

SHORELINES – October 2010

Hurricane *Earl* Recap

As presented to the *Island Review* magazine

September 10th marks the climatological peak of the hurricane season, and just about true to form, Hurricane *Earl* passed ~120 miles east/slightly southeast of Beaufort Inlet as a category 2 hurricane at approximately 11 pm, September 2nd (Fig. 1). Earlier in the day (9/2) *Earl* became the third strongest Atlantic hurricane on record so far north in U.S. coastal waters (Category 4, 140 mph near the latitude of the Georgia coast).

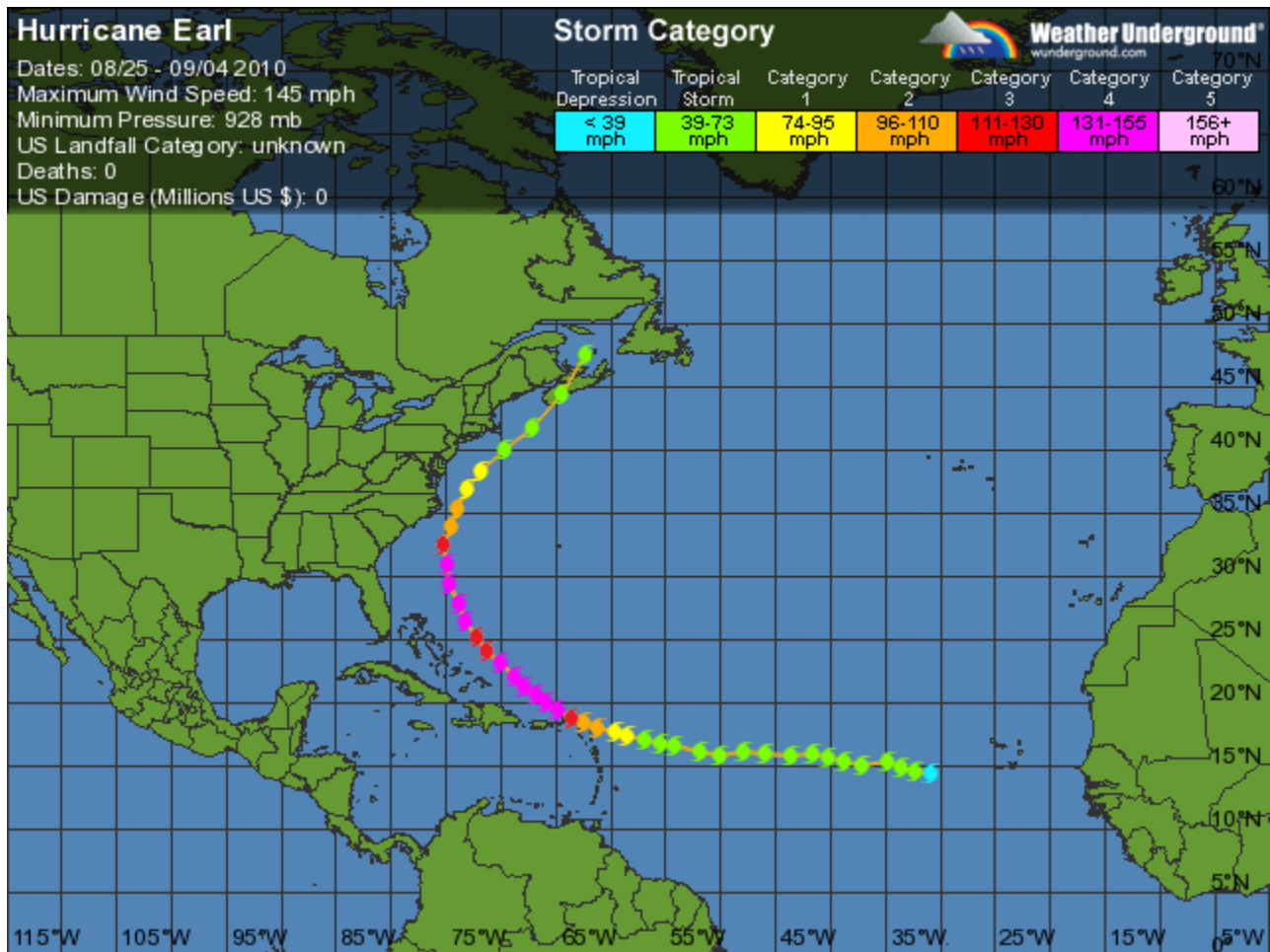


Figure 1 – Tropical cyclone track and intensity for Hurricane *Earl* (from wunderground.com)

The Shore Protection Office generally evaluates 5 variables to ascertain the threat and subsequent impacts of a tropical cyclone that affect Bogue Banks and adjacent beaches (granted some of them are interrelated); (1) Intensity, (2) Duration, (3) Angle of Approach, (4) Storm Surge, and (5) Tidal Cycle. Of these variables, there were two that were

relatively fortunate for Bogue Banks regarding *Earl* – Angle of Approach and Duration (discussed below). *Based on visual observations, there was no dune erosion, and little sand appeared to have eroded off the beach/transported offshore.* The only area of dune erosion that was identified was in a small section of the numbered streets of Emerald Isle, which is known as a “hot spot”. Carteret County has implemented a multi island [beach survey program](#) that is conducted on an annual basis with an optional post-storm survey. Considering the relatively minor amount of erosion Bogue Banks sustained from *Earl*, and the unlikelihood that the FEMA reimbursement category for these types of expenditures will be authorized; a post-storm survey for *Earl* was not warranted.

Angle of Approach - The east side of the hurricane is where the maximum winds and storm surge are generated; while the west side of the hurricane is relatively less destructive (plus the wind patterns are often more favorable for the south-facing beaches of Bogue Banks). There are many examples we have experienced to this effect including hurricane *Isabel* in 2003 – landfall was close to Drum Inlet and caused extraordinary, record flooding in the Down East corridor of the County. On the other hand, the west side of the County near Bogue Banks and ~35 miles west of the hurricane eye sustained minimal damage. Conversely, Bogue Banks was roughly 75 miles east of *Floyd* (1999) and the island incurred significant damage.

For *Earl*, Bogue Banks was ~120 miles west of the center and again, the damages the beaches sustained were generally minimal. Water may have touched the frontal dunes in discrete locations at peak high tides.

Duration – Coupled with a “favorable” angle of approach was the rapid forward motion of *Earl*, which helped limit the long-term development of high seas and water piling up in the sounds, especially over multiple tidal cycles. *Ophelia* (2005) was a model “duration hurricane”.

To these effects, the differences in *Isabel* and *Earl* are also interesting to think about. *Isabel* (2003) was a much slower moving hurricane (it was Cat. 5 cyclone at one point) and made a tangential strike to Core Banks, which besides causing record flooding Down East, also created a breach in Hatteras Island, just north of Hatteras Village, and was also the “storm of record” for the Duck Research Pier – a 26.6 feet significant wave height in 55 feet of water (highest ever on record). *Earl* (2010) on the other hand was very swift moving, and never made landfall in North Carolina, positioning Bogue Banks and other beaches along the less intense west side of the cyclone. Both storms were considered to be very large (diameter of the cyclone).

Although the impacts of *Earl* were minimal in terms of erosion (especially dune erosion), it’s still important to remain cognizant of the ***cumulative effects*** the glancing blows we’re having with *Danielle*, *Earl*, *Fiona* and whatever lies ahead the next several weeks – this could result in sand being displaced off the beach and deposited offshore. Some or most of this sand may return to the beach as it oscillates up and down the profile. Thus with our beaches compromised, a “small” direct hit later this hurricane season could result in considerable erosion.

And finally - perhaps the legacy of *Earl* will be the ***numerous tires*** that washed up on the beach, presumably from the broken artificial reef complex ([AR-315](#)), originally comprised of over 177,000 tires lashed together with chains. The municipalities of Bogue Banks did a great job of clearing the tires (hundreds) off the beach in time for the Labor Day weekend. The tires were staged on properties located off the beach and subsequently collected by the N.C. Division of Marine Fisheries.