, and (b) the push of water like a plow by the cyclone. The bulk of the surge is again located along the northeast quadrant of the storm. In general, a category 1 hurricane can produce a storm surge of 3 to 5 foot above normal, while a category 4 hurricane can produce a surge ranging from 13 to 18 foot above normal, and a 20 foot above normal storm surge can be developed by a category 5 hurricane.

**Irene** – I have not seen a predicted storm surge yet for North Carolina, but *Isabel* (2003) and *Donna* (1960) had an estimated 6 to 8 foot storm surge for N.C., and that’s probably within the order of scale for *Irene* (possibly higher) – again, if we’re west of the cyclone, then the full effects of the surge will not be realized.

**(5) Lunar Tide** – The tidal range along Bogue Banks is roughly a 3.5 feet total swing and obviously a lower tide is a better time to bear the brunt of any storm. Spring, neap, and other tidal changes also can play a factor in the ultimate flooding potential of a particular hurricane. A term that is quite often used to describe the additive effects of tides is the **storm tide**, which is the cumulative height of the storm surge and the tide. Thus for example, a ten foot storm surge plus a two foot tide at time of landfall may produce a 12 foot storm tide that impacts the coast.

**Irene** – With no pun intended, the stars and moons are not aligned too favorably for us. There is a New Moon in almost full effect on Saturday night, and the tides are currently running a close to a 1 foot above normal (predicted) right now. The tides for this Saturday (Beaufort Inlet) are 7:04 am – HIGH, 1:18 pm – LOW, and 7:34 pm – HIGH. Moreover, our tidal levels are uneven and the higher of the two high tides is that evening, which is predicted to be almost a foot higher than that morning high tide. Obviously this will accentuate any flooding (ocean or soundside) *Irene* brings.

### **IRENE’S POSSIBLE IMPACTS**

Before the National Weather Service adjusted the track of the storm, we were looking at a near direct hit of the NE quadrant of Major Hurricane – it could have been a storm of record for us, and interestingly had/has a very similar track and intensity of the Great Beaufort Hurricane (1979) – (see Fig. 3). Although well before our time, this hurricane was a Category 3 (major) hurricane when it made landfall and was responsible for a total of 46 deaths.

Otherwise we anticipate the following based on the most current information;

**Oceanside** – High water, flooding of the beach berm, and some minor dune erosion in discreet locations. Sand will be transported “offshore” to dissipate wave action. Hopefully no overwash at the Circle in AB. High water at the Point in EI. Windblown sand back on dune after storm crosses us.

**Rain** – Early estimates range from roughly 5 to 10 inches across the County, and based upon the forward speed of motion and location, it will be a relatively quick event. Significant, but not record setting or the worse we have seen in the past few years.

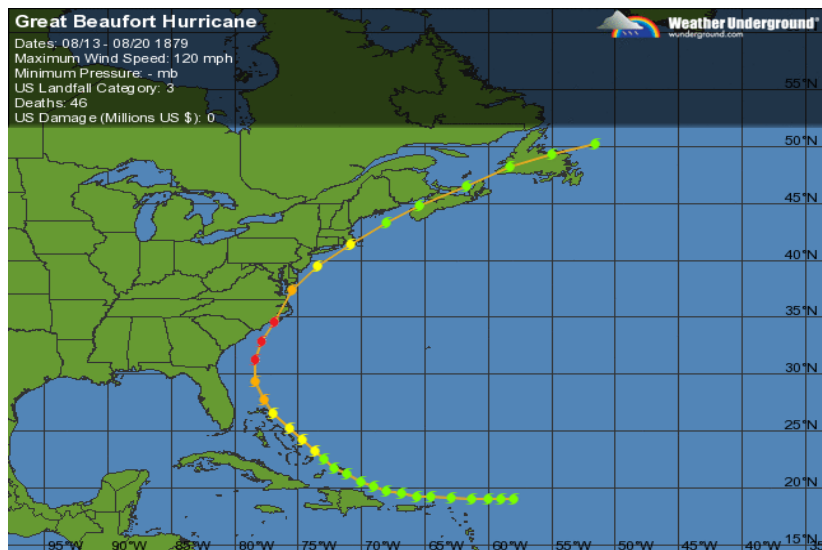


Fig. 3 – The Great Beaufort Hurricane of 1879

**Wind** – Significant winds are inevitable and again, nothing official has been posted yet on what to exactly expect for us in Carteret County, but hurricane force winds flirting with a 80 mph or greater gust is a possibility.

**Soundside Flooding** – Probably the biggest threat, especially Down East because of the New Moon, mixed high tidal ranges coupled more importantly by the wind tides coming from the sound, and if the cyclone is close, surge as well.

### **PRE STORM ACTIONS**

**Beach Surveying** – Our contractors (Geodynamics) are on call for a post *Irene* survey if warranted. Our annual monitoring event of Bogue Banks, Shackleford Banks, and Bear Island is conducted in the May/June timeframe and constitutes our “pre-storm survey”. If we feel that the County will be part of a Federal Disaster Declaration as a result of a hurricane, then we will proceed with a “post-storm” survey. This will help us document the volume of sand lost during this Federal Disaster, which is part of the process that enables us to participate in a FEMA reimbursement effort to replace this sand along our beaches.

**Photographic Cataloguing** – We will conduct pre and post photography on land of certain locations along Bogue Banks, and if warranted; we will conduct aerial reconnaissance after the storm. The pictures will be made available on-line, and we will hopefully be migrating towards a video cataloguing system for next year.