



SHORELINES – January 2009

As presented to the *Island Review Magazine*

2008 Hurricane Season Recap

November 30, 2008 marked the last day of the 2008 hurricane season which officially started back on June 1st. Most experts agree the Atlantic Ocean basin is in the middle of a trend of heightened tropical cyclone activity, regardless of the underlying causes. Warming climate and seas may help produce larger numbers and more intense hurricanes over the next several years but the jury is really still out concerning these relationships. As of now, it appears there *may* be a positive corollary between global warming and the *intensity* of storms – the relationship between the *number (frequency)* of storms and warming climate appears to be further away from any type of consensus. As we'll discuss in a moment, the 2008 season may be a good representation of these dominant trends – heightened tropical cyclone activity with more intense hurricanes. Also despite a couple of years of admittedly being pretty far off the mark, hurricane forecast experts were pretty much “spot on” with their predictions this year.

It's also important to remember that a **tropical cyclone** is a warm-core, atmospheric closed circulation rotating counter-clockwise in the Northern Hemisphere (that's us) and clockwise in the Southern Hemisphere. A tropical cyclone becomes a **tropical storm** when the maximum sustained surface wind speed ranges from 39 mph to 73 mph using the U.S. 1-minute average, and is designated as a **hurricane** when the cyclone reaches a maximum sustained surface wind of 74 mph or more.

Hurricanes are further segregated utilizing the Saffir Simpson scale that includes a 1 to 5 rating based upon wind speeds, again 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. Category 3 or higher is classified as a major hurricane. Interestingly, category 5 hurricanes very rarely make landfall - only three category have ever made land fall in the U.S. – the Labor Day hurricane (1935), *Camille* (1969), and *Andrew* (1992).

The terms “extratropical” and “subtropical” are also mentioned sometimes during the hurricane season and deserve an explanation here as well. An **extratropical storm** is a *cold-core* atmospheric cyclone deriving its energy when cold and warm air masses interact, not as part of the positive feedback loop identified with tropical storms as warm, moist air rises causing heat exchange. Unlike tropical storms, extratropical storms can have one or more fronts connected to them, and can occur over land or ocean. An extratropical cyclone can have winds ranging to levels associated with a tropical depression, or as strong as a hurricane. Examples of extratropical cyclones include blizzards and nor'easters, which often form in winter and fall months off the mid-Atlantic and drift slowly along the north Atlantic seaboard and eventually east. If it drifts back west towards land, it is called a retrograded nor'easter.

A **subtropical storm** occurs if waters under an extratropical cyclone are warm, followed by thunderstorms that gradually build inside the storm. The storm core may subsequently and gradually go from cold to warm, and the storm will be called subtropical.

Both subtropical and extratropical cyclones have the highest winds and thunderstorms a good distance away from the center, and may have frontal boundaries associated with the systems. The two (extra- and subtropical) are usually broader systems than a tropical system, but the subtropical system will produce more rain compared to an extratropical one.

As mentioned above, the hurricane forecasters had a good year in 2008. How can we objectively make this assessment? My personal preference is to review the predictions produced by groups that make not just their prediction public, but verify their prediction skill in the public arena as well. This really leaves us with two groups – the Tropical Meteorology Project at Colorado State University, and the University College London, U.K. for Tropical Storm Risk. We'll add the National Oceanic & Atmospheric Administration (NOAA) to the mix because this is our Federal voice for climatology/meteorology matters. We then take these groups' last prediction just before the hurricane season started on June 1st and compare the predictions to the actual results at the end of the season. As the accompanying prediction summary chart indicates, the average prediction included 15 total cyclones (the actual was 16), 8 of which were predicted to generate into hurricanes (the actual was indeed 8), with 4 of these becoming major hurricanes (the actual was 5). Not bad!!

	NOAA (max.)	Colorado State University, US	University College London, UK	Average of Predictions	Actual 2008	Average (1950-2000)
Total No. of Named Tropical Cyclones	16	15	14	15	16	10
Tropical Storms	7	7	7	7	8	4
Hurricanes / Major	9/5	8/4	7/3	8/4	8/5	6/2
Accumulated Cyclone Energy (ACE) Index	160	150	131	147	141	96

Table 1 - Summary comparing publicly available pre-season predictions for the 2008 Hurricane Season with actual results and average activity.

One term we haven't discussed that appears on the prediction chart is the *Accumulated Cyclone Energy Index* (ACE Index), which is simply a measurement taking a storm's wind speed strength for each 6-hour period of its existence into account. The larger the ACE Index value, the more active the season. This is actually one of the more revealing parameters in my humble opinion (and others) and likely serves as a better barometer of whether or not a hurricane season is truly "active" or not. Last year (2007) is a perfect example. We had 5 more tropical cyclones than average, but most of the cyclones were very short-lived or rather weak, with the exception of two category 5 hurricanes that impacted Central America. The mood for most of the Atlantic and Gulf States was that the hurricane season was very benign. The ACE Index for 2007 was 68 – the average is 96. The 2006, 2005, 2004, and 2003 Index figures were 79, 248 (highest on record), 225, and 175, respectively. These numbers are very consistent with the actual hurricane activity we had in these years. For 2008, the average predicted ACE Index was 147 – the actual was 141 (very close) and the average is 96. Again, this makes a lot of sense – the 2008 season was not as active as the 2003, 2004, and 2005 seasons but definitely busier than the past two years (2006 and 2007). For 2008, the intense hurricanes of *Gustav* and *Ike*, and the longevity associated with *Bertha* were the biggest factors contributing to the ACE Index.

Some of the more interesting aspects of the 2008 hurricane season include;

- (a) Out of the 16 tropical cyclones that formed, 10 made landfall, 6 of which were in the U.S.

- (b) Hurricane *Bertha* although never making landfall, was the longest-lived hurricane in July, longest-lived tropical storm in July, and the farthest east forming tropical storm and hurricane for so early in the season.
- (c) The coastal damages associated with Hurricane *Ike* that made landfall in Texas is estimated at \$27 billion – the third costliest hurricane behind *Katrina* (2005) and *Andrew* (1992).
- (d) In Haiti, 800 people were killed by four consecutive tropical cyclones (*Fay*, *Gustav*, *Hanna*, and *Ike*) during August and September.
- (e) *Hanna* made landfall as a tropical storm near the N.C./S.C. State line on September 6th and was the closest landfall to Bogue Banks in 2008. The local impacts were generally regarded as minimal.
- (f) A “no-name storm” occurring after *Hanna* may have caused the most beach erosion, especially in southern N.C. It was an extratropical storm (see explanation above) that formed off the N.C. Coast and retrograded back towards land.