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Surviving Hurricane Harvey While Keeping Up Reports from My Rain Gauge

By Jack Stopnicki, NWS Coop Observer

I have been a Coop observer for 18 years. My gauge goes by the identifier Houston Westbury. It's first location was in my parents' backyard 8 miles southwest of downtown Houston. In November 2011, I requested the site be moved to my new home, 6 miles southwest of downtown Houston.



Figure 1: Rain gauge by drainage ditch

My home and gauge are adjacent to Pour Farm drainage ditch, **Figure 1**.

I always wondered if my gauge could be compromised during a major flood event since it is so close to the ditch. I knew the flooding history of the neighborhood and the depth of the water in previous storms. The only storm of record to hit this area was Tropical Storm Allison in June of 2001. Based on my analysis of high-water marks from my neighbor's home, my gauge would have not been compromised during that event.

As years went by, I wondered... What would happen to the gauge if a major flood event were to occur? At what point would it float away? Would the metal stand that it sits in offer some protection? All of my questions were answered during Hurricane Harvey when I was forced to take drastic actions to preserve the historical rainfall data that Harvey produced.

The first outer bands of Harvey produced moderate to briefly heavy rainfall. My first day total was 2.98 ending at 7 am on Saturday August 26. This amount caused

no flooding because we are accustomed to these types of rainfalls along the Gulf Coast.

After a relatively dry Saturday, my attention turned to the next feeder band approaching on the evening of August 26. This band produced 5 inches of rain in 2 short hours between 8:15 pm and 10:15 pm, causing minor to major street flooding.

The drainage ditch rose rapidly, responding to this rainfall but remained a few feet below top of bank. As the feeder band moved away between 10:15 pm and midnight, the street flooding subsided somewhat, and the ditch remained at its same level still below bank full.

After midnight on August 27, I turned my attention to the multiple rain bands setting up and merging in my area. I knew this had the potential to become a major problem with the ditch now full and the rainfall increasing once again. I made the decision to empty my gauge on a regular basis before the rainfall exceed 2 inches and reached the overflow can rather than wait until my normal 7:00 am

By about 6:30 am, the gauge was still contained by the metal frame but had risen a foot inside the frame, thus it was still able to record rainfall.

reading. This proved to be the right decision. The rainfall continued all night long and I made several trips to the gauge to measure and empty. As I made each trip, I noticed the ditch getting higher and higher and the street in front of my house beginning to fill up.

At around 4:00 am on Sunday, August 27, the ditch and subsequent street flooding reached the level experienced in the Memorial Day Flood of 2015, still a foot below the bottom of the gauge.

Looking at the radar I was becoming concerned that this flood would top the Allison 2001 level and compromise my gauge.

Sure enough, around 5:30 am the flood waters reached the bottom of the gauge and it began to float up slowly. At this point, I decided to remove the funnel and inside measuring tube to be on the safe side.

By about 6:30 am, the gauge was still contained by the metal frame but had risen a foot inside the frame, thus it was still able to record rainfall, **Figure 2**.

At 7 am, when I took the last of my measurements for my daily 24-hour total, my gauge was getting closer to floating away, so I had to make a decision about what to do next, **Figure 3**. I ended up measuring 12.73 inches of rain. My storm total was now 15.71 inches.

The rain had briefly stopped, giving me



Figure 3: Rain gauge in danger of floating away

some time to think. I had already moved my vehicles across the street to higher ground since my garage was a lot lower than my neighbor's driveway.

The decision was made, I would relocate my gauge to the roof of my wife's car to continue recording the rainfall. The spot was clear of any trees and far enough away from the house to maintain the NWS standard.

I used a shim of wood for leveling and a brick deposited into the can for stability, although I did not think the wind would



Figure 2: Rain gauge partially submerged, left.

become an issue. At about 8 am the gauge was teetering on floating away so I moved it across the street, **Figure 4**.

It would have floated away if I hadn't moved quickly because the water continued to rise and the entire gauge bracket was now underwater, **Figure 5**.

The water level rose another inch, peaking around 10 am and remained at this level all day because the rain continued steadily but was not extreme for most of the day.

With some breaks in the rain, I was still able to measure and maintain my gauge by walking through waist deep floodwaters to reach the gauge across the street, bring it into my flooded garage to measure and record, and then return it back to the car roof twice during the day. By late evening the rain had mostly stopped, and I was optimistic that when I woke up early Monday morning, the water would be receding from my garage and street.

By 7 am on Monday, August 28, the water was receding rapidly and all the

flooding was gone. The ditch returned to bankfull. My 24-hour measurement was 6.25 inches, all collected on the roof of my wife's car. Thankfully the rain gauge holder/bracket did not float away, and I was able to return my gauge to its original location.

Heavy rainfall continued on and off for the next 2 days, 8.46 inches on the 29th and 0.87 inches on the 30th. Thankfully, the drainage ditch remained at bank full but did not threaten to overflow again. My 5-day storm total was 31.31 inches.



Figure 4: Newest location of rain gauge on car at full flood during Hurricane Harvey.



Figure 5: Rain gauge under water

any flooding because it was built above the 100 year flood plain. My garage is at normal grade and received 28 inches and sustained minor damage. Both of my vehicles were lost in the flood.

The NWS advises that COOP observations be suspended when observing equipment is flooded or hazardous conditions pose a safety risk to the observer. Photos of private house printed with permission. Have a weather story or photos you would like to share? Send it to the editor at melody.magnus@noaa.gov.

It has now been one year since Hurricane Harvey and looking back, I am still amazed to see how much rain fell when looking at the before and after photos of the flooding, **Figures 4 and 6**. The normal rainfall here is about 54 inches per year for my location. To measure 31.31 inches in 5 days is still hard to comprehend.

As a foot note, my home did not experience



Figure 6: Rain gauge after water receded.

With some breaks in the rain, I was still able to measure and maintain my gauge by walking through waist deep floodwaters to reach the gauge across the street...

Thomas Jefferson Award



Dennis Pike of Farmington, ME, was awarded Thomas Jefferson Award for his dedication and the quality of his observations provided over more than 51 years.

From left, NWS Gray, ME, Meteorologist-In-Charge (MIC) **Hendricus Lulofs**, Observer **Dennis Pike**, and Senior Service Hydrologist (SSH) **Thomas Hawley**. Photo by Observing Program Leader (OPL) **Nikki Becker**.

John Campanius Holm Awards

Dick Brewer of Brandenburg, MT, was awarded the John Campanius Holm Award for outstanding service. The Brandenburg station dates to 1956. Dick took over from his ranch in 1982. He has provided timely, accurate and dependable weather data that has totaled nearly 13,000 observations during his 35+ years of service. Dick's weather records help define the climate of the Tongue River Valley of Montana, a remote area where data would otherwise be difficult, if not impossible to obtain.

This area has experienced extreme temperatures ranging from -44°F degrees in December 1984 to as high as 112°F in July 2002. Annual average precipitation since 1948 has been 14.38 inches with seasonal snowfall averaging 41.1 inches. The maximum daily rainfall Dick reported was 2.47 inches in May of 2013, maximum daily snowfall was 16 inches in February 2000.



From left, NWS Western Regional Director **Dr. Grant Cooper**, Observer **Dick Brewer** and MIC **Keith Meier**, NWS Billings, MT. Photo by OPL **Larry Dooley**.

125 Year Honored Institution Award

The **University of New Hampshire** in Durham, NH, accepted a 125 Year Honored Institution Award. From left, NWS Gray, ME, MIC **Hendricus Lulofs**, New Hampshire State Climatologist **Mary Lemcke-Stampone, Ph.D.**, and SSH **Thomas Hawley**. Photo by OPL **Nikki Becker**.



Family Heritage 50 Year Award



From left, Escalante, UT, observer **Sharon Dale Marsh** and his wife, **Eve Marsh**, accept a 50 Year Family Heritage Award from NWS Salt Lake City MIC **Rusty Billingsley**. Photo by OPL **Lisa Verzella**.

Recognizing 50 years of dedication, NWS Salt Lake City, UT, is proud to honor the Marsh Family of Escalante, UT, as a recipient of the Family Heritage Award. The historical record of the Escalante Coop reports date back to May of 1901, when this southern Utah station was established under the U.S. Weather Bureau. There were five observers before Sharon father **Dale Marsh** took the helm in 1968 and served from 1968 to 1981. Dale was also a flash flood spotter and served as County Commissioner until 1976. He received a 1981 National Weather Association Achievement Award for assisting the meteorological community in providing weather-related information to the public. Shortly after receiving this award, Dale passed away.

His son **Sharon Dale**, already serving as backup observer, took over. As a rancher and farmer, Sharon recognizes the importance of climate and weather reports and never misses an observation. He has the longest record of service at this station and was awarded the Holm Award for exemplary service in 2015.

Edward R. Stoll 50 Year Awards

NWS Eastern Region OPL **Chris Stachelski**, left, presented a 50 Year Honored Institution Award to **Rutgers University** Meteorology Department Chairman **Tony Broccoli**. The award was presented for the New Brunswick, NJ, site on behalf of NWS Mt. Holly, NJ. Tony also serves as one of the many observers at the site along with his wife and numerous Rutgers meteorology students. The site gives students an opportunity to learn about the manual aspect of observing and the different types of equipment that exist for observing meteorological parameters. Photo by OPL **Andrew Beavers**, NWS Charleston, WV.



Earle L. Stewart, center, of Laveen, AZ, was presented the Edward H. Stoll Award for 50 years of service. The award was presented by NWS Phoenix, AZ, MIC **Jeral Estupinan**, left, and NWS Phoenix OPL **Marvin Percha**, right. Photo by Warning Coordination Meteorologist (WCM) **Ken Waters**.

50 Year Honored Institution Awards

The National Park Service at Bullfrog Basin, UT, earned an Honored Institution Award for 50 years of daily weather observations in Bullfrog. Salt Lake City MIC **Rusty Billingsley** presented this award to weather observers on the Bullfrog maintenance staff. Pictured from left are Observers **Craig Hartline** and **Bill Kelley**, NWS Salt Lake City MIC **Rusty Billingsley**, and Observer **Mike Deparde**. Bill Kelley has been taking weather observations for over 25 years at this site. Photo by OPL **Lisa Verzella**.



45 Year Dick Hagemeyer Service Award



Wayne Beullke of Bouse, AZ, was presented the Dick Hagemeyer Award for 45 years of service. The award was presented by NWS Phoenix WCM Ken Waters, left, and NWS Phoenix OPL **Marvin Percha**, right. Photo by **Judy Beullke**.

45 Year Dick Hagemeyer Service Award



Charlie Sanborn of Epping, NH, accepted a 45 Year Dick Hagemeyer Service Award from NWS Gray MIC **Hendricus Lulofs**, left, and SSH Thomas Hawley. Photo by OPL **Nikki Becker**.

40, 35 Year Length of Service Awards

Darwin Morris, right, of Appling, GA, receives his 40 Year Length of Service Award from NWS Columbia, SC, SSH **Leonard Vaughan**. Darwin began taking observations in 1977, taking over from **Roy Tankersly** who established the Appling Station in 1961.



Michael Sink, left, at Burnsville, NC, was presented a 35 Year Length of Service Award by OPL **Chris Horne**, NWS Greenville-Spartanburg, SC. Michael is the general manager of WTOE/WKYK radio in Burnsville, where the observing equipment is located.



30 Year Length of Service Awards



Brad Harvey, center, observer near Collyer, KS, was presented with a 30 Year Award by NWS Dodge City, KS, MIC **Larry Ruthi**, right, and WCM **Jeff Hutton**. Brad's wife, **Gayla** also attended. The station was founded in 1940 by **Jerry Dalby**. **Oscar Luce**, Jerry's nephew, was the observer from 1949-1981. **Gary Walt** then served from 1981-83, when he passed away. Brad's father, **Don**, served until 2005, when Brad took over. Photo by OPL **Jesse Lee**.



NWS Eastern Region OPL **Chris Stachelski** presented a 30 Year Length of Service Award on behalf of the NWS Mt. Holly, NJ, to **Walter Loughlin, Jr.** of Flemington, NJ. Walter has kept the observations of temperature, precipitation and snow going for over 30 years at this Historic Climate Network site that originally started in March of 1898. Photo by OPL **Andrew Beavers**, NWS Charleston, WV.



From left, NWS Salt Lake City, UT, MIC **Rusty Billingsley**, presents Sunnyside City, UT, Observers **Mike** and **Teri Marquez** with their 30 Year Length of Service Award. Teri and Mike are also astute severe weather spotters, consistently contacting NWS Salt Lake City in the event of nearby flooding and severe weather.

Photo by OPL **Lisa Verzella**.



Bruce Peterson, left, of Laurin, MT, shows his 30 Year Length of Service Award presented by NWS Great Falls, MT, MIC **Don Britton**. Taking official weather observations is a family tradition. His grandfather recorded the weather at Virginia City, MT, and his father near Alder, MT, where Bruce served as the unofficial backup. Bruce officially took over the station in 1988. He started the Laurin site when he moved their in 1988.

30, 25 Year Length of Service and Special Service Awards



Bill and Barbara Schreiber, center, observers at Ransom, KS, were presented with a 30 Year Length of Service Award by NWS Dodge City, KS, MIC **Larry Ruthi**, left, and OPL **Jesse Lee**. Bill is the primary observer and Barbara is the backup. The station was started in 1946 by **Ira Shellenberger**. **Fred Yost**, Barbara's uncle, took over in 1958. After Fred passed away in 1975, Barbara's father **Ulrich** maintained by site from 1976-1988, when Bill took over. The Yost family has served for 60 year. Photo by WCM **Jeff Hutton**.



Moby Wile, observer at Buckhorn Mountain, CO, shows his 30 Year Length of Service Award for taking daily observations. The award was presented by **Jim Kalina**, OPL, NWS Boulder, CO.



From left, Eastern Region Headquarters OPL **Chris Stachelski** gave Margate, NJ, Observer **Marty Ross** a Special Act Award on behalf of the NWS Mt. Holly, NJ. Marty, a retired member of the NWS Mt. Holly staff, is now retiring as an observer after 25 years of service. Photo by **Kevin B. Lowrie**, NWS Sterling, VA, Support Center.



NWS Great Falls, MT, presented **Martin** and **Karen Hauge** with a 25 Year Length of Service Award for service near Lennep, MT. Martin and Karen Hauge's observations consist of maximum and minimum temperatures, precipitation, snowfall and snow depth. The award was presented by OPL **Matt Moorman**.

25 Year Length of Service and Honored Institution Awards



James and **Catherine Brown** of Durham, ME, accepted a 25 Year Length of Service Award for their generous service. Photo and presentation by OPL **Nikki Becker**, NWS Gray, ME.



The city of Youngtown was presented a 25 Year Honored Institution Award by NWS Phoenix, AZ. From left, are Community Development Coordinator **Nicole Smart**, NWS Phoenix OPL **Marvin Percha Jr.**, and Observers **Jim and Arlene Schuh**.



Peter Hayes, right, Lab Technician for the **Telluride Water/Wastewater Treatment Plant**, receives a 25 Year Honored Institution Award from **John Kyle**, Data Acquisition Program Manager at NWS in Grand Junction, CO.



Randy Everett, primary observer at the **Ballinger Water Treatment plant** displays his 25 Year Length of Service Award.

20 Year Length of Service Awards



Dennis Brown, left, observer in rural northeastern Ford County, KS, near Bellefont, was presented with a 20 Year Length of Service Award by Dodge City, KS, MIC **Larry Ruthi**. Photo by OPL **Jesse Lee**. The station was established by **Delbert Kane** in 1959. In 1983, **Lavonne Nau** took over and served until 1998, when Dennis generously took over the site.

Alan and Laurie Brown of Bradford, NH, accepted a 20 Year Length of Service Award. No photo taken.



Dorothy Powell of Wentworth, NH, accepted a 20 Year Length of Service Award. Photo and presentation by Hydrometeorological Technician **James F. Brown**, NWS Gray, ME.



Scipio, UT, Observer **Deanna Hatch** shows her 20 Year Length of Service Award. Deanna observes and reports temperature, rain and snow data every single day. The Scipio site was established in 1895 and has been in the Hatch family since 1924. Photo by NWS Salt Lake City OPL **Lisa Verzella**.



Cottonwood Weir Water Treatment Plant Observer **Mike Gill** was presented with a 20 Year Length of Service Award. In addition to taking observations, Mike also has trained others to be part of the team. From left are NWS Salt Lake City MIC **Rusty Billingsley**, Observer **Mike Gill**, OPL **Lisa Verzella**, Observer **Jeff Brinck** and Acting Regional COOP Manager **Ryan Eldridge**. Photo by Plant Communications and Engagement Manager **Holly Mullen**. The site dates to 1917.

15 and 10 Year Length of Service Awards



From left, NWS Gray, ME, MIC **Hendricus Lulofs** presents **John Kelley** of West Hampstead, ME, with a 15 Year Length of Service Award. Also pictured is SSH **Thomas Hawley**. Photo by OPL **Nikki Becker**, NWS Gray, ME.



Wayne Francis displays his 15 Year Length of Service Award for his Ojai, CA. Ojai observations date back 1905. Wayne is also an active member of the Ham Radio Operators, the Red Cross, and CERT. The award was presented by OPL **Bonnie Bartling**, NWS Oxnard/ Los Angeles, CA.



Andy Armstrong, observer for the **Timpanogos Cave National Monument** in Utah, shows his 10 Year Length of Service Award presented by Salt Lake City OPL **Lisa Verzella**. Andy has been an outstanding leader of the observation team at this historic recreation area nestled in American Fork Canyon. The Timpanogos site dates to 1938. Photo by Timpanogos Observer and Ranger **Crystal Lambert**.



Jimmie Coggins, right, of **WKDK Radio** received a 10 Year Length of Service Award for himself, **Carole Murray** and **Powell Way** from NWS Columbia, SC, Acting OPL **Doug Anderson**. The site in Newberry, SC, dates to 1897 with only a 3-year break. It is a particularly important climate site in the hilly Piedmont Region. Photo by SSH **Leonard Vaughan**, NWS Columbia, SC.

10 Year Length of Service Awards



Philip Coning, left, of the **Miami Conservancy District** (MCD) in West Manchester, OH, has been providing weather data to NWS Wilmington, OH, for 10 years as part of the invaluable partnership with MCD. The award was presented by NWS Wilmington, OH, OPL **James Gibson**.



Levan, UT, Observer **Paul Mangelson** was presented a 10 Year Length of Service Award by Salt Lake City OPL **Lisa Verzella**. Paul has been consistently recording and reporting temperature, rain and snow data every single day from this rural town in central Utah. The Levan Coop site itself was established in 1889. Photo by Paul's daughter, **Paula**.



Bill Porter of El Nora, IN, displays his 10 Year Award. Bill is a runner with numerous awards for races from 1 mile to marathons. He is a retired Senior Program Manager from the Naval Surface Warfare Center, where he tested samples of the Pyrotechnic Ammunition. "Weather played an important part in all those evaluations," said Bill. Observations were transferred from the Crane test site to Bill's home when he retired. Photo by Bill's wife Judy.



Billy Thomas of Bamberg, SC, right, receives his 10 Year Length of Service Award from NWS Columbia, SC, Acting OPL **Doug Anderson**. Billy's site dates to 1951. Photo by SSH **Leonard Vaughan**.

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