

Predecessor Rain Events and what happened with Helene By KI5

It has been often stated in the media that the people affected dramatically by Helene should have been prepared for what happened. Why weren't they prepared for a major storm event in their area? My favorite answer to this is that for them to prepare for a hurricane is the same as telling Iowa that they need to prepare for a tsunami or Florida to prepare for a blizzard. These events happen in certain areas. As far inland as lower Appalachia is from the landfall of Helene, many would not expect they would get more than some remaining rain off of the hurricane. The normal issues they have with weather. It was predicted to be in greater amounts than seen historically, but who would have a benchmark to know what would happen? No one did - but now they do. What happened was a PRE.

PRE stands for predecessor rain event. This term was only coined in 2007 and is relatively new in research in meteorology. These are high impact rainfall events that happen before a hurricane arrives in the eastern third of the US usually in August and September. Because these are mesoscale regions of heavy rainfall, they are difficult to predict in space and time though they are getting better with time and study. A PRE is defined as a coherent region of heavy rainfall. This rain is in a position of being poleward and separate from the main hurricane. These events are on average 1000 km poleward of the hurricane at the time of the PRE initiation. They are the movement of deep tropical moisture coming before the hurricane. They can then be influenced by meeting another front. Such as in this case there was a stalled front across the Carolinas which kept the storm to the area it hit.

Helene's affect on this area was quite dramatic, many saw that a PRE would precede the hurricane to the area but how to explain and warn people of such an anomaly. Without the PRE, the flooding would have been moderate as opposed to the catastrophic event it became. Many people knew how the river has flooded in their valley before. People knew what roads can be impassible and which ones after flooding - can still be used. But when you know what the "average" event does to your area, you have no idea what the "anomaly" event will do. An example given is that it is like you knowing how to ride a bicycle but that does nothing to prepare you for driving a Formula One race car.

The predictions of rain were close to what happened. People did prepare for a storm. Schools were even closed and people huddled down. But....

Their benchmark for devastating flooding was the flood of 1916. Over a century before. This flood was the result of several hurricanes coming in and affecting the area. So with that scenario, who would expect much out of one hurricane. This can account for why in the River Arts area of Asheville you can watch as owners there talk of the flooding they've seen and how high it can get, and yet nothing coming close to matching this one. In fact, western North Carolina received four to five months worth of rain in three days.

So back to our PRE. In the 36 hours preceding Helene reaching the area, rainfalls exceeded 12 inches over much of the area with totals going as high as some reaching 20 to one recording of 30 inches. It was a particular severe storm in and of itself with thunderstorms and one recorded tornado. The ground became super-saturated over most areas. When Helene's rains reached the area there was nowhere for them to go but to follow the hollers, coves, and valleys down the steep mountain sides to the creeks and rivers and to spread out wherever there was space. When the ground is super-saturated it only takes moderate winds of 40-60 mph to uproot large trees. So many trees were taken down so quickly that this then led to the cascading effect of landslides, power outages, road damage, and flash floods.

And talking of flash floods. They are difficult to give enough warning for people to respond to them. Especially, in a mountainous region such as lower Appalachia. There can be a difference in what will happen as close as of a mile or two apart. USGS stream gauge along the French Broad River near Fletcher, NC recorded a peak height of 30.31 ft. on September 27th. This is more than 10 feet higher than the record flood for this area. The Swannanoa River record flood stage was 20.7 ft. in 1916, but now has broken that record and crested at 26.1 ft this time. Flood stage for the Swannanoa is

considered to be 10 ft. The PRE or Helene by themselves would have produced moderate flooding but putting the two together created a catastrophic flood event.

One big takeaway for this event is the lack of communication infrastructure. The first 24 hours are most important after an event and when you are needing to get into areas for rescues that you cannot communicate with or get into, the number of people found alive drops dramatically. Interestingly, these people didn't sit around and wait if they could get out and help. They were helping each other. I've seen video of a father and daughter who climbed over a ridge to get to friends that they hadn't heard from yet. The people themselves, that could, were working on their own roads and with 4x4s were able to make ways out and in. Also I think this event will be remembered for all the the mules and helicopters that have been the main means of rescue and grassroots endeavors. A paraphrase on one persons observation of the aftermath is that when SHTF happens, be sure you have a mountain redneck around to help.

PDF with nice graphics showing what happened. Copy URL and it should be the first item up.

Center for Western Weather and Water Extremes

<https://cw3e.ucsd.edu> > HelenePRE_EventSummary