The HWN Report

The Official Newsletter of the Hurricane Watch Net

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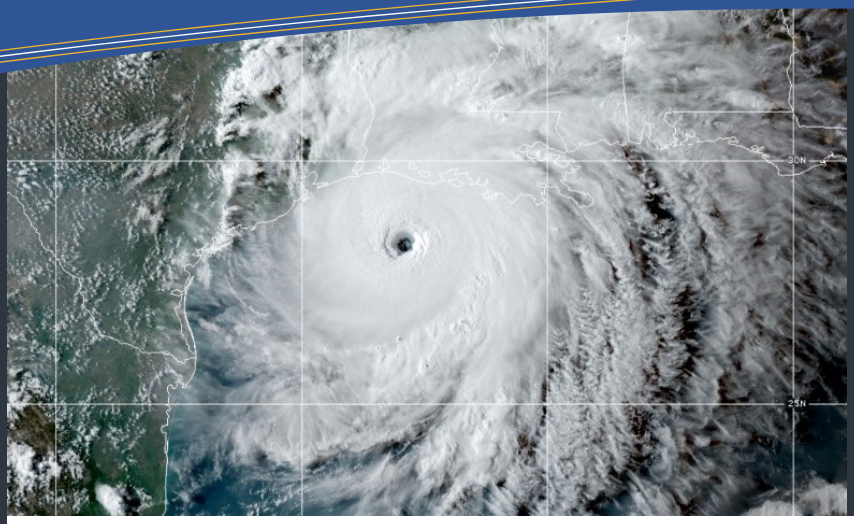

Hurricane Laura 2020

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NEW PODCAST

Check our Net Video Podcast, ***"The HWN Report"***

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This new series will feature in-depth discussions on tropics weather, the rich history of amateur radio's involvement with the National Weather Service and the National Hurricane Center, hurricane preparedness tips, and much more.

Stay tuned—we're just getting started!

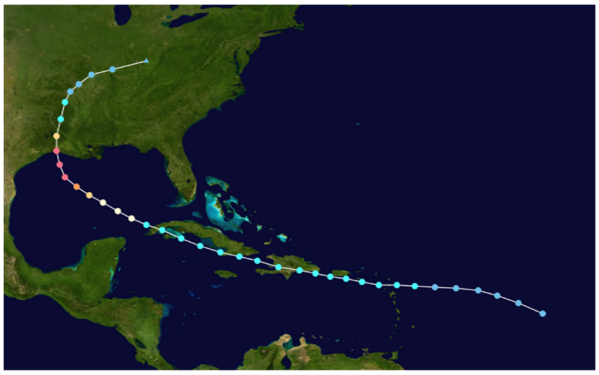
Hurricane Laura: Amateur Radio, Impact, and Lessons in Preparedness

When Hurricane Laura slammed ashore on August 27, 2020, near Cameron, Louisiana, it arrived with a force few had ever seen. Sustained winds of 150 miles per hour ripped across the Gulf Coast, making Laura the fifth-strongest hurricane to strike the continental United States. The storm left behind devastation that would take years to fully comprehend and served as a stark reminder of why preparedness – especially for amateur radio operators – can mean the difference between life and death.

For hams and meteorologists alike, Laura was more than another hurricane on the charts. It was a test of resilience, resourcefulness, and the vital role that emergency communications play when modern infrastructure fails.

HWN Operations: A Firsthand Account

While our Net was still in operation Sunday afternoon and evening, August 20th, for Hurricane Marco, we were already keeping a close eye on Tropical Storm Laura. Early forecasts called for a strong Category 2 hurricane at landfall, but as so often happens, Mother Nature had other plans.



The Official Track of Hurricane Laura 2020

We began operations for Laura on Wednesday, August 26th, at 1300 UTC. By that morning, Laura had become a Major Hurricane (Category 3) and was showing signs of further intensification. The Hurricane Watch Net was activated on both 14.325 MHz and 7.268 MHz. We did this for two reasons: (1) HF propagation was terrible on both bands, and (2) I wanted to give anyone trying to reach HWN a better chance of getting through. I knew this decision would stretch our manpower, but Laura was a Major Hurricane and growing stronger by the moment. Our job is to serve the public and the National Hurricane Center, and that meant giving every opportunity for stations in the storm's path to be heard. We remained in continuous operation until Thursday, August 27th, at 1830 UTC.

As someone who has tracked hurricanes for nearly 40 years, I also noticed something odd about Laura. Most hurricanes with a clear, well-defined eye undergo at least one eyewall replacement cycle. To my knowledge, Laura never did – and several professional meteorologists I know remarked on the same thing. In fact, there is no mention of such in the historical record for this storm on the NHC website.

Once Laura was downgraded to a Tropical Storm, we shifted gears and began asking for post-storm reports. We also called for anyone with emergency or priority traffic. Propagation was poor, and reporting stations were few. I can't help but wonder if someone in the affected area may have been calling us for help that we never heard due to the poor or, at times, non-existent propagation.

From a Tropical Wave to a Monster Storm

Laura's story began as a tropical wave off the coast of Africa in mid-August 2020. By August 21, it had organized into a tropical storm near the Lesser Antilles, moving steadily through the Caribbean. Laura first brushed Puerto Rico, then crossed Hispaniola, where it killed 31 people in Haiti and 4 in the Dominican Republic. It went on to sweep across Cuba, prompting evacuations of more than 260,000 people before emerging into the Gulf of Mexico.

Once over the Gulf, Laura found near-perfect conditions for rapid intensification: warm waters near 86–88°F, low wind shear, and abundant tropical moisture. Within 24 hours, the storm exploded from a Category 1 to a Category 4. By the evening of August 26, Laura was packing sustained winds of 150 mph—just 7 mph shy of Category 5 strength.

That afternoon, forecasters at the National Hurricane Center used language you don't often hear: *"**unsurvivable storm surge**."* They warned of water depths up to 20 feet in some areas, with flooding pushing as far as 40 miles inland. For those in the projected impact zone, it was a life-or-death message.

Catastrophic Impact Across Louisiana and Texas

Laura's landfall at Cameron, Louisiana, in the early hours of August 27 was nothing short of apocalyptic. Sustained winds of 150 mph ripped apart homes, businesses, and entire neighborhoods. The storm surge reached up to 17 feet, sweeping away everything in its path and cutting off entire communities.

Radome of Doppler Radar Site in Lake Charles, LA

Lake Charles, farther inland, bore the brunt of catastrophic wind damage. High-rise office towers were stripped of their windows, communications towers collapsed, and entire neighborhoods were flattened. More than 10,000 homes were destroyed, and another 150,000 were damaged. Nearly 900,000 people lost power, many for weeks, leaving families in sweltering summer heat without air conditioning, refrigeration, or running water.

In the end, 24 people in the U.S. lost their lives to Laura, and damages were estimated at $8.7 billion.

The Hidden Danger: Carbon Monoxide Poisoning

While winds and flooding dominated the headlines, another silent killer emerged in the aftermath: carbon monoxide poisoning. With power out, thousands turned to generators – tragically, some were run indoors, in garages, or too close to homes. At least 15 people died from carbon monoxide exposure, more than from flooding itself.

It's a sobering reminder that surviving a hurricane isn't just about making it through the storm – it's also about staying safe in the days that follow.

Amateur Radio: A Lifeline in the Storm

Amateur radio operators once again proved their worth during Laura. The Hurricane Watch Net gathered reports of barometric pressure, wind speeds, rainfall, and storm surge. WX4NHC, the amateur station at the National Hurricane Center in Miami, logged dozens of these reports, helping forecasters verify data and fine-tune warnings.

Propagation was challenging – electrical noise from the storm and poor HF conditions made contacts difficult. That's why activating both bands (20 meters – 14.325 MHz, and 40 meters – 7.268 MHz) was essential.

Other networks also stepped up. The VoIP Hurricane Net relayed information through EchoLink and IRLP. Local ARES and RACES operators staffed emergency operations centers, shelters, and hospitals. Together, amateur radio filled the communications gap when the grid went dark.

Lessons in Preparedness

Every storm teaches us something, and Laura left no shortage of lessons. Rapid intensification showed how quickly a storm can escalate, leaving little time to prepare. Generator safety proved to be a matter of life and death. And from an HWN perspective, the storm highlighted the importance of adequate manpower and backup plans when facing poor propagation.

Amateur operators who had go-kits, spare antennas, and backup power were able to stay on the air for days. Those without backups fell silent just when communications were most needed. Antennas also proved critical: permanent towers often failed, while portable or wire antennas could be redeployed quickly.

And, above all, household preparedness matters. Operators can't serve their communities if their own families aren't safe and supplied.

Reflections on a Storm Etched in Memory
Hurricane Laura's name has since been retired from the Atlantic naming list, a recognition reserved for storms of exceptional impact. For those of us who worked this hurricane, Laura was a storm that tested our communities, our Net, and our resilience.

I'll never forget the lessons she left us with: prepare early, plan thoroughly, and always remember that amateur radio is more than a hobby – it's a service, a bridge, and sometimes, a lifeline.

Hurricane Preparedness Checklist for Amateur Radio Operators

1. **Equipment Readiness**
   - Check all radios, antennas, and accessories well before hurricane season.
   - Pack a **go-kit** with transceivers, headphones, microphones, power cords, batteries, and spare fuses.
   - Include **digital interfaces** (soundcards, TNCs, USB adapters) if you operate FLDIGI, PSK31, Winlink, or other digital modes.
   - Label all gear and keep instructions/manuals handy.
2. **Antenna & Deployment**
   - Inspect and reinforce permanent antennas; secure or remove loose elements.
   - Have portable antennas ready: verticals, dipoles, mag-mounts, or end-fed wires.
   - Practice quick setup and teardown to ensure you can deploy during emergencies.
3. **Power & Backup**
   - Stock **deep-cycle batteries**, spare batteries, and power cables.
   - Maintain a **generator** (or multiple) for extended outages.
   - Have solar panels or other alternative charging options if possible.
   - Test all power systems under load before hurricane season.
4. **Generator Safety (Critical!)**
   - Never operate a generator indoors, in garages, basements, or sheds.
   - Place the generator **at least 20 feet from your home**, with exhaust facing away from doors, windows, and vents.
   - Install **battery-operated CO detectors** in living spaces.
   - Refuel only when the generator is completely cool.
   - Use approved fuel containers, stored safely **outside living areas**.
   - Follow all manufacturer safety instructions; never overload the generator.
5. **Knowledge of Nets & Frequencies**
   - **Hurricane Watch Net: 14.325 MHz & 7.268 MHz**
   - **VoIP Hurricane Net**, local ARES/RACES nets.
   - Keep a list of net times, repeaters, and backup frequencies**.**
   - Include callsigns of emergency operations centers and key liaison stations.
6. **Emergency Communications Plan**
   - Have a written plan detailing where and how to set up operations.
   - Share your availability and contact info with family and local nets.
   - Know evacuation routes and alternate stations in case your primary location is compromised.
7. **Household & Personal Preparedness**
   - Ensure your household is stocked with **food, water, and medications** for at least **72 hours**.
   - Review evacuation plans and secure important documents.
   - Keep **first aid kits** and **flashlights** accessible.
   - Plan for extended outages; prepare **coolers or ice storage** if needed.
8. **Post-Storm Operations**
   - Prioritize safety before going on air. Check the structural integrity of your station.
   - Monitor band conditions; HF propagation may fluctuate after storms.
   - Provide situational reports to nets, but always verify safety before venturing into damaged areas.
   - Assist your community with communications support as needed.

From the Manager

By Bobby Graves, KB5HAV

Welcome back to *"The HWN Report"*!

I sincerely hope you are enjoying our newsletters. Each month, I hope to review a historic landfalling hurricane, its effects, and lessons learned. As the saying goes, those who don't learn from the past are likely to repeat it.

This month, I'm thrilled to share that we've officially entered the world of podcasting! For many years, I've wanted to create an audio/video podcast to highlight the history of the Hurricane Watch Net, share stories of historic landfalling hurricanes we've been part of, discuss lessons learned, and provide helpful information on hurricane preparedness.

This new podcast, "The HWN Report", the same title as our newsletter, launched on September 4, 2025**,** on YouTube**.** Since it's listed as a podcast, it's also available on YouTube Music, where you can choose to either listen or watch. If you have a Smart TV, simply install the YouTube app and follow us right from your living room.

A few days later, we expanded to Spotify, offering the same audio/video options. Additionally, the audio version of "The HWN Report" is now available on Apple Podcasts, Amazon Music, and iHeart. To make it easy, we've provided direct links to each platform.

Our In this first episode, learn how amateur radio operators became a lifeline during hurricanes, beginning with Jerry Murphy, K8YUW, and Hurricane Betsy in 1965. This episode features rare insights, vintage clips, and how HWN continues providing real-time reports that help save lives.

If you have ideas, suggestions, or would like to contribute an article for a future issue of *"The HWN Report"*, I'd love to hear from you. Drop me a line at: editor@hwn.org

Hurricane Season Off To A Slow Start

As we move through the heart of the 2025 Atlantic hurricane season, one notable trend has emerged: it's been unusually quiet – at least so far. While there have been six named storms this season, including Erin, which reached Category 5 intensity, remarkably, as of Wednesday, September 17, 2025, only Tropical Storm Chantal has made landfall.

Several factors appear to be influencing this slow pace. Sea-surface temperatures remain high and favorable for tropical development, but other atmospheric conditions have suppressed storm formation. Strong wind shear, dry air, and the presence of the Saharan Air Layer have either choked out developing systems or limited their intensification. Forecasters from NOAA, CSU, and other monitoring agencies continue to track these conditions closely, as the season is far from over.

History reminds us that a slow start does not guarantee a quiet season. Some of the most impactful hurricane seasons on record, including 1992 and 2017, began slowly but ramped up quickly in August and September – the peak months for storm activity. Meteorologists emphasize that preparedness remains essential, regardless of early-season calm.

For members of the Hurricane Watch Net and other emergency communications groups, this slower start provides a valuable opportunity. It allows time to review protocols, check equipment, and ensure readiness for any storms that may develop later in the season.

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Stay Informed with HWN's Free Tropical Weather Email Service
HWN offers a free tropical weather email subscription service, available in multiple regions: Atlantic (in English and Spanish), Eastern Pacific, and Central Pacific. During hurricane season, subscribers receive the Tropical Weather Outlook four times daily. Whenever there is an active storm, updates are issued every six hours. In addition, if watches or warnings are in effect, an intermediate advisory is sent three hours after the main advisory. When the National Hurricane Center issues a Tropical Cyclone Update, subscribers receive that as well. All of this is completely free and available through the HWN website at www.hwn.org.

As always, staying informed is key. Reliable forecasts, up-to-date alerts, and communication plans can make the difference when a storm does appear. While the 2025 season may be off to a slow start, we remain vigilant—and ready—to support the public and emergency management agencies whenever hurricanes threaten landfall.

Meet Bobby Graves, KB5HAV

Many know me as Net Manager of the Hurricane Watch Net, webmaster for hwn.org, publisher of "The HWN Report" newsletter, and now, host for "The HWN Report" Podcast. But who is Bobby Graves?

I was born in 1960 and raised in Jackson, MS, and lived in that area most of my life until my wife and I relocated to Starkville in 2020. We made the move to be close to a new grandchild expected around Christmas that year. Since then, we've been blessed with two grandsons – one nearly five and the other almost two – who bring joy and light to my life every day.

Early Fascination with Weather
My fascination with severe weather came in March 1966, when a devastating tornado struck the Candlestick Shopping Center where my mom worked. Thankfully, she had gotten home just an hour before the storm leveled the building. At the time, there were no sirens or warning systems in my area – only news after the fact. That storm was later classified as an F-5 under the Fujita Scale (developed in 1971), and eventually updated to EF-5 when the Enhanced Fujita Scale was introduced in 2007. The storm didn't frighten me – it sparked a deep interest in weather and a desire to understand what caused such destruction.

Career in Technology and Service
After high school, I dreamed of becoming a meteorologist, an architect, or even a pilot. But the high cost of college pushed me toward my fourth choice: electronics.

From early 1979 until early 1999, when major side effects from cancer forced my retirement, I built a 20-year career in electronics troubleshooting and repair, patient care, and EMT services. In 1992, I established and managed a Biomedical Electronics Service Department, which quickly grew into a nationwide corporation where I served as Chief of Technologies. I also consulted for major medical manufacturers, built and maintained computers and networks, designed software, and led staff training. In 1994, I created and managed an R&D Department that developed new technologies and techniques.

Amateur Radio Beginnings
I discovered amateur radio in early 1988. By July, I earned my Novice license, quickly upgraded to Technician (August), and General (December). During the fall of 1988, I became involved in helping establish "Central Mississippi Skywarn" in coordination with the NWS office in Jackson. Over the years, I assisted with training ham operators as weather spotters, served as ARRL EC and DEC, and helped establish "RACES" with the Mississippi Emergency Management Agency.

From 1992 until 2004, I owned and operated a full-service packet BBS, and from 1998 to 2004, an APRS I-Gate with a Weather-Gate. Through all of this, my callsign, KB5HAV, has remained unchanged for 37 years – it's part of who I am.

A Life-Changing Diagnosis
In December 1998, I began losing my hearing and experiencing severe headaches and vertigo. After months of tests, an MRI revealed something no one expected – an extremely rare form of spinal cord cancer. At the time, I was only the third known case of this cancer in that location, according to John's Hopkin's Medical Center.

Surgery in March 1999 lasted more than eight hours. The goal was simple: keep me alive. The side effects, however, were lifelong. I was left with complete numbness on the right side of my body from the chest down, and could barely walk even with a walker. My arms and hands shook uncontrollably, and I had some memory loss. Radiation therapy successfully

stopped the tumor from growing, but I was forced into early medical retirement.

Within months, I was basically confined to a wheelchair as I simply could not walk further than a few steps. Also, I had to relearn the most basic tasks – buttoning a shirt, writing my name, even feeding myself. Although my therapist ordered special weighted eating utensils, I relied on finger foods because my arms and hands shook violently, like someone with Parkinson's disease. But by God's grace, after years of determination and therapy, I gradually regained the use of my arms and hands, and in late 2006, I was able to set the wheelchair aside.

Me in 2004

Am I completely well? No. I live with constant chronic pain in my upper spine and uncontrollable muscle spasms (both of which worsen with weather changes), and numerous physical limitations. Some days, the pain is overwhelming, and medications don't help at all. Thankfully, I have more good days than bad. And, I can walk, but not far or for long. Still, I remain deeply thankful for the progress I've made.

Turning to Amateur Radio

Since I could not return to my former career (my doctors simply would not release me to do so), I poured myself into amateur radio as a way to serve others. By the end of 1999, I began working with the Maritime Mobile Service Net, assisting in rescues, running phone patches for mariners, missionaries, and doctors across Central and South America. In 2001, I created their website, www.mmsn.org, which I still maintain. I also created their logo in late 2000. From 2017 to 2023, I served as Assistant Manager.

In March 2000, I joined the Hurricane Watch Net. The Net Manager quickly learned of my website skills and basically named me webmaster (www.hwn.org) immediately. Since the website was new and still under development, I completed the work, along with adding a number of extra tools that remain in use to this day. From 2002 to 2006, I served as Assistant Net Manager of HWN, and in 2013, I was appointed Net Manager – a role I still hold today.

As Net Manager, I've worked to modernize and expand HWN. In 2014, I visited the National Hurricane Center in Miami, meeting Julio Ripoll (WD4R), John McHugh (K4AG), Rob Macedo (KD1CY), and others who share the mission of "Helping Save Lives." That same year, I proudly represented HWN at the National Hurricane Conference, the first Net Manager to do so in over a decade.

Left to Right: Mike Leger – N1YLQ, Rob Macedo – KD1CY, Julio Ripoll – WD4R, Bobby Graves – KB5HAV (seated). In back, Jim Palmer KB1KQW and John McHugh – K4AG. WX4NHC Station at the National Hurricane Center, Miami, FL Photo taken April 13, 2014

Under my leadership, HWN expanded operations to 24 hours when activated, established dual-frequency operations on 14.325 MHz and 7.268 MHz, created training materials and an Elmer Team, and most recently launched a video podcast across YouTube, Spotify, and other platforms.

Faith, Family, and Purpose

I am thankful for the support of my family during my battle and recovery from cancer. I cannot do all that I once could, but it is by God's grace that I'm able to do what I can. Despite trials, I still find peace and happiness. As Jesus said in John 16:33 (NLT): *"Here on earth you will have many trials and sorrows. But take heart, because I have overcome the world."*

I truly believe that anyone living with a disability can find strength and purpose through amateur radio. It has given me a way to serve, to stay connected, and to turn life's storms into opportunities to help others.

What is Barometric Pressure?

While there is a lot of information on this subject, I'll attempt to present a condensed version for this newsletter and a more in depth version at a later time.

As we have all seen in the advisories issued by the National Hurricane Center, the National Weather Service uses units of measure to indicate the for Atmospheric Pressure, or as it is now known, barometric pressure, at sea level.

The two most common units used by the NWS to measure atmospheric pressure are "Inches of Mercury" and "Millibars". Inches of mercury refers to the height of a column of mercury measured in hundredths of inches. This is what you will usually hear from the NOAA Weather Radio or from your favorite weather or news source. At sea level, standard air pressure in inches of mercury is 29.92.

Millibars come from the original term for pressure "bar". Meteorology has used the millibar for air pressure since 1929. Bar come from the Greek "báros" meaning weight. A millibar is 1/1000th of a bar and is approximately equal to 1000 dynes (one dyne is the amount of force it takes to accelerate an object weighing one gram, one centimeter, in one second). Millibar values used in meteorology range from about 100 to 1050. At sea level, standard air pressure in millibars is 1013. Weather maps showing the pressure at the surface are drawn using millibars.

So, what is meant by "High" pressure and "Low" pressure? In a high-pressure system, air sinks and goes down in an area. As the air goes down, warming occurs just over the dew point. In high-pressure systems, clouds rarely form. High pressure moves counterclockwise in the southern hemisphere and clockwise in the northern hemisphere.

Low-pressure systems usually herald a storm. Air goes up in a low-pressure system, taking evaporated moisture from the ground. As air goes up, the air cools, reaching the dew point. The air is condensed and turns into clouds. The clouds get heavy and become storms. They can also turn into hurricanes. Low-pressure systems run clockwise in the southern hemisphere and counterclockwise in the northern hemisphere. If a deep low-pressure system is near, you will notice the barometer fall to below 29 inches of mercury or 982 millibars.

So why do we have both measurements? Both are measurements, however, when comparing the inches of mercury scale to the millibar scale, trends are much easier to follow on the millibar scale as minor changes are more visible. Of the seven category five storms this century, let's look the four strongest storms to strike US as a hurricane and the lowest pressure recorded during their lifespan using only the inches of mercury scale. Ivan 2004, 26.87; Katrina 2005, 26.64, Rita 2005, 26.49; Wilma 2005, 26.05.

Now, looking at them using the millibar scale shows a much bigger story. Ivan 2004, 910; Katrina 2005, 902, Rita 2005, 897; Wilma 2005, 882. For the record, Wilma has the lowest barometric pressure ever recorded; Rita is the third lowest. The previous record holder was Gilbert in 1988 with a reading 888 mb.

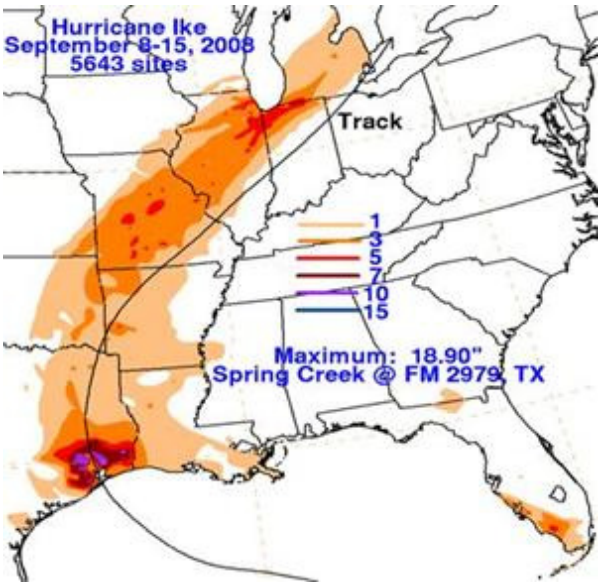
Why is Rainfall Amount Important?

By Bobby Graves – KB5HAV

A few years ago, I wrote an article on this subject, “Why is Rainfall Amount Important?” With all that occurred after Hurricane Helene made landfall in 2024, I thought it a good idea to visit and repost that article.

On March 25, 2009, Dr. Steve Lyons, Tropical Weather Expert for the Weather channel said, "One of the most difficult tropical cyclone (tropical depression, tropical storm or hurricane) land impacts to forecast accurately is its rainfall. Because rain is highly variable in space and its patterns constantly change through time, forecasting where rain will fall, how fast it will fall, how much will fall and who will get flooded are very difficult forecasts indeed! It turns out that forecasting the maximum rainfall from a tropical cyclone is probably the least difficult, of course, it is usually fairly easy to outline a "broad swath" of where it will or will not rain, but the devil is in the details. The primary ingredients for forecasting rainfall totals are: how fast the tropical cyclone moves across land, how large it is, and how warm the water it leaves is. For simplicity here, I assume there are no complicating land obstacles like mountains."

Let's examine the NOAA estimated rainfall total map from Hurricane Ike in 2008.



There are at least a few interesting points on this rainfall map, namely: 1) the maximum rainfall was 18.9 inches, 2) heavy rain was fairly evenly distributed around the center at landfall, 3) heaviest rainfall occurred near the coast, and 4) the rain maxima shifted quickly into the west or northwest side of the track as Ike moved inland. With the onshore flow of warm, moist Gulf of Mexico air on Ike's east side, one might assume rainfall would be skewed toward the east of southeast side of Ike, not the west or northwest side. That was not the case since. It became more obvious as Ike moved inland that the rainfall maximum had shifted well to the left (west) side of Ike's path toward as it moved well inland. In fact, by the time remnants of Ike reached northern Arkansas, all most all of the rainfall the exceed one inch fell west of Ike's track!

The complicating factor in this case was a weak but well observed and forecast cold front extending across the central U.S. from the southwest Great Lakes to the Texas panhandle just before Ike make landfall. That front moved little from then until well after Ike made landfall on the upper Texas coast, where Ike eventually merged with that cold front.

Hurricane Ike is in the top 10 (as of Sept 2025) for most destructive hurricane's to ever hit with $24 billion (2008 USD) in the United States, with additional damage of $7.3 billion in Cuba, $200 million in the Bahamas, and $500 million in the Turks and Caicos, amounting to a total of $32 billion in damages. Hurricane Ike results in at least 195 deaths all the way from Haiti to Galveston and many places in between.

Rainfall totals can be amazingly high

A land falling tropical system doesn't have to be a hurricane to cause massive rainfall. The highest one-day total of 42 inches of rain was recorded near Alvin, Texas as a result of the remains of Tropical Storm Claudette in July 1979. This remains the twenty-four hour rainfall record for any location in the United States. At one time, up to 6 inches of rain per hour fell at this same location.

In 2001, Tropical Storm Allison devastated southeast Texas in June of the 2001 Atlantic hurricane season. The first storm of the season, Allison lasted unusually long for a June storm, remaining tropical or subtropical for 15 days. The storm developed from a tropical wave in the northern Gulf of Mexico on June 4, 2001, and struck the upper Texas coast shortly thereafter. It drifted northward through the state, turned back to the south, and re-entered the Gulf of Mexico. The storm continued to the east-northeast, made landfall on Louisiana, and then moved across the southeast United States and Mid-Atlantic. Allison was the first storm since Tropical Storm Frances in 1998 to strike the northern Texas coastline.

The storm dropped heavy rainfall along its path, peaking at over 40 inches in Texas. The worst flooding occurred in Houston, where most of Allison's damage occurred: 30,000 became homeless after the storm flooded over 70,000 houses and destroyed 2,744 homes. Downtown Houston was inundated with flooding, causing severe damage to hospitals and businesses. Twenty-three people died in Texas. Along its entire path, Allison caused $5.5 billion ($7.1 billion 2012 USD) in damage and 41 deaths. Aside from Texas, the places worst hit were Louisiana and southeastern Pennsylvania.

Following the storm, President George W. Bush designated 75 counties along Allison's path as disaster areas, which enabled the citizens affected to apply for aid. Due to extreme destruction, the name Allison was retired in the spring of 2002, and will never again be used in the Atlantic basin; the 2001 incarnation of Allison is the only Atlantic tropical system to have its name retired without reaching hurricane strength. The name was replaced with Andrea in the 2007 season.

Perhaps the deadliest hurricane to make land fall since the Great Hurricane of 1780 would have to be Hurricane Mitch in 1998. Hurricane Mitch was the most powerful hurricane and the most destructive of the 1998 Atlantic hurricane season, with maximum sustained winds of 180 mph. The storm was the thirteenth tropical storm, ninth hurricane, and third major hurricane of the season. Along with Hurricane Georges, Mitch was the most notable hurricane in the season. At the time, Mitch was the strongest Atlantic hurricane observed in the month of October, though it has since been surpassed by Hurricane Wilma of the 2005 season. The hurricane matched the fourth most intense Atlantic hurricane on record (it has since dropped to seventh).

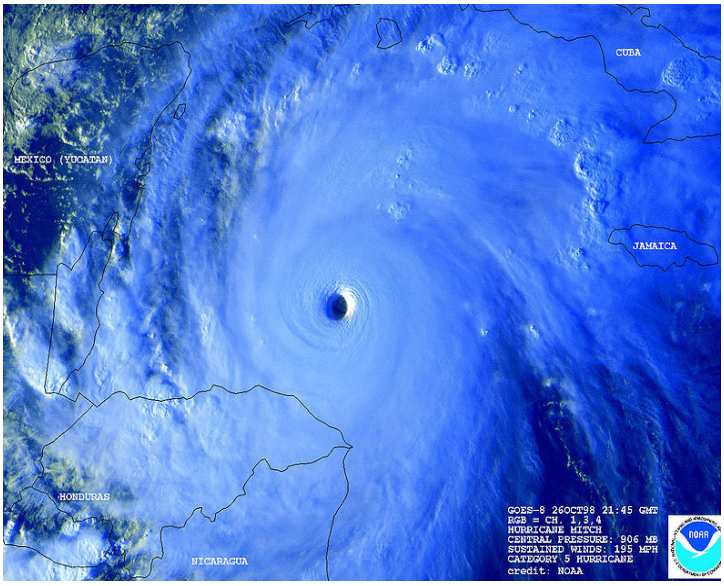
Mitch formed in the western Caribbean Sea on October 22, and after drifting through extremely favorable conditions, it rapidly strengthened to peak at Category 5 status. After drifting southwestward and weakening, the hurricane hit Honduras as a minimal hurricane. It drifted through Central America, reformed in the Bay of Campeche, and ultimately struck Florida as a strong tropical storm.

Prior to hitting Honduras, Hurricane Mitch sent waves of up to 22 feet in height to the coast. Upon making landfall, it diminished in intensity, but still caused a strong storm surge and waves of 12 feet in height. While the storm was drifting over the country, it dropped extreme rainfall peaking at nearly 36 inches in Choluteca, where over 18 inches of rain fell in one day. The rainfall in Choluteca was equivalent to the average rainfall total in 212 days. The Choluteca River at this point flooded to six times its normal width. The widespread flooding was partially caused by Honduras' slash-and-burn agriculture, so the forests could not absorb any moisture. In addition, there were estimates of as high as 75 inches in mountainous regions. The rainfall collected in rivers, causing extensive river flooding across the country. The deepest average depth was 41 feet on the Ulúa River near Chinda, while the average widest length was nearly a quarter-mile wide on the Río Lean near Arizona. The rainfall also caused widespread mudslides across the mountainous country.

The extreme flooding and mudslides killed over 6,500, with several thousand missing. Many of the unidentified were buried in mass graves, resulting in great uncertainty over the final death toll. Over 20% of the country's population, possibly as many as 1.5 million people were left homeless. The severe crop shortages left many villages on the brink of starvation, while lack of sanitation led to outbreaks of malaria, dengue fever, and cholera.

Though Mitch never entered Nicaragua, its large circulation caused extensive rainfall, with estimates of over 50 inches. In some places, as much as 25 inches of rain fell on coastal areas. The flank of the Casita Volcano failed and turned into a lahar from excessive rain. The resulting mudslide ultimately covered an area 10 miles long and 5 miles wide.

Two million people in Nicaragua were directly affected by the hurricane. Across the country, Mitch's heavy rains damaged 17,600 houses and destroyed 23,900, displacing 368,300 of the population. 340 schools and 90 health centers were severely damaged or destroyed. Sewage systems and the electricity subsector were severely damaged, and, combined with property, damage totaled to $300 million (1998 USD, $407 million 2011 USD).



Due to the enormous size of Mitch, which affected not only Honduras and Nicaragua, but that of Cuba, Jamaica, Cayman Islands, Panama, Costa Rica, El Salvador, Guatemala, Belize, Mexico, and Florida, deaths due to catastrophic flooding made it the second deadliest Atlantic hurricane in history; nearly 11,000 people were killed with over 11,000 left missing by the end of 1998. Some reports list just over 19,000 deaths cause by Mitch. Additionally, roughly 2.7 million were left homeless as a result of the hurricane. The flooding caused extreme damage, estimated at over $6 billion (1998 USD, $8.56 billion 2012 USD).

Saffir-Simpson Scale vs. Storm Surge Hazard

In September 2012, the National Hurricane Center issued this report. The Saffir-Simpson Hurricane Wind Scale (SSHWS) categorizes hurricanes only by wind speed. Tropical cyclones cannot be easily categorized by storm surge because the surge is not a characteristic of the storm alone, being also dependent on the shape and bathymetry of the affected coastline, the storm's forward motion, angle of approach, and so on. A hurricane striking the Gulf coast of Florida, for example, would cause a much greater surge than an identical storm striking Florida's Atlantic coast. This is why storm surge was formally removed from the original Saffir-Simpson Hurricane Scale in 2010.

A number of new and more complicated scales have been proposed over the past several years. Most, if not all of these, consider the combined effects of hurricane strength and size, or of wind and surge. However, the National Hurricane Center (NHC) does not believe that combined or integrated hurricane scales help local emergency managers or members of the public make informed decisions about their particular vulnerabilities.

Hurricanes pose a variety of hazards to life and property; these include strong winds, storm surge, heavy rains with inland flooding, and tornadoes. The relative risk among these hazards varies from storm to storm and place to place, with each threat requiring a different response. Combined scales tell users nothing about which hazard(s) are threatening them nor provide any guidance about an appropriate response. NHC believes that the clearest way to communicate each of the hurricane hazards is to do so directly and distinctly, and not to conflate them as the proposed integrated scales do.

NHC has recognized the importance of storm surge since our inception and has been a part of several significant advances in forecasting storm

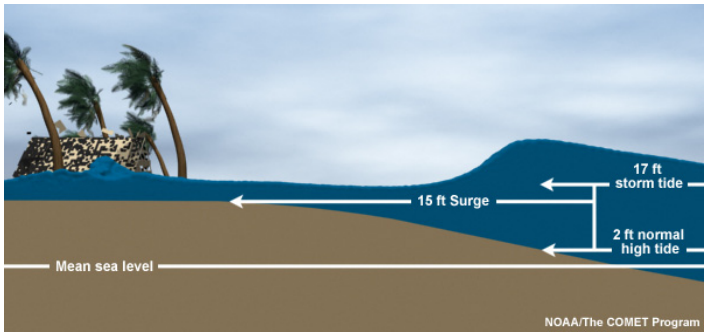
surge. Currently, the NHC is experimenting with two new approaches intended to help communities prepare for and respond to surge threats. The first is the application of a Storm Surge Warning, which would be issued by the National Weather Service to highlight exclusively the expectation of life-threatening surge. The second is an easy-to-understand high-resolution map showing the forecast inundation from storm surge. Both approaches are being developed with input from communications and social science experts to maximize the clarity and utility of the new products. The new approaches to surge are being designed to reinforce instructions from local emergency managers. We cannot overstate the importance of following evacuation orders and other instructions from local officials, regardless of the category or strength of a tropical storm or hurricane. Ignoring evacuation orders risks not only the lives of those who stay behind, but also the lives of first responders who may be called upon to rescue them.

Why is it Important to Understand Storm Surge?

About 12 years ago, Brian Jarvinen of the National Hurricane Center had a report in USA Today in which he said, "In the early days of the studies I gave presentations to local groups that wanted to understand the hazards (of Storm Surge). By the time I got to what a Category 4 storm could do, I could sense a feeling that people were awestruck by (how) high the floods could be."

NOAA uses to two programs for land-falling Hurricanes: "MEOW" which is an acronym for the "Maximum Envelope of Water" likely to be pushed ashore by a particular storm which is used to help officials decide who should evacuate, and "SLOSH" for "Sea, Lake, and Overland Surge from Hurricanes" which produces figures to make maps showing what kind of flood to expect from just about any hurricane.

Storm surge, a dome of water pushed ashore by a hurricane, causes the flooding.



Over the years, storm surge floods have killed more people than hurricane winds, including a large share of the victims of the 1900 Galveston, Texas, hurricane, but since Hurricane Camille in 1969, this has no longer been the case.

Thanks to computer models of storm surge, and forecasters and emergency managers who use these models to see where a particular storm's surge is likely and then evacuate those in the danger area, storm surge killed only about a half dozen people in the USA from the 1970 through 2002 hurricane seasons.

Camille's storm surge was a deadly one. On Aug. 17, 1969, a 24-foot-high dome of water pushed into Pass Christian, MS. Katrina, which made landfall on Aug. 29, 2005, holds the record for the highest storm surge, 27 feet. During Camille, at least three feet of surge hit places as far as 125 miles east and 31 miles to the west of Pass Christian. Camille destroyed or seriously damaged more than 18,000 homes and 700 businesses.

The best figures available indicate that Camille killed 172 people when it came ashore on the Gulf Coast, with surge accounting for most of these deaths. A dying Camille crossed the Southeast, dumping heavy rain on the mountains of Virginia. The resulting "fresh water" floods killed almost as many people as Camille's surge had on the Gulf Coast.

Since then, fresh water flooding caused by hurricanes and even tropical storms as they move inland, have been the USA's biggest hurricane killer.

But, should a hurricane hit a heavily populated area of the US coastline before those in danger have time to flee, "Storm Surge" could return to the top of the hurricane killer list.

What if Storm Surge threatened New York City?
The New York City area worries experts such as Jarvinen the most. Here the north-south running coast starts to run west-east, creating a "corner" that helps push the water of a surge higher. Jarvinen says a computer simulation using 1989's Hurricane Hugo shows what could happen.

Storm Surge From Super-Storm Sandy in 2012

In the simulation, the computer had Hugo turning north instead of moving ashore just north of Charleston, S.C. It weakened to a Category 3 storm, but picked up forward speed before coming ashore near Atlantic City, N.J. From here, its eye followed New Jersey's Garden State Parkway north to around Newark, N.J. This path would bring the highest surge into New York Harbor.

The computer simulation showed that such a storm would push more than 10 feet of water over JFK Airport and Battery Park on the tip of Manhattan. It would be a major disaster for New York City.

Jarvinen notes that no strong hurricane has ever followed such a course. But, strong storms have followed courses on both sides of such a path. "It's not of matter of will it happen," he says. "It's a matter of when it will happen. It could be 500 years from now. It could be next week."

For more information on Storm Surge, please visit,
http://hwn.org/resources/storm_surge.html

Do You Have Ideas or Articles for this Newsletter?

If you have ideas or articles you would like to see in this newsletter, as well as have any questions or comments, they are most welcomed and can be sent to editor@hwn.org

When submitting an article, please adhere to the following: guidelines:

- Articles should be of general interest to readers if possible.
- Articles should be in MS Word format (.doc) or plain text files. (.txt)
- Vulgar or offensive language should be avoided.
- No copyrighted materials.

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Upcoming Events

Skywarn® Recognition Day

December 6, 2025

SKYWARN® Recognition Day is observed annually on the first Saturday in December to honor the dedication of volunteer storm spotters across the country. These individuals serve as the eyes and ears of the National Weather Service (NWS), providing real-time, ground-level observations during severe weather events.

SKYWARN® volunteers and amateur radio operators report conditions such as tornadoes, hail, flooding, or damaging winds. Their timely reports help forecasters issue more accurate and lifesaving warnings, often giving communities the critical minutes needed to prepare and take shelter.

This special day recognizes the vital role these volunteers play in building a Weather-Ready Nation. Without their commitment and vigilance, many severe weather threats would go undetected until it's too late.

ORLANDO HamCation®

February 13th – 15th, 2026
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AMBASSADOR WRN WEATHER-READY NATION

Bobby Graves – KB5HAV
Newsletter Editor
7856 New Light Road
Starkville, MS 39759
www.hwn.org
editor@hwn.org