Community Collaborative Rain, Hail & Snow Network

Southern New England

August 2016

The sun shone brightly throughout the month of July. Our drought conditions worsened, our reporting became stronger, and the precipitation was highly variable.

Last year, Monthly Zeros and Station Precip Summary were explained, primarily with words. This year, more pictures than words will be used. The overall message remains the same. Please check over your reports each month. Learn from looking at other stations, near or far from yours.

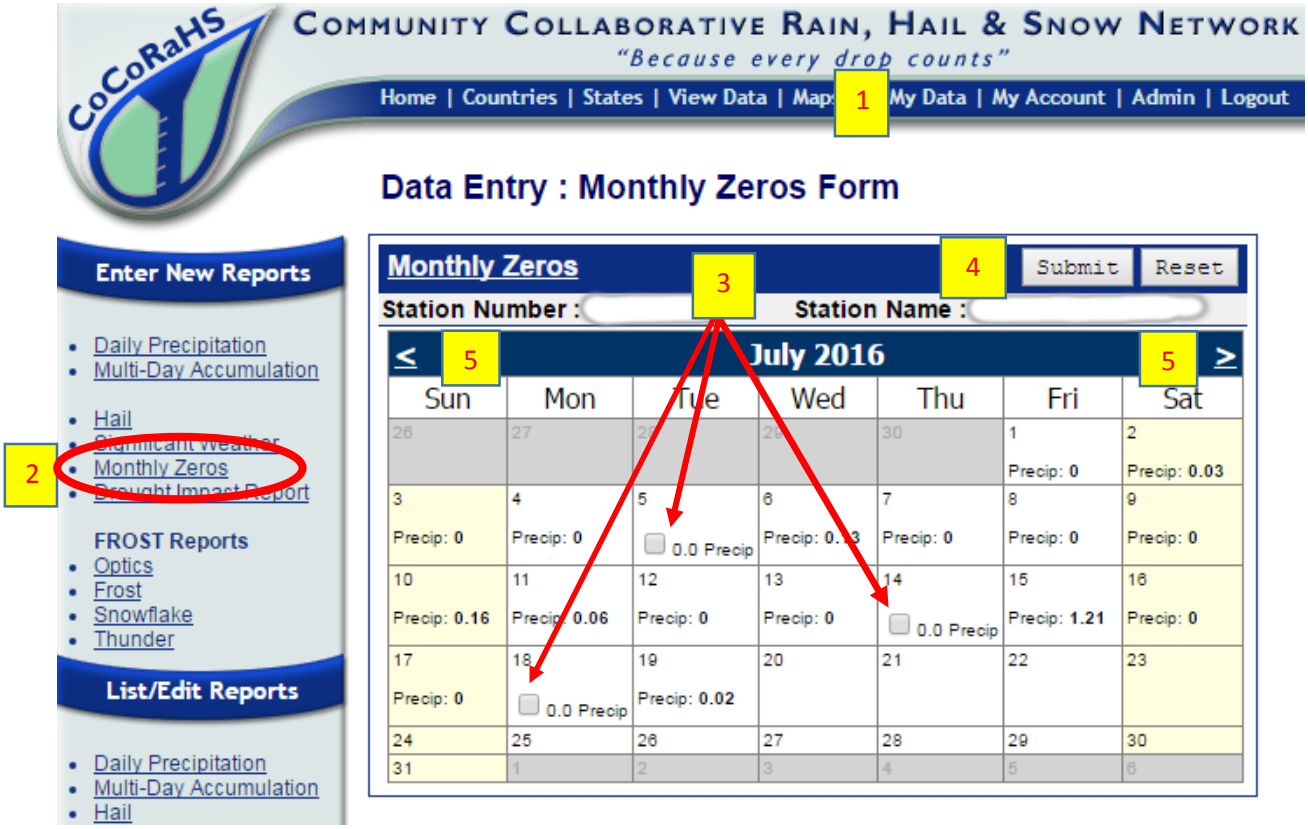
We have a trio of detailed contributions for this newsletter. Leading off is a student of meteorology who found something from last year in Rhode Island.

In an effort to keep our content recent and relevant, our second article is from the Flash Flood event in Ellicott City MD this past July 30.

Remember the wet year five years ago in 2011? In our last article, Nicole Belk tells us about Hurricane Irene's impact on our area that impacted our area 5 years this August.

Monthly Zeros

A quick way to fill in zeros, in between precipitation events, and to see missing reports all in a feature called Monthly Zeros.

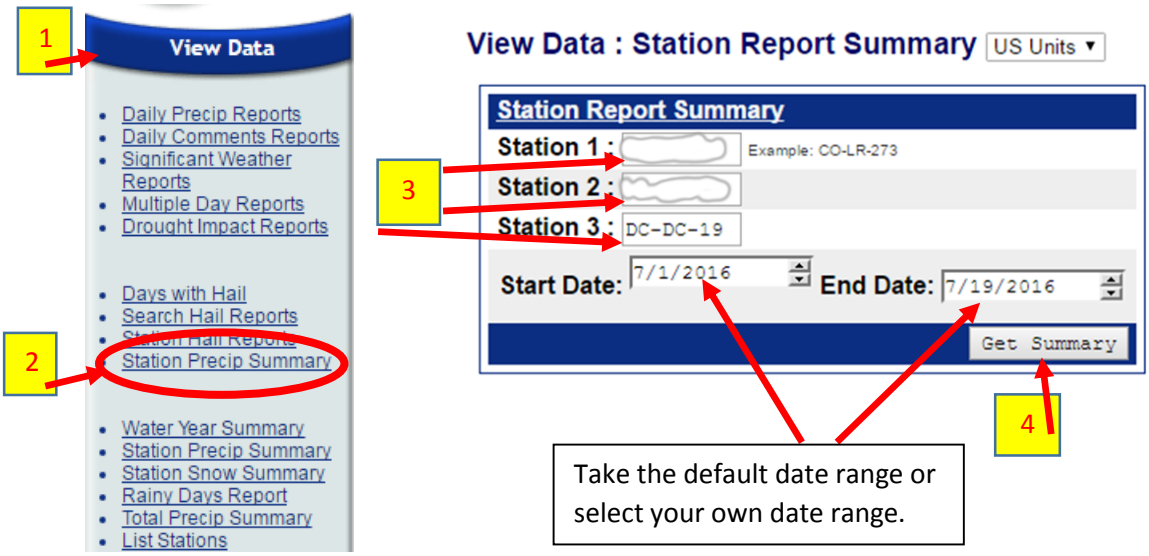


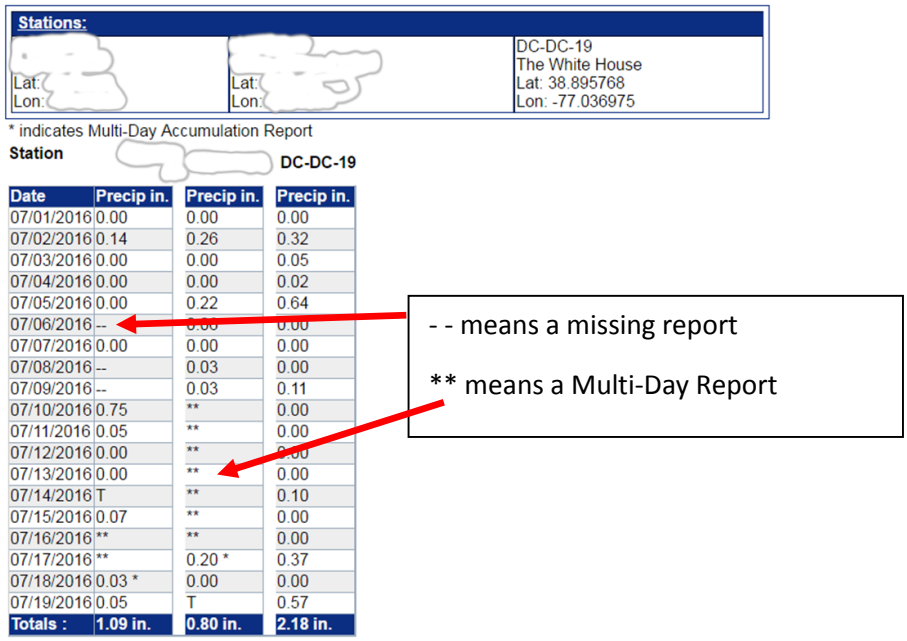
After you login to your CoCoRaHS account. By the numbers.

1- Click on My Data.
2- Click on Monthly Zeros.
3- Click on the check boxes to assign a zero
4- Click on Submit. The important step.
5- Left to a previous month. Right to a later month.

Station Precip Summary

This inquiry tool lets you look at your station and two others. It will show missing reports, multi-day reports and it will total your precipitation.





By the numbers.

1- View Data.
2- Station Precip Summary.
3- Enter 1, 2 or 3 stations. DC-DC-19 is the White House.
4- Click on Get Summary

Detail and Summary for July 2016

From the National Weather Service (NWS) Climate sites for July 2016.

Location	Station ID	July 2016 Precip	July departure from normal	May-June-July Precip	3 month departure from normal	Feb-July Precip	6 month departure from normal
Pittsfield MA	PSF	4.15''	-0.10''	10.63''	-2.23''	19.66''	-3.11''
Bridgeport CT	BDR	4.80''	1.34''	9.56''	-1.31''	19.34''	-2.50''
Hartford CT	BDL	2.20''	-1.98''	6.68''	-6.20''	16.19''	-6.92''
Worcester MA	ORH	2.06''	-2.17''	5.93''	-6.68''	17.32''	-6.84''
Providence RI	PVD	3.95''	0.66''	8.18''	-2.30''	20.09''	-3.05''
Boston MA	BOS	0.87''	-2.56''	5.03''	-5.57''	15.27''	-6.64''

This July had nearly 13 days that were void of any precipitation in our area. The other days served as reminders of the variable nature of precipitation, appreciation of the observers that captured that variation, and as a reminder that with more observers, more details can be captured.

Some areas experienced above normal precipitation. Other areas were below normal precipitation. In the end, stream flows remain below normal.

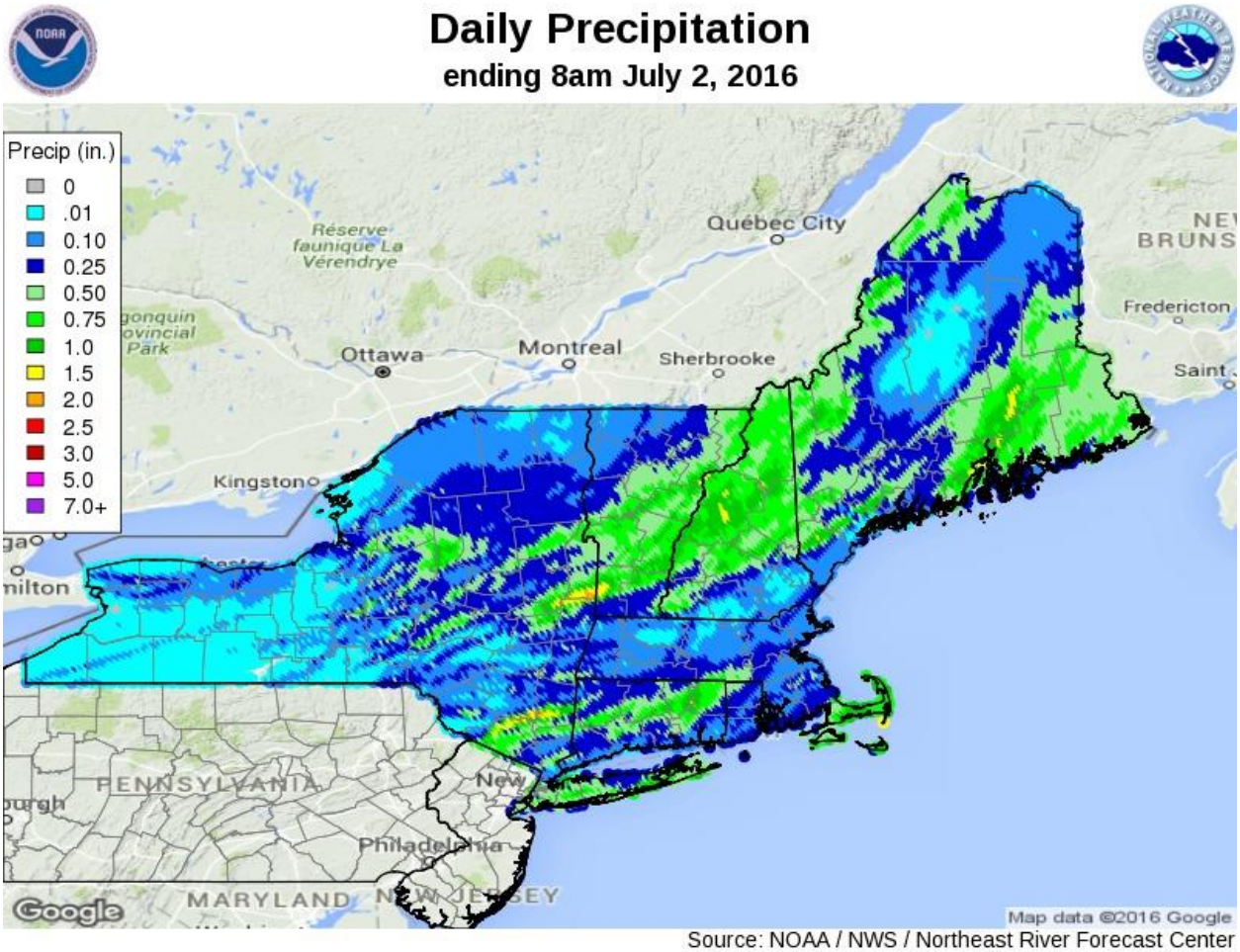
Despite the 4th of July Holiday and vacation season in full swing, more reporting records were broken. Last July, our three states totaled 3641 Daily Reports. This July saw 3631 reports of zero entered! So close, yet so pleased with all of you and your reporting this month of July.

Look over the next pages with our appreciation of your volunteer efforts. Three months ago, in April, we broke through 5,000 Daily Reports. In these past three months, we have surpassed the monthly reporting totals for the states of Arkansas, South Dakota, Wisconsin, Ohio, Alabama, Pennsylvania, New Jersey and Michigan.

In three months, 26 additional observers have reported. But to achieve that much of an increase in reporting, the bigger change was with you. Your attention to zeros and not missing many days has carried our reporting totals to new heights. Thank you!

From your reports for July 2016

Observers reporting	250
Reported all 31 days	103
Completed by Multi-Day Reports	34
Missing 1 or 2 reports	33 *** Please look over your station data at end of the month.
Daily Reports	6289
Zero Reports	3631
Non-Zero Reports	2658
Comments	765
Multi-Day Reports	132
Significant Weather Reports	11
Hail Reports	1
Highest Daily Report	3.94″ from Berlin CT (CT-HR-18) reported on 7/31



Source: NOAA / NWS / Northeast River Forecast Center

With summer vacations in full swing, we have a record breaking 137 stations that have complete station data for this month of July. With the rains that occurred near the beginning of July and August and at the end of July, only 1 station was given generosity among those that had an Multi-Day report overlap the monthly boundaries of July.

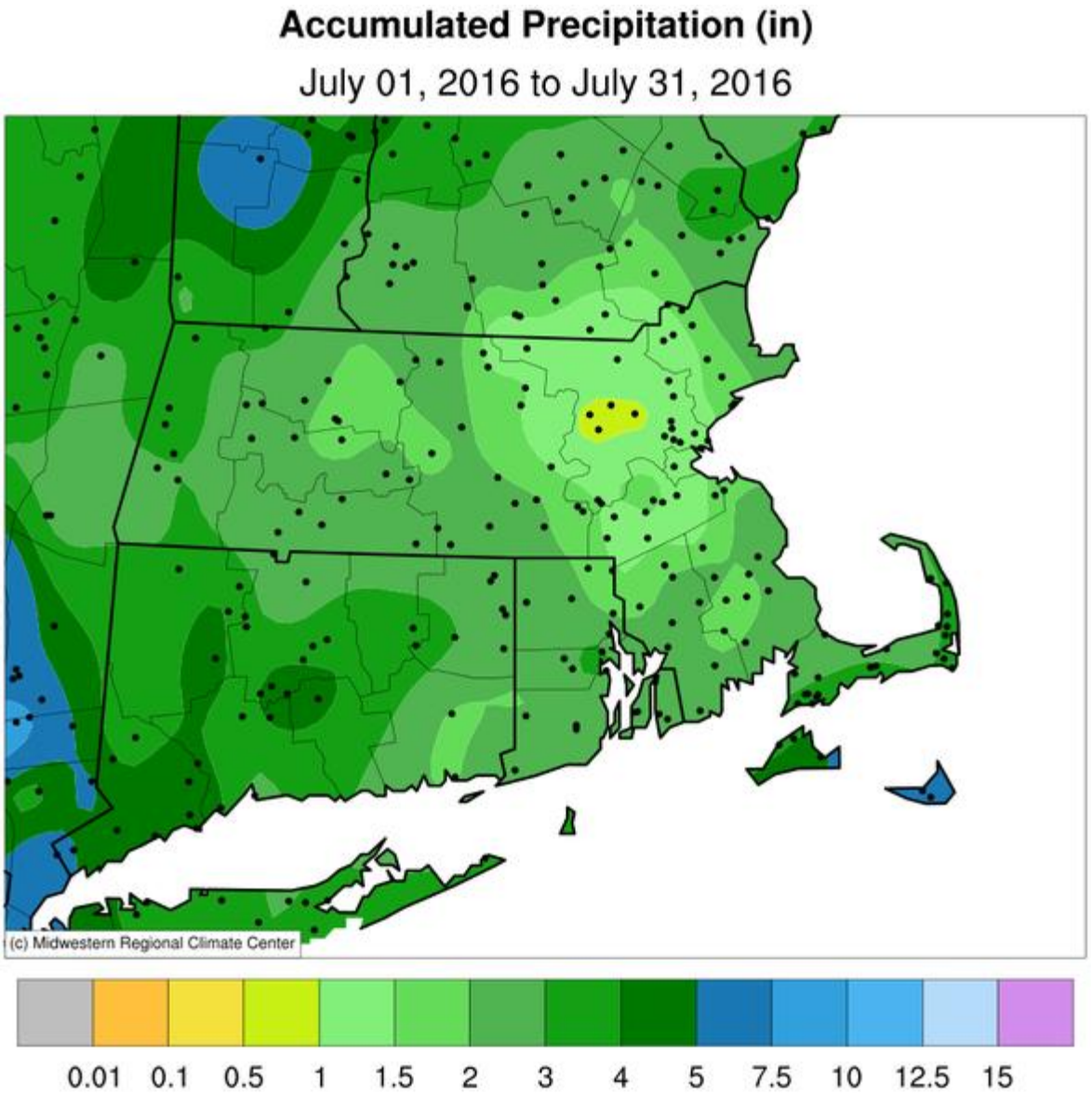
This list is getting longer and can continue to get longer if you make the effort not to miss any days either by a Daily Report or a Multi-Day Report. The information given at the beginning of this newsletter should help you look at your reports for missing reports.

Station	Location	Precip	County & State
MA-BE-11	Great Barrington 3.0 N	1.98''	Berkshire MA
CT-LT-7	Litchfield 2.3 NNE	3.15''	Litchfield CT
CT-LT-9	New Hartford Center 3.2 SW	4.77''	Litchfield CT
CT-FR-39	Stamford 4.2 S	4.82''	Fairfield CT
CT-FR-37	Stamford 0.4 WNW	5.03''	Fairfield CT
CT-FR-29	Ridgefield 1.9 SSE	6.39''	Fairfield CT
CT-FR-3	New Canaan 1.9 ENE	4.53''	Fairfield CT
CT-FR-25	Norwalk 2.9 NNW	3.85''	Fairfield CT
CT-FR-9	Brookfield 3.3 SSE	3.09''	Fairfield CT
CT-FR-31	Newtown 4.6 SSW	5.15''	Fairfield CT
CT-FR-32	Monroe 0.8 W	5.06''	Fairfield CT
CT-FR-42	Monroe 0.1 SE	4.86''	Fairfield CT
CT-FR-23	Shelton 1.3 W	6.14''	Fairfield CT
CT-FR-30	Stratford 0.5 WNW	4.78''	Fairfield CT
CT-NH-16	Milford 1.8 E	4.95''	New Haven CT
CT-NH-26	Prospect 1.5 NW	3.77''	New Haven CT
CT-NH-22	Prospect 0.5 SW	4.63''	New Haven CT
CT-NH-29	Hamden 3.0 WSW	3.69''	New Haven CT
CT-NH-14	Prospect 1.9 ENE	3.25''	New Haven CT
CT-NH-21	East Haven 3.5 SSW	3.09''	New Haven CT
MA-FR-17	Buckland 1.8 ESE	2.45''	Franklin MA
MA-FR-13	Conway 2.9 NW	3.19''	Franklin MA
MA-FR-10	Conway 0.9 SW	2.56''	Franklin MA
MA-FR-12	Sunderland 1.3 SE	1.67''	Franklin MA
MA-HS-14	Plainfield 2.4 ESE	2.21''	Hampshire MA
MA-HS-2	Westhampton 1.8 SW	3.78''	Hampshire MA
MA-HS-8	Williamsburg 1.2 WSW	2.20''	Hampshire MA

MA-HS-10	Northampton 1.6 NE	2.16''	Hampshire MA
MA-HD-13	Springfield 4.1 W	2.19''	Hampden MA
MA-HD-23	Springfield 2.5 WNW	1.73''	Hampden MA
MA-HD-20	Wilbraham 3.7 SSW	1.09''	Hampden MA
MA-HD-16	Wales 0.4 SSW	2.38''	Hampden MA
CT-HR-24	Collinsville 0.9 NW	3.05''	Hartford CT
CT-HR-28	North Canton 0.8 SSW	2.73''	Hartford CT
CT-HR-23	Southington 0.9 SSE	3.13''	Hartford CT
CT-HR-15	Southington 3.0 E	3.97''	Hartford CT
CT-HR-8	North Granby 1.3 ENE	2.44''	Hartford CT
CT-HR-35	Weatogue 0.7 E	2.02''	Hartford CT
CT-HR-34	Granby 0.8 W	1.90''	Hartford CT
CT-HR-18	Berlin 2.4 SSE	7.30''	Hartford CT
CT-HR-11	West Hartford 2.7 SSE	2.66''	Hartford CT
CT-HR-6	Wethersfield 1.2 WSW	3.69''	Hartford CT
CT-HR-22	East Hartford 1.3 E	3.79''	Hartford CT
CT-HR-40	Glastonbury Center 4.0 ENE	4.42''	Hartford CT
CT-TL-15	Central Somers 0.3 N	1.14''	Tolland CT
CT-TL-18	Hebron 5.3 NW	5.81''	Tolland CT
CT-TL-13	Crystal Lake 1.2 W	1.66''	Tolland CT
CT-TL-14	Storrs 1.5 SW	3.93''	Tolland CT
CT-TL-4	Mansfield Center 1.9 SW	3.96''	Tolland CT
CT-MD-2	Portland 0.9 S	4.41''	Middlesex CT
CT-MD-11	Westbrook Center 1.5 NE	2.44''	Middlesex CT
MA-WR-40	Gardner 1.4 SSW	2.18''	Worcester MA
MA-WR-44	Westminster 0.6 WSW	1.81''	Worcester MA
MA-WR-41	Auburn 2.6 SW	2.65''	Worcester MA
MA-WR-8	Fitchburg 1.6 SSW	1.56''	Worcester MA
MA-WR-32	Auburn 1.9 ESE	2.12''	Worcester MA
MA-WR-13	Leominster 1.5 S	1.39''	Worcester MA
MA-WR-31	Grafton 1.3 W	2.41''	Worcester MA
MA-WR-28	Berlin 1.3 WSW	1.31''	Worcester MA
MA-WR-18	Northborough 0.6 SSE	1.55''	Worcester MA
MA-WR-1	Milford 2.3 NNW	1.97''	Worcester MA
CT-WN-10	South Windham 1.3 NNE	3.02''	Windham CT
CT-WN-11	Scotland 2.3 SSW	2.72''	Windham CT
CT-WN-2	North Grosvenor Dale 1.7 SSE	2.03''	Windham CT
CT-WN-6	Dayville 2.0 ENE	2.63''	Windham CT
CT-WN-8	Moosup 1.7 NE	2.18''	Windham CT
CT-WN-4	East Killingly 1.3 SW	2.95''	Windham CT
CT-NL-7	Uncasville-Oxoboxo Valley 5.6 W	1.71''	New London CT

CT-NL-5	Oakdale 2.6 WNW	2.26''	New London CT
CT-NL-22	Central Waterford 2.7 SSW	1.95''	New London CT
CT-NL-17	Waterford 2.2 N	1.86''	New London CT
CT-NL-6	New London 1.0 NNW	1.93''	New London CT
CT-NL-8	Uncasville-Oxoboxo Valley 1.6 ENE	1.73''	New London CT
CT-NL-19	Mystic 0.9 W	1.64''	New London CT
CT-NL-21	Griswold 0.9 N	2.38''	New London CT
RI-PR-20	West Glocester 3.4 SE	2.41''	Providence RI
RI-PR-33	Greenville 0.7 NNW	2.45''	Providence RI
RI-PR-32	Providence 2.3 NE	1.50''	Providence RI
RI-KN-2	East Greenwich 2.3 ESE	3.48''	Kent RI
RI-WS-32	Kingston 6.9 NNW	2.49''	Washington RI
RI-NW-4	Middletown 1.1 SW	1.40''	Newport RI
RI-NW-11	Tiverton 0.8 SSW	2.81''	Newport RI
RI-NW-5	Little Compton 1.7 NW	1.98''	Newport RI
RI-NW-7	Little Compton 0.6 E	2.19''	Newport RI
MA-BR-17	North Attleboro 0.8 E	0.91''	Bristol MA
MA-BR-23	Attleboro 0.9 ENE	1.07''	Bristol MA
MA-BR-2	Rehoboth 2.1 N	1.51''	Bristol MA
MA-BR-3	Norton 1.8 NNE	1.85''	Bristol MA
MA-BR-33	Taunton 2.4 W	1.44''	Bristol MA
MA-BR-8	Dighton 1.1 WSW	2.21''	Bristol MA
MA-BR-30	Taunton 3.9 N	2.89''	Bristol MA
MA-BR-14	Dartmouth 2.5 SSW	2.05''	Bristol MA
MA-BR-32	Acushnet 1.8 SSE	2.23''	Bristol MA
MA-MD-47	West Townsend 0.5 W	1.04''	Middlesex MA
MA-MD-12	Acton 1.3 SW	0.89''	Middlesex MA
MA-MD-51	Maynard 0.7 ESE	0.70''	Middlesex MA
MA-MD-42	Holliston 0.8 S	1.54''	Middlesex MA
MA-MD-62	Chelmsford 1.2 E	1.07''	Middlesex MA
MA-MD-60	Billerica 2.0 W	1.09''	Middlesex MA
MA-MD-52	Lexington 0.6 SW	0.73''	Middlesex MA
MA-MD-54	Belmont 0.3 SE	0.99''	Middlesex MA
MA-MD-45	Wilmington 1.5 NE	1.01''	Middlesex MA
MA-MD-7	Winchester 0.7 SE	1.19''	Middlesex MA
MA-MD-44	Medford 1.2 W	0.99''	Middlesex MA
MA-MD-11	Cambridge 0.9 NNW	1.05''	Middlesex MA
MA-MD-43	Somerville 0.8 SSE	1.17''	Middlesex MA
MA-MD-74	Somerville 0.7 SSE	0.89''	Middlesex MA
MA-ES-3	Haverhill 3.6 WNW	1.62''	Essex MA
MA-ES-20	Haverhill 0.7 N	1.30''	Essex MA

MA-ES-26	Haverhill 2.6 ESE	1.60''	Essex MA
MA-ES-12	Boxford 2.4 S	1.12''	Essex MA
MA-ES-1	Salisbury 3.7 NW	1.94''	Essex MA
MA-ES-2	Beverly 2.8 NW	1.36''	Essex MA
MA-ES-8	Marblehead 0.8 SW	1.66''	Essex MA
MA-ES-25	Gloucester 4.3 N	2.01''	Essex MA
MA-ES-22	Rockport 1.0 E	1.33''	Essex MA
MA-SF-10	Chelsea 0.8 N	1.58''	Suffolk MA
MA-SF-2	Winthrop 0.2 N	1.17''	Suffolk MA
MA-NF-16	Bellingham 4.7 S	1.69''	Norfolk MA
MA-NF-1	Norwood 1.3 NW	2.31''	Norfolk MA
MA-NF-5	Weymouth 0.5 NW	1.06''	Norfolk MA
MA-PL-24	Whitman 1.1 WSW	1.15''	Plymouth MA
MA-PL-23	Pembroke 2.8 SW	1.81''	Plymouth MA
MA-PL-19	Rochester 1.2 NNW	1.83''	Plymouth MA
MA-PL-6	Middleborough 5.5 E	1.51''	Plymouth MA
MA-BA-14	North Falmouth 0.5 ENE	3.00''	Barnstable MA
MA-BA-17	East Falmouth 1.2 WNW	2.47''	Barnstable MA
MA-BA-19	East Falmouth 0.7 NW	2.86''	Barnstable MA
MA-BA-3	Falmouth 3.0 E	2.99''	Barnstable MA
MA-BA-11	East Falmouth 1.4 ESE	3.84''	Barnstable MA
MA-BA-18	Waquoit 0.6 SSW	2.92''	Barnstable MA
MA-BA-47	Mashpee 2.4 WSW	2.99''	Barnstable MA
MA-BA-45	Sandwich 0.9 NNE	1.98''	Barnstable MA
MA-BA-22	Yarmouth 0.9 NNW	2.95''	Barnstable MA
MA-BA-36	Harwich 2.6 ENE	2.17''	Barnstable MA
MA-BA-51	Orleans 3.0 S	2.70''	Barnstable MA
MA-BA-12	Orleans 1.1 E	2.88''	Barnstable MA
MA-BA-30	Eastham 0.6 SW	2.64''	Barnstable MA



With some space available, I can give a more detailed explanation on this graph. The scale immediately grabs our attention. 15"? Who has seen 15" recently?

During the afternoon and evening of Saturday July 30, a band of heavy rain fell in northeast NJ and southeast NY. 3" – 8" of rain fell in that one event, captured by a few CoCoRaHS observers, and caused the monthly totals to range from 9"-12". NY-PT-4 reported 9.43" for July. That area of southeast NY appears toward the left edge of this graph.

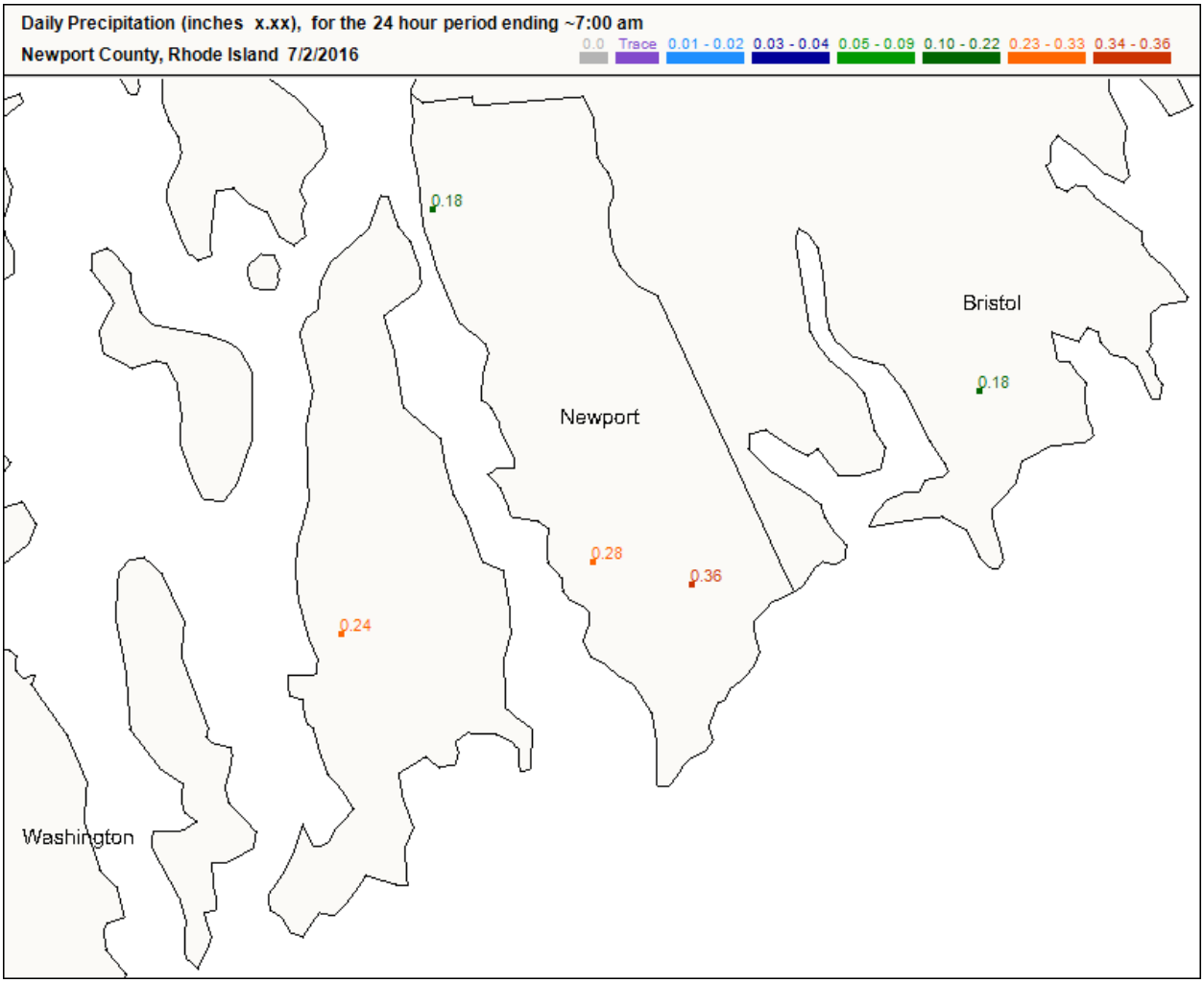
We need the precipitation, and we need to be reminded of the highly variable nature of precipitation during this time of year.

Map of the Month – Newport County RI

Islands in a bay by the ocean. No large rivers. 80,000 residents in 100 square miles. So what do we need CoCoRaHS here for? One reason is drinking water. Rhode Island relies on its reservoirs for municipal drinking water and Newport is no different.

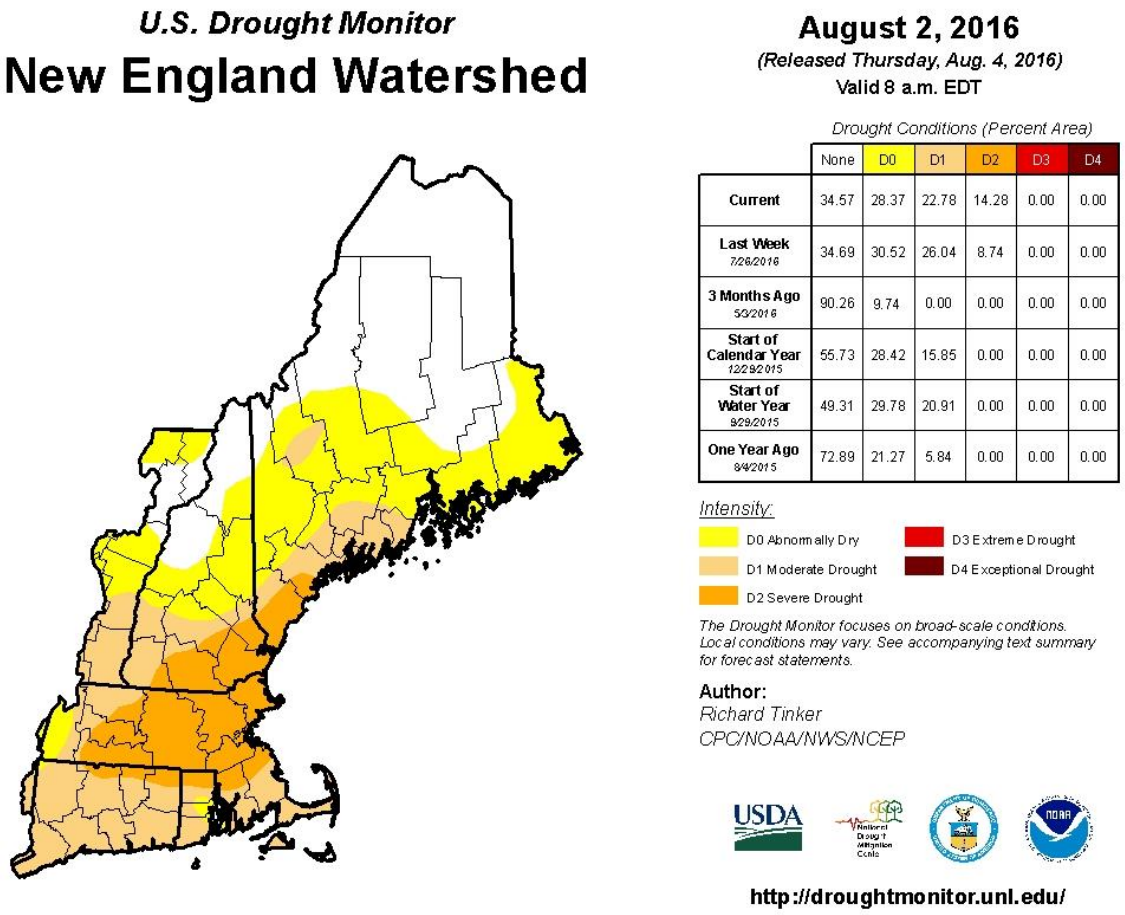
Easton Pond (Newport), Green End Pond (Newport), Nelson Pond (Newport), Gardiner Pond (Newport), Jamestown Reservoir (Jamestown), Watson Reservoir (Little Compton / Tiverton) are some of the places that this county relies upon for its drinking water.

In the next article, you will see another reason that CoCoRaHS has value and that is the variability in precipitation it captures. If you know of someone who might be interested in measuring and mapping precipitation, ask them to join CoCoRaHS.



From the Drought Monitor.

Just like last month. The drought is getting worse while your reporting continues to get better. Every drop counts and zeros do too!



For a viewing explanation on the Drought Monitor, the CoCoRaHS animated video is on YouTube.

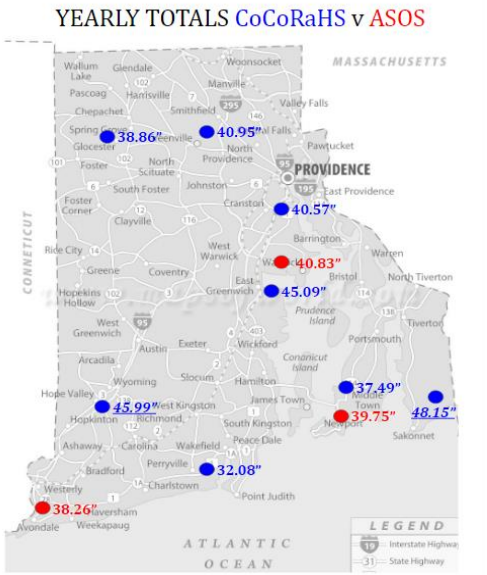
Big Rains in the Smallest State

By Lucy Bergemann – Intern at NWS Taunton MA

My name is Lucy Bergemann and I am an intern at the NWS Taunton Office working specifically on CoCoRaHS outreach and research. I'm learning where the observers are and where they need to be, especially in Rhode Island. I've grown to appreciate the observers we do have and how their stations paint a hyperlocal picture. I stumbled upon the September 10-11th 2015 rainfall event while looking at yearly records. It instantly grabbed my attention and I spent an entire afternoon researching! I hope you're as captivated as I am.

Daily precipitation reports are essential to forecasters at the National Weather Service office in Taunton, MA because it helps them to determine what the atmosphere is capable of in a given day. Reports come ASOS (Automated Surface Observation Stations) at airports and from dedicated observers who are part of the CoCoRaHS. The National Weather Service relies on CoCoRaHS observers during high-impact events, like thunderstorms, heavy rains or winter storms. Their reports are essential for determining what areas have seen the most precipitation and help forecasters confirm where watches and warnings may need to be issued.

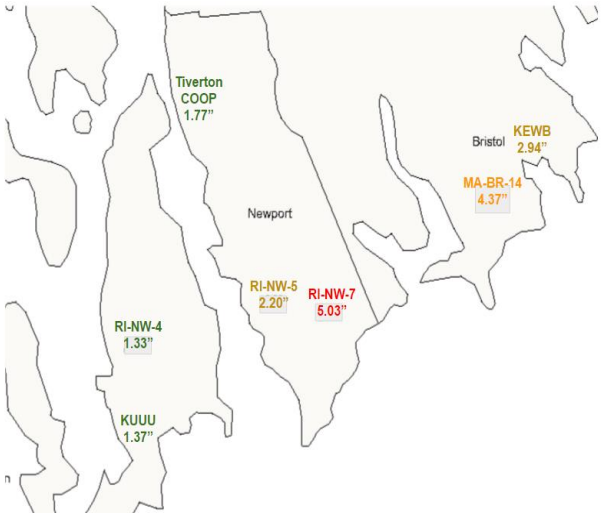
The graphic (right) shows the differences between measurements at ASOS and CoCoRaHS stations in Rhode Island for the Calendar Year of 2015. For the small state of Rhode Island, there are only three ASOS stations that are equipped with rain gauges: Providence (PVD), Newport (UUU) and Westerly (WST) airports. The CoCoRaHS network is also limited in the state. There are only 8 observers reporting their rainfall consistently enough for their data to be used by the NWS. Despite the small data availability in Rhode Island, it is clear to see that the ASOS and CoCoRaHS stations have similar totals. Only one station sticks out in particular for the yearly totals as having a summary far greater than its corresponding



CALENDAR YEAR 2015 PRECIPITATION TOTALS. BLUE = COCORAHS. RED = ASOS.

airport. One CoCoRaHS station in Newport County, RI reported 10” more rain than the Newport Airport.

After breaking down the data monthly, it was clear to see that in September 2015 this particular CoCoRaHS station reported 8.62” of rain as compared to 4.14” at the airport. After separating the data and looking at the daily reports, on September 11, 2015 the CoCoRaHS station (RI-NW-7) reported 5.03” of rain as compared to 1.37” at the Newport Airport (UUU), and 2.20” and 1.33” at the two other CoCoRaHS stations in Newport County. Initial thinking was observer data entry error but after seeking out nearby stations it was found that a nearby CoCoRaHS stations in Bristol County, MA reported 4.37” on the same day and the New Bedford MA airport ASOS (EWB) recorded 2.94” on September 10-11th too.



PRECIPITATION REPORTS FOR SEPTEMBER 11, 2015

Next step: Look at archived NWS data. Records show that Flash Flood Watches and Warnings were issued for September 10-11th throughout New England, and that CoCoRaHS stations in southeast MA, not Springfield MA) had reported 4+” of rainfall too. Furthermore, radar data showed that there was a heavy precipitation event overnight September 10th into the 11th with heavier pockets of rain across southern RI and southeast MA. CoCoRaHS stations put numbers to the image the radar paints - consistent observers are vital to forecasting and preparing for high-impact events, as well as issuing watches and warnings during snow and rain storms. CoCoRaHS fills in the holes between ASOS stations and shows the more susceptible areas.

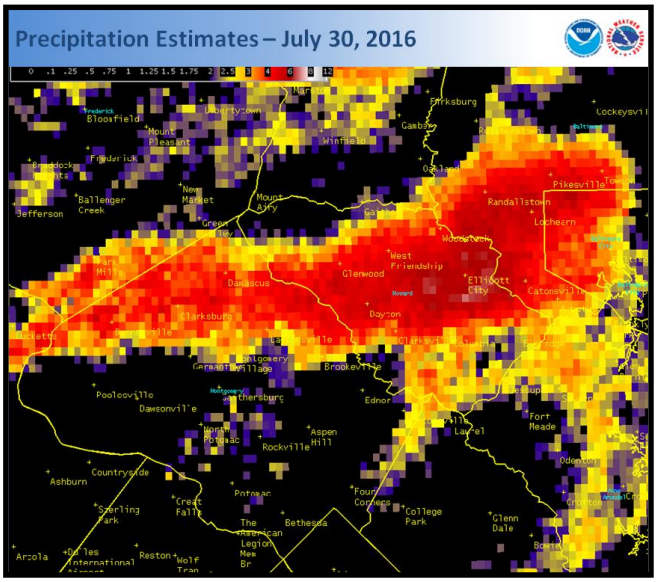
Rhode Island is in desperate need of more CoCoRaHS observers. If you are interested in joining the network of observers, please join at CoCoRaHS.org!

Ellicott City Historic Rain and Flash Flood

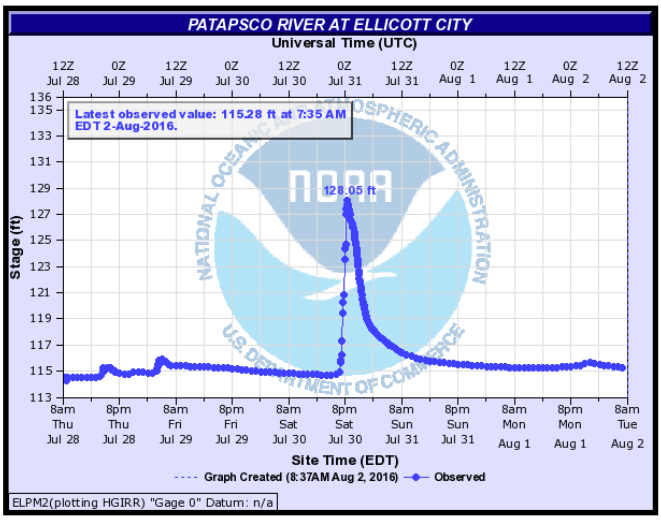
Courtesy of NWS Baltimore/Washington, DC

On Saturday, July 30th, 2016, torrential rainfall occurred in and near Ellicott City, Maryland, causing severe flash flooding and destruction to the historic Old Town portion of the city. Two fatalities were reported. Many buildings in Old Town Ellicott City were damaged or essentially destroyed, and hundreds of vehicles were impacted.

The MRMS (Multi-Radar/Multi-Sensor) precipitation estimates from the event show the swath of most persistent heavy rain that occurred from northern Montgomery County, Maryland to Baltimore City. MRMS is a combination of radar rainfall estimates and observations from automated rain gauges. The image (right) is filtered to show only amounts over two inches. Areas in yellow are over 2.5 inches; red is over 4 inches; and the pixels of white near Ellicott City are estimates of over 6 inches. Much of this rain fell in 90 minutes or less.



Certainly, rain of this severity will cause a sharp rise on streams, and this was reflected in numerous automated stream gauges monitored by the NWS. The largest river impacted in this event was the Patapsco River, which is the county border between Howard and Baltimore Counties for much of its reach. At Ellicott City, the Patapsco rose just over 13 feet in 100 minutes (7:20pm - 9:00pm), and rose over two feet in just five minutes (8:40pm-8:45pm). This sharp 2+

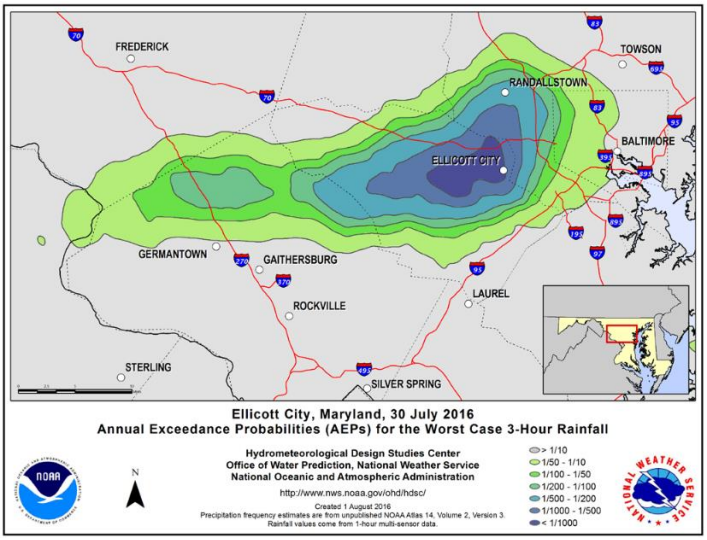


foot rise coincides with the time when the most significant reports of flooding began to be received.

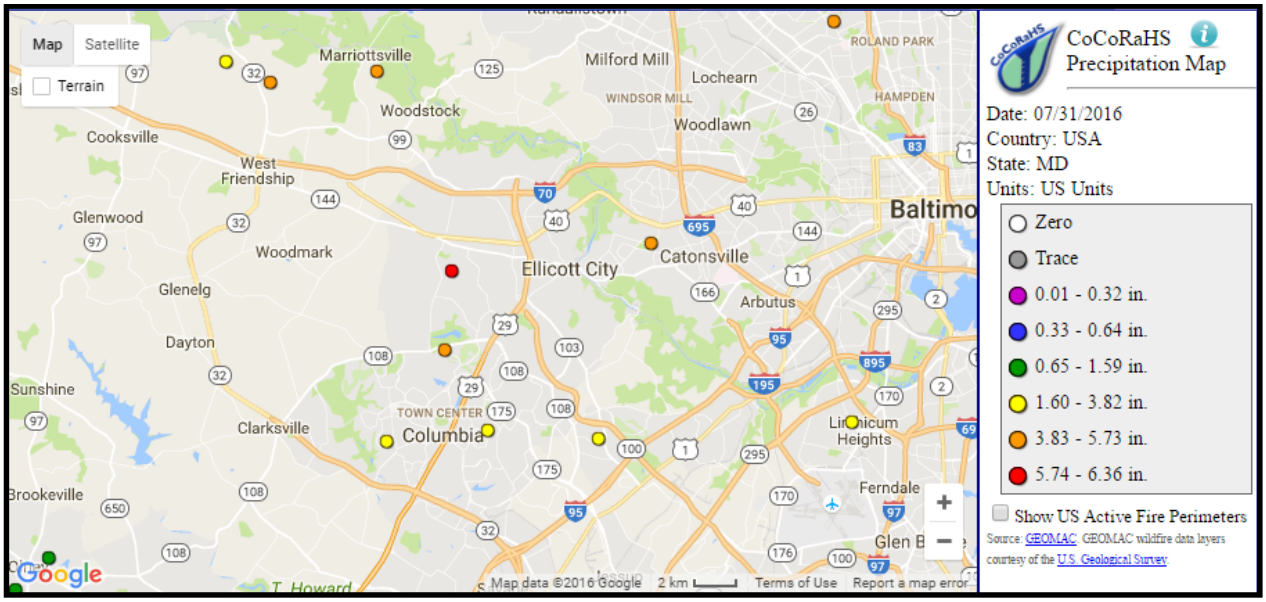
The NWS joined the Howard County Office of Emergency Management and Howard County Department of Public Works in conducting a survey of affected areas of Ellicott City, Maryland on August 1st, 2016. The survey revealed clear signs of flooding both from the Patapsco River and from flash flooding within Ellicott City. Signs of flooding, including damaged pavement, were observed as far up as the intersection of Rogers Avenue and Frederick Road, where Hudson Branch came out of its banks. From this location, eyewitnesses reported seeing water not only in the creek, but moving swiftly down Main Street beginning "just after dark".

The most significant damage observed was near 8100 Main Street, where the street curves slightly. Based on topographic maps, this general area is also approximately where the extent of the Patapsco flooding would have reached based on the observed peak of 128.05 feet. Although we cannot say for certain, it is possible that this area being the meeting point of the upstream and Patapsco floodwaters could have caused more significant damage in that immediate area.

The NWS Hydrometeorological Design Studies Center completed an exceedance probability analysis for this rainfall event, based on the rainfall estimates and observed data shown above. At time durations of 5 minutes to 3 hours, the observed rainfall at the Ellicott City gauge has a probability of occurrence of less than or equal to 1/1000. ***This does not mean this extreme rainfall will only occur once in a thousand years.*** However, it is a rare and unlikely event. Based on statistical analysis, there is a 0.1% chance or less of this rainfall occurring in these time durations and location <u>in any given year</u>.



What about CoCoRaHS observations? As you can see on the map below, there is an observer on the west side of Ellicott City who reported a total of 6.36 inches. Nearby observers reported 4.20 inches in Columbia (to the southwest) and 4.15 inches in Catonsville (to the east). This stresses the importance of CoCoRaHS observations which add value to automated observing networks!



Two observers in the area made Significant Weather Reports during this event.

Date ▲	Time	Station Number	Station Name	Duration Minutes	New Precip in.	Total Precip in.	New Snow in.	Total Snow in.	Flooding	State	County	View
7/30/2016	8:14 PM	MD-MG-1	Montgomery Village 1.3 SSW	34	1.33	1.33	NA	NA		MD	Montgomery	
7/30/2016	10:00 PM	MD-BL-16	Towson 0.8 SW	210	3.35	NA	NA	NA	Minor	MD	Baltimore	

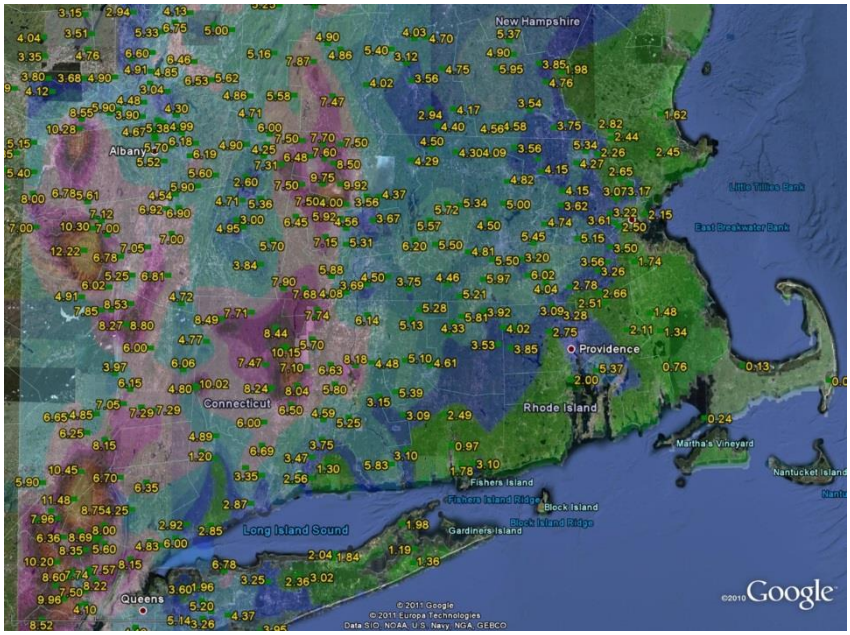
Remembering Irene
in Southern New England 5 Years Later

By Nicole Belk, Senior Service Hydrologist, NWS Taunton

Hurricane Irene, which became Tropical Storm Irene as it crossed into southern New England, brought copious amounts of moisture into the area. Flooding along the Connecticut River was the worst experienced since the 1980s.

The heaviest rain reached southern New England during the overnight hours of Saturday night August 27th into midday Sunday on August 28th. During this timeframe, torrential rains fell over the region. Specifically to NWS Taunton's area, the heaviest rain fell over the east slopes of the Berkshires in MA and western Hartford County CT. However, from the standpoint of runoff feeding the lower Connecticut River, excessive rains fell across most of the Connecticut River Basin from central Connecticut northward throughout western MA, western NH and eastern VT.

Rainfall totals were as high as 6 to 10 inches along the east slopes of the Berkshires, including western Franklin, Hampshire and Hampden counties in Massachusetts. Six to 10 inches of rain also fell in western and central portions of Hartford County CT, with lesser totals farther to the east. The map (right) shows a more detailed graphic of precipitation totals.



PRECIPITATION MAP SHOWING TOTALS ASSOCIATED WITH IRENE, AUGUST 27TH TO 28TH 2011.

The response of rivers and streams in western New England was profound. The USGS Massachusetts/Rhode Island Water Science Center reported that preliminarily, many small streams in Franklin and Hampshire Counties achieved new peaks of record.

At the Deerfield River at Charlemont, the river peaked out at 20.16 feet, the second highest crest on record. Flood stage is 7 feet. The record crest is 0.01 foot higher, from 1938.

Major flooding occurred to portions of northwest Massachusetts, from Greenfield northwest through Colrain, Leyden, Buckland, Charlemont, and vicinity, in particular along the Deerfield River and its associated tributaries. Numerous roads were flooded. There were numerous evacuations and a number of homes that were flooded and others also condemned. One building in Shelburne Falls was moved approximately 100 yards downstream of its foundation. Another home was reported to have been washed away in Leyden on the Green River. Multiple major routes/highways were affected in western Massachusetts, including Route 2, I-91, Route 20, Route 5, and Route 112. A flood survey along the Deerfield River indicated that in between Routes 5 and I-91, a large swath of farmland was inundated, and many homes within that stretch experienced various degrees of flooding. The Mohawk Meadow Country Club at the junction of the Connecticut and Deerfield Rivers was submerged. On the Green River in Greenfield, the purportedly haunted Eunice Williams Covered Bridge was no longer attached to its abutments and the river scouring was so severe the river diverted itself around the bridge.

DAMAGE TO EUNICE WILLIAMS COVERED BRIDGE ON THE GREEN RIVER AT GREENFIELD, MA.

Along the Deerfield River, Shelburne Falls and adjacent towns were hit especially hard, with homes inundated and some shops along the river flooded. This is a tourist attraction area including the Bridge of Flowers. The Bridge of Flowers re-opened on September 2nd. A portion of the Deerfield River parallels Route 2. Even as of early October 2011, Route 2 from Charlemont to Florida Massachusetts was closed indefinitely, with a detour in place.

The Deerfield River at West Deerfield gage went 6 feet over its previous flood of record. Based on the last USGS rating curve for this location, the flow coming off of this river was equal to the entire flow of the Connecticut River at Montague at moderate flood. The Montague river gage is 1000 feet downstream of the mouth of the Deerfield River, and given the flow

feeding into the Connecticut River from this one tributary, it lends credence that data shows the Connecticut River at Montague rose over 8 feet in 2 hours during the afternoon of the 28th and peaked at its highest level since 1984.

In Westfield, Route 20 and Union Street were closed due to floodwaters from the Westfield River. Evacuations on Ellsworth Avenue and River Street occurred. Granville Road was washed out. Route 20 was closed within additional communities from various streams and rivers…including Chester, Russell, West Springfield, Brimfield, and Wilbraham. Elsewhere, numerous roads were closed due to flooding from various streams and rivers.

The Connecticut River at Northampton and Holyoke crested at their highest levels since 1987.

Significant flooding was not limited to Massachusetts. In Connecticut, the Pequabuck River in Bristol overflowed its banks and resulted in a building collapse into the river. Significant floodwaters from this river washed onto and flowed through Main Street. Two people went canoeing into the floodwaters on Main Street before their canoe was overturned. One person was rescued. A 47 year old male drowned and was found approximately 2.5 miles downriver in the Forrestville section. In Burlington, Bunnell Brook had its third worst flood on record, with records going back to the 1930s. Significant flooding also occurred along the Farmington River, while the Connecticut River at Thompsonville, Hartford and Middletown all crested at their highest levels since 1987.

Irene contributed to substantial precipitation totals for the month of August 2011. Some totals for the month at major climate stations are listed below. Note that all 4 climate stations ranked in the top 10 wettest Augusts on record, Worcester and Hartford had their 2nd wettest Augusts on record. Both Hartford and Worcester ranked in their top ten wettest months on record.

Location	*August 2011 Precipitation*	*Departure (Inches)*	*Wettest August Ranking*	*Record go back to*	*Wettest Month Ranking*
Boston	7.74	+4.39	5th	1872	NA
Worcester	12.21	+8.50	2nd	1892	4th
Providence	8.02	+4.42	7th	1905	NA
Hartford	11.67	+7.74	2nd	1905	6th

Wrap up

Hurricane season is coming to a climax. Stay informed and have a plan ready should a tropical system come in our direction.

For staying informed, two websites. One for a full browser. One formatted for a mobile device.

http://www.nhc.noaa.gov

http://www.nhc.noaa.gov/mobile

For having a plan, look at these two websites.

https://www.ready.gov/hurricanes

https://www.ready.gov/hurricane-toolkit

The Climate Prediction Center www.cpc.noaa.gov was mentioned to look at for Drought and longer range predictions. Recently, a feature was added to look at Tropical predictions for the next 1-2 weeks, titled Global Tropics Hazards Outlook. Give it a look to see a more long range forecast for tropical activity.

August can give us more of the same variable precipitation that July did. Should you experience a significant event, make note of the start and stop times and, when it is safe to do so, fill out and submit a Significant Weather Report. The basic guideline is 1” or more of precipitation in 1 hour or less. If you feel it is significant, fill out and submit a Significant Weather Report.

Nolan mentioned Significant Weather Reports in his recent newsletter. And we mentioned them with the recent Flash Flood event in Ellicott City MD. These reports are extremely valuable, real-time reports to our National Weather Service customers.

One last month of meteorological summer remains. Enjoy it.

Thank you for all that you do for CoCoRaHS, whether in the past, present and in the days to come.