Colorado CoCoRaHS

October 2013
Volume 1, Issue 6

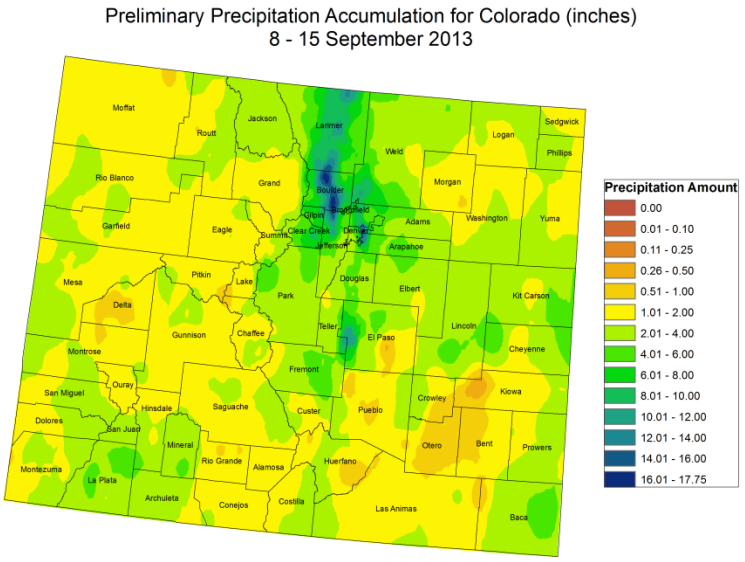
COLORADO FLOOD OF 2013

A one or two page summary in the monthly Colorado CoCoRaHS newsletter isn't nearly enough space to explain in detail just how significant this event was, not only with respect to our state's climate, but more importantly, to those who lived through the nightmare.

During the week of September 9, 2013, historic rainfall exceeding a foot fell across relatively small river channels in the foothills of Boulder, Larimer and Jefferson counties, as well as over some urban waterways, including Westerly Creek, which flows through Denver and Aurora.

Three weather elements came together to create this "perfect storm," including a large plume of tropical moisture from the south, a cold front from the north which stalled over the state, and a blocking weather pattern at the jet stream level which didn't allow the storm system to move. The result was a prolonged rain event that produced catastrophic flooding from the foothills of Boulder, Larimer and Jefferson counties, through the I-25 urban corridor from the northern Denver metropolitan area to Fort Collins, and into the rural communities of northeast Colorado. In total, 14 counties and 6 major water ways were impacted.

The event established a number of new records across the region, including a new all-time daily, all-time monthly, and all-time annual record for precipitation at the Boulder weather station.



A preliminary map of rainfall between Sept. 8-15 around Colorado, using numerous data sources, including CoCoRaHS observers and National Weather Service stations; map created by Zach Schwalbe.

There were 129 CoCoRaHS observers from 9 counties that measured over 10 inches of rain during September 2013. The top total from each county is in the chart below.

Top Total By County Stations Exceeding 10" of Rain Sep-13		
CO-BO-30	Boulder 1.9 SE	19.18
CO-LR-225	Drake 3.0 NNE	16.65
CO-AD-127	Aurora 4.2 NNW	16.63
CO-AR-270	Aurora 0.7 WSW	16.39
CO-DN-183	Denver 5.1 ENE	13.49
CO-EP-175	Manitou Springs 1.2 ESE	12.84
CO-JF-365	Golden 2.1 SW	12.64
CO-WE-203	Longmont 8.2 ESE	11.57
CO-CC-7	Idaho Springs 4.7 SSE	10.34

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HISTORICAL SIGNIFICANCE OF 2013 FLOOD

It's been all the hype in the news and online chats; was the September flood in Colorado a 1000-year storm? For some, it may have been. For others, though significant, probably not. No two storms are alike, and that is the first "fly in the ointment" for making an apples-to-apples comparison. Another issue researchers face is that in some key areas there was equipment failure, and in a few cases, gauges that completely washed away. There have been and will continue to be extensive research and site visits to recreate the flood and make as accurate of an assessment as possible.

It's important to note that Colorado has seen major, widespread flood events like this in the past, including one over virtually the same area at the same time of year in 1938. But what makes this storm so different from previous events is the modern time we live in. The population of the impacted area has grown significantly, there is a much more sophisticated infrastructure, and many more ways to document storms than ever before, through pictures, backyard weather observers (i.e. CoCoRaHS) and real-time updates via social media.

The Colorado Climate Center has established a website dedicated to the 2013 Flood Event. As further analysis is completed and new data is available to share, it will be posted. We invite you to bookmark the following site and visit often.

http://coflood2013.colostate.edu

The September flood event in north-central and northeast Colorado carved new river and creek channels, washed away homes, cut off towns and claimed lives. This picture from Jamestown provided by Steven Zumwalt of FEMA.

CoCoRaHS DATA INVALUABLE PART OF DATA MINING

The staff of the Colorado Climate Center, along with several partners, have been involved in an exhaustive process called "Data Mining" to acquire as many rainfall reports as possible to accurately recreate and study the historic September flood. To date, over 2,000 pieces of rain data have been acquired, and more than half of those are from CoCoRaHS observers. Data is still being accepted; if you know of any friends, family, neighbors or co-workers that measured the rain with any type of measuring device, please encourage them to send that information to the following email address… coflood2013@gmail.com.

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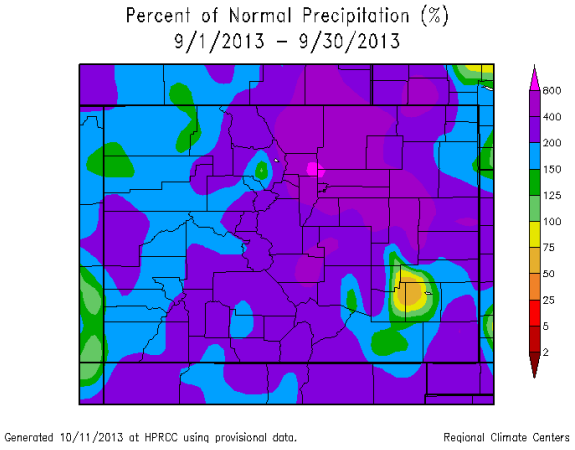
SEPTEMBER PRECIPITATION GENEROUS ACROSS COLORADO

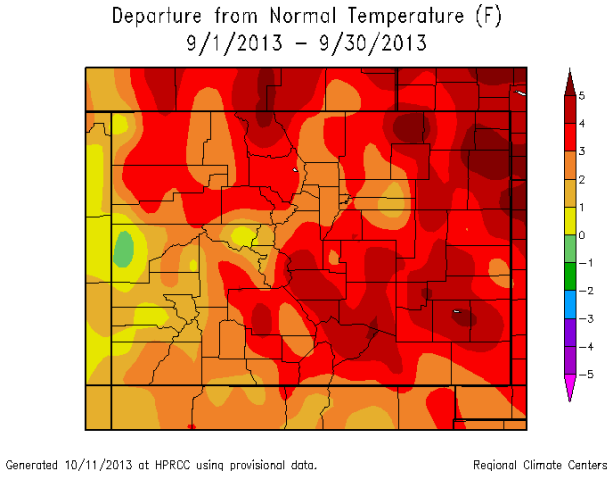
The title says it all! In some cases, the moisture was enough to end the drought. Much of Colorado saw above normal rainfall during the month of September with the exception of areas along the Arkansas River Valley between Pueblo and Lamar.



There were over 100 CoCoRaHS stations that recorded more than 10" of rain during the month of September. That is nearly an entire year's worth of water.

TEMPERATURES WARMER THAN NORMAL DURING SEPTEMBER

Despite all the moisture, temperatures across Colorado were 2 to 5 degrees above normal for most locations during September. They were near or slightly below average in the western valleys, in particular, around Grand Junction.



This CoCoRaHS gauge was hard at work during one of several cool, damp and cloudy days in the Grand Valley during early September; picture from Harry Gilbert (CO-ME-83).

Colorado Weather Trivia

Question: ***What is the coldest winter location in Colorado?***

Answer: Taylor Park Dam (outside of Gunnison). They average a temperature of -8°F during January and record about 90 days each winter with temps at or below zero.

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THE ULTIMATE CoCoRaHS GAUGE OVERFLOW

If you are new to CoCoRaHS and have yet to experience going out to your gauge and seeing that it has rained hard enough to overflow the inner cylinder, just wait! It is truly a KODAK moment! (or in this day and age, a moment for Facebook and Twitter)

Despite classes being cancelled on September 12th, Bill Schmoker, an Earth Science Teacher at Centennial Middle School in Boulder, made the long and wet trek in to school that morning to make the daily observation. He and his students operate CoCoRaHS station CO-BO-337. The picture below tells the tale of what Bill found!

Inside the gauge was a whopping 8.43" of rain with more in the forecast. The total capacity of the CoCoRaHS gauge is about 11" – it's a good thing Bill was able to make the measurement, because the next day, he reported another 3.31" of rain – the two days combined would have completely overflowed the gauge!

SEPTEMBER FUN FACTS FROM AROUND COLORADO

*As of 1 pm on 10-20-13

- 1,357 stations filed at least one daily report
- 985 stations reported at least half of the month
- 413 stations filed a report every day
- Wettest station: CO-BO-30 (Boulder 1.9 SE) with 19.18" of precipitation
- Driest station that reported all 30 days: CO-OT-23 (Swink 0.1 WNW) with 0.78" of precipitation
- 99 stations filed a multi-day accumulation report
- 41 stations reported measurable snow during September with the most being 7" at station CO-GN-18 (Crested Butte 6.2 N)

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SIGNIFICANT WEATHER REPORTS

There were 172 significant weather reports filed during the month of September. These reports are read in real-time by the National Weather Service and can be very helpful to forecasters. REMEMBER: These reports do not take the place of your daily precipitation report; they are simply just a snapshot of what is currently happening at your location. So if you measure 1.47" at 6:45 p.m. and send a significant weather report, then another 0.55 inches falls before the observation time tomorrow, the report filed will be 2.02" for the previous 24 hours.

A few reports include…

- *3.00" of rain this morning in east Denver. The first time I've seen this. Drainage basins are fuller that I've ever seen before, but have not over-topped*. (CO-DN-49, filed 9/12/13)
- *6.29" since Monday at 5pm. Heavy rain with lightning now but not much thunder. My kids report significant flooding on S. Boulder Road near Cherryvale with cars stalled*. (CO-BO-67, filed 9/11/13)
- *0.37" in 19 minutes, clouds formed quickly with heavy rain and lots of thunder, still raining now*. (CO-HF-27, filed 9/3/13)
- *2.38" – Beaver Creek is flowing for the first time in 7-8 years and is about to flow over Road L in Morgan County*. (CO-MR-83, filed 9/23/13)

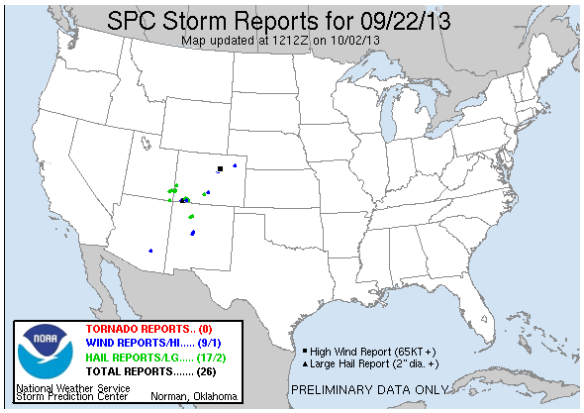
HAIL REPORTS DURING SEPTEMBER

There were 56 hail reports filed from around Colorado during September; thankfully, most were small. There was a rare outbreak of severe weather on the western slope during late September which produced hail the size of golf balls in some locations. Top hail reports from CoCoRaHS observers include…

- 1.75" diameter at station CO-LP-26 (Hesperus 13.3 SSW) on 9/22/13
- 1.00" diameter at station CO-LP-25 (Bayfield 0.6 WSW) on 9/22/13
- 0.75" diameter at station CO-LP-61 (Durango 4.8 WSW) on 9/22/13

Hail up to 2" in diameter was reported by the public, to the National Weather Service office in Grand Junction, near Breen (La Plata County) on 9/22/13.

Below is a map of storm reports as severe weather moved across Colorado on 9/22/13.



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OBSERVER SPOTLIGHT

This month's observer spotlight features Rick and Vicky Jordan. They have been CoCoRaHS observers since the organization first formed in Larimer County during the late 1990s. In addition to operating a gauge at home, Vicky also maintains a gauge along with her students at Wellington Middle School.

Why did you join CoCoRaHS? I joined CoCoRaHS pretty much at its inception because Nolan Doesken wanted observers in the Wellington area and was willing to come to my school to do personal a training session with my students.

What have you learned from measuring precipitation? Since we live in the High Park Fire area, we recognize how critical every piece of data is for monitoring runoff and reclamation, so we have tried to be sure to report accurately on a daily basis. It's interesting to compare our data with neighbors near and far and realize just how variable each storm can be!

Has being a CoCoRaHS observer made you more aware of climate? I don't think CoCoRaHS has made me more aware of climate; rather the focus on climate change has made me more aware that collecting thorough and accurate data is important to help us figure out what is really going on with climate. I tell my students that good scientists pose questions and then collect data to help answer those questions, which always brings up more questions. As citizen scientists, we can participate in this process, and our data is valuable. Even the zeroes; sometimes, especially the zeroes!

During the September flood event, the Jordan's measured 10.33" of rain in three days at their home in the foothills of Larimer County. They lost electricity and their road, but fortunately, did not lose their home or cars. In true CoCoRaHS spirit, they continued to check their rain gauge each day and made the most of the inclement weather.

Vicky Jordan checks the gauge at CoCoRaHS station CO-LR-4.

The Jordan's washed out road due to the historic September 2013 flood event.

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SNOW SEASON IS HERE, ARE YOU READY?

Do these pictures look familiar? (Pictures by Chris Spears, CO-AR-179)

It's that time of year! If you need to brush up on your snow measuring skills, don't forget to utilize the great training resources on the CoCoRaHS website. There are also some cute animations on the CoCoRaHS YouTube Channel if you are a visual learner. One important reminder now that temperatures are falling below freezing at night is to bring the inner tube and funnel lid to your gauge inside so they don't freeze and crack!

WHAT A DIFFERENCE ONE STORM CAN MAKE!

Check out the huge drought improvement across Colorado during the month of November in the maps below!