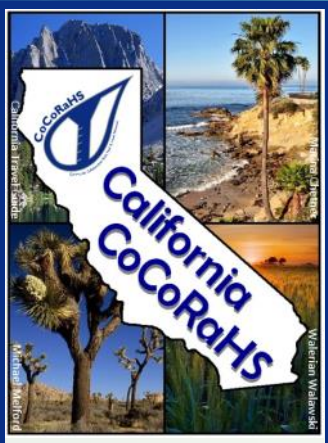


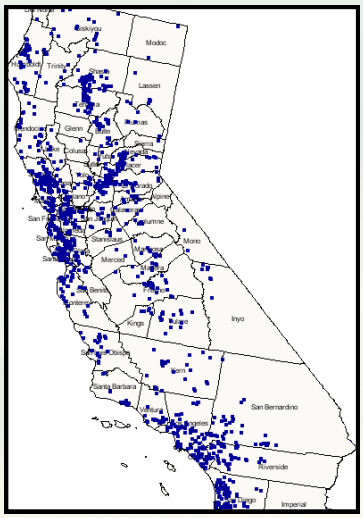
California Cumulonimbus

Fall 2016

Articles in this Edition:

Welcome Message

by Jimmy Taeger



Map of current California CoCoRaHS observers as of November 26th, 2016. *(Source: CoCoRaHS)*

Leaves are turning and days are shorter which means...it's time for another edition of the *California Cumulonimbus*! The *California Cumulonimbus* is a biannual newsletter for California CoCoRaHS observers that is issued twice a year; once in the spring and once in the fall.

This edition contains articles on a dedicated observer, the winter outlook, how to set up your gauge, the need for more observers, the continuing drought, and how to measure snowfall, snow depth and snow water equivalent.

If you're not a CoCoRaHS volunteer yet, it's not too late to join! CoCoRaHS, which stands for Community Collaborative Rain Hail and Snow network is a group of volunteer observers who report precipitation daily. Not only is it fun, but your report gives vital information to organizations and individuals such as the National Weather Service, River Forecast Centers, farmers, and others.

Visit cocorahs.org to sign up, or e-mail Jimmy.Taeger@noaa.gov for additional information.

Enjoy the newsletter!

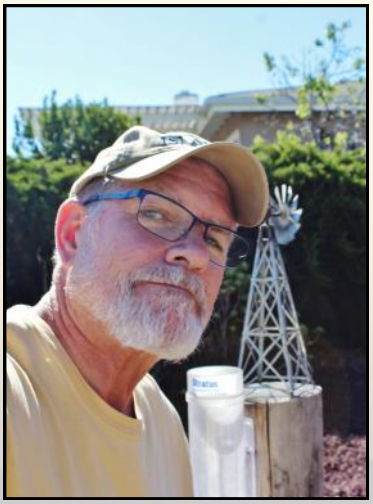
Observer Spotlight: Michael Furman

by Jimmy Taeger

Michael Furman has been observing and reporting precipitation daily for CoCoRaHS for 10 years. He first began taking observations in Rogers County, Oklahoma, and then continued his observations in California when he moved to San Diego County in 2009.

Michael was born and raised in Los Angeles, and experienced his first thunderstorm at the age of 4. He loves thunderstorms and severe weather, and witnessed various types of severe weather while living in Tulsa Oklahoma, but never saw a tornado. He worked for Xerox Corporation, and retired in 2007 after 30 years of service. His other interests are aviation, music and writing. Michael is married, has a daughter, two grandchildren and another on the way.

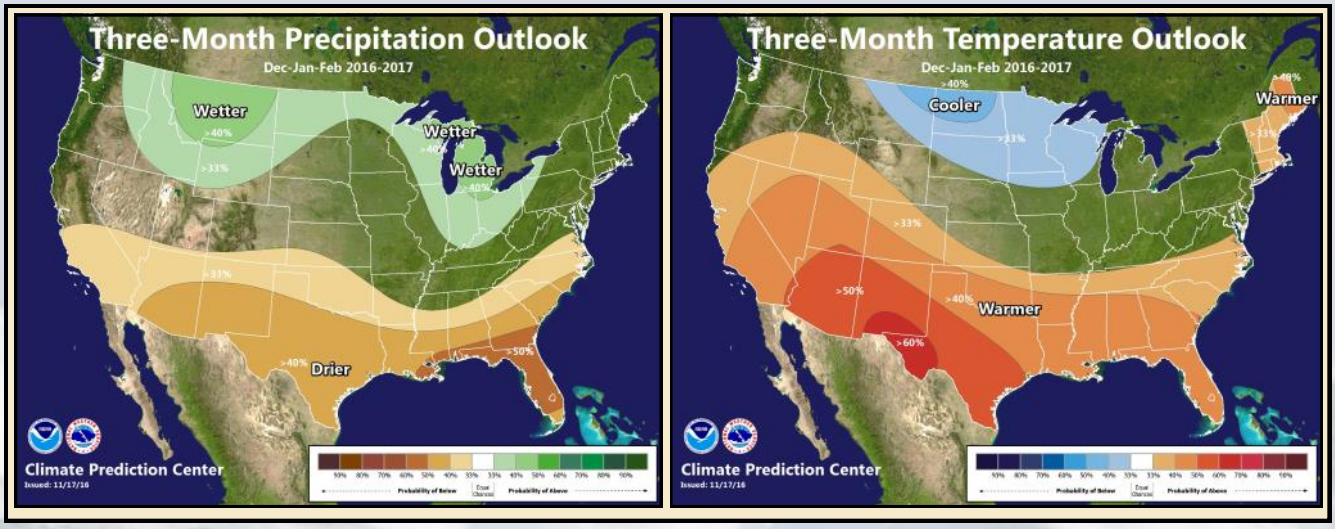
Thanks for your daily dedication to CoCoRaHS, Michael!



Michael next to his rain gauge.

California Winter Outlook

by Alex Tardy



Winter 2016-2017 temperature and precipitation outlook for December through February from the Climate Prediction Center. Most of California is forecast to have greater chances of above normal temperatures and the southern half is forecast to have greater chances of below normal precipitation through the period. (*Source: Climate Prediction Center*)

The National Oceanic Atmospheric Administration Climate Prediction Center (NOAA-CPC) predicts another mild winter in California and near normal to slightly below normal precipitation potential. The state is suffering from a 5-year drought, and precipitation deficits are as high as 3 of the last 5 seasons in part of L.A. and Orange Counties. The entire state is missing 24 inches of precipitation in the past 60 months, and the only period that exceeds this amount of deficit is 1986 to 1991 (-27 inches). For the same period, the average temperature is the warmest (2.8 F above normal) on record for California.

The 2016-17 winter forecast is based on trends of the past several years: the formation of a weak La Niña (cold phase El Niño Southern Oscillation) in the equatorial Pacific Ocean, and the computer model projection (e.g., North American Multi-Member Ensemble) of precipitation and temperature several months in advance. When the La Niña episode is considered, it takes into account the tendency for past similar ENSO seasons, in which slightly below average precipitation occurred across southern California. Weak La Niña years have had a range of impacts and even included major precipitation events. The last statewide heavy precipitation event was December 2010, which was in La Niña oceanic conditions.

California receives a large portion of its annual precipitation from a few atmospheric river events, and these are not predicted beyond a 2 week period. These short durations of significant and sometimes excessive precipitation can result in a significant portion of the annual precipitation. Non-El Niño years have produced many of these major events, or atmospheric rivers, such as February 1986, March 1991, January 1993, January 1997, and December 2010.

1981-2010 Normal Monthly Winter Precipitation (in.)

City	December	January	February
Eureka	8.12	6.50	5.63
Los Angeles	2.33	3.12	3.80
Palm Springs	0.88	1.00	1.03
San Diego	1.53	1.98	2.27
San Francisco	4.03	4.19	4.06
Sacramento	3.25	3.64	3.47
Redding	6.27	5.96	5.51

Normal (30-year average from 1981-2010) precipitation for various cities across California in the winter months. (*Source: National Climatic Data Center (NCDC)*)

Setting Up Your Gauge

by Debbie K. Clarkson

Figure 1) Near a downspout (left) and in an area with animals (right) are not ideal locations to place a rain gauge. (*Source: CoCoRaHS*)

Many of us have questions on setting up and where to put our gauge when new to CoCoRaHS. Sometimes after we put a gauge in one location, we discover something is blocking rain in one direction and it needs to be relocated. Whatever the reason here are some guidelines taken from the CoCoRaHS slide show: "Getting Started".

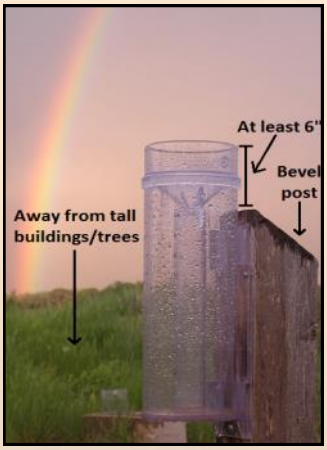


Figure 2) A good example of how and where to set up your gauge. (*Source: CoCoRaHS*)

First of all, very few of us have the ideal location in the middle of a field or large lawn with no trees or buildings nearby. You have to find the best spot for your location. *Figure 1* shows two locations that might not be the best locations to place your gauge. It's also important to find a spot that is easy for you to read and empty the gauge. The location should be an equal distance away from all large buildings, walls, trees and large vegetation as possible. Install your gauge so it sticks up 6 inches above the pole or rail to prevent rain bounce. If on a pole, bevel the top away from the gauge. Use a level to get level gauge as level as possible. This makes it easier to read the gauge. *Figure 2* is a good example of the above recommendations.

Figure 3) An example where a gauge was placed in an urban environment (left) and in a residential environment (right).

The picture on the right in *Figure 3* happens to be my gauge. Is it the ideal location? No; but it is the best location for where I live since the rest of the yard has large trees that would block the rain from entering the gauge.

If you are unsure of the best location for your gauge, you can email your local coordinator or the CoCoRaHS staff including a picture of where you are thinking of along with alternate spots. It helps the staff if you include your latitude and longitude. *The most important thing is report every day even when it is zero day*. Welcome to CoCoRaHS, and thanks for joining us!

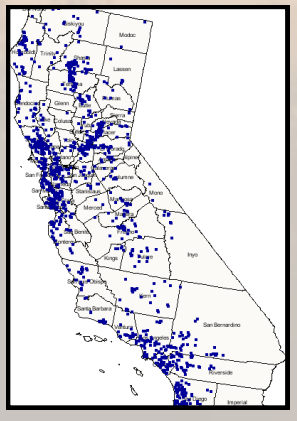
Wanted: CoCoRaHS Observers

by Jimmy Taeger

As California's drought continues, it is vitally important to record any and all precipitation that falls this winter. Knowing how much rain and snow that falls with each event will help state officials, hydrologists, and meteorologists, and many more with important jobs and forecasts.

While some cities in California have a good number of observers, many areas still lack precipitation observations. Areas of the mountains and deserts are especially deficient in observers.

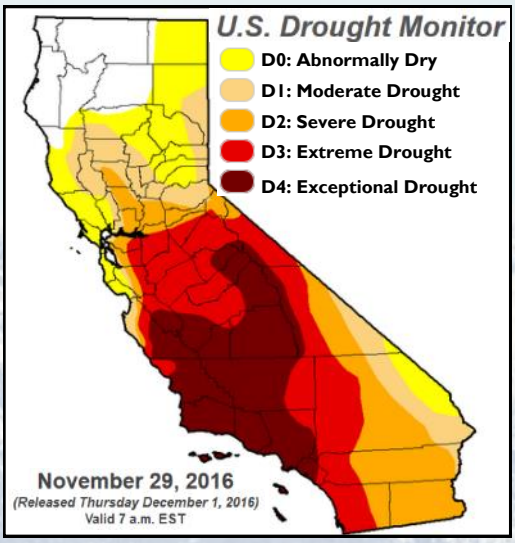
If you know of anyone who may be interested in observing precipitation at home, work or school, please encourage them to sign up for CoCoRaHS, today!



CoCoRaHS observers as of November 26, 2016. (*Source: CoCoRaHS)*

California's Drought Enters 6th Year

by Tina Stall

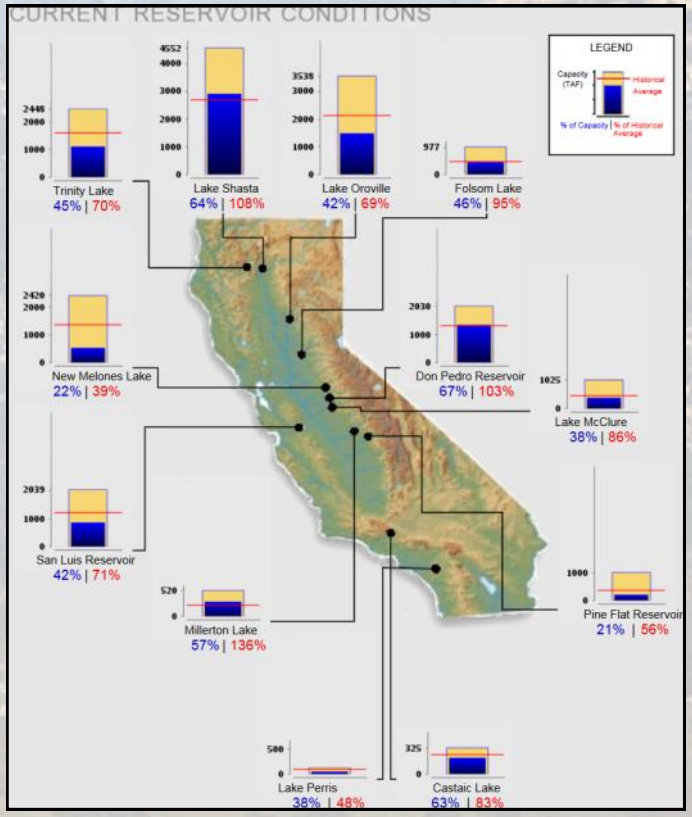


Status of the CA drought as of November 29, 2016 from the U.S. Drought Monitor. Over half of California was still in severe drought. (*Source: U.S. Drought Monitor http://droughtmonitor.unl.edu/)*

As the 2015-2016 water year ends, we stop to take a look at the current state of the drought in California. On September 29, 2016, the Department of Water Resources (DWR) released a new report and announced that California's 2015-16 Water Year will officially close with lower-than-expected rainfall and a "snow drought" as the state's snowpack measured well below average. Water year 2015-16, which ran from October 1, 2015 to September 30, 2016, will be officially categorized as "dry" statewide, continuing California's five-year drought. As of November 29, 2016, 60% of California remains in severe (D2) drought or worse. However, precipitation did ease drought conditions in Northern California, bringing a reduction in abnormally dry (D0) conditions for that area.

Rainfall across the state is rarely uniform and as such, reservoir levels vary considerably with respect to each other. According to the latest chart from the California Department of Water Resources (DWR), the reservoirs are between 20-70% of capacity overall. According to the California state drought report on October 20, 2016, Central Valley reservoirs from Shasta and Trinity in the North to Isabella in the South had a net loss in storage of 130,645 acre-feet (AF), with total gains of 7,374 AF for a total loss of 138,019 AF. While this may seem bleak, several reservoirs are actually near or even slightly above their historical average capacity, including the large Shasta Reservoir in northern California, and as of the latest update on November 17, reservoir levels have remained steady, state-wide. Also, despite the "snow drought," many lakes and reservoirs in the Sierras are at or above their average storage level for this time of year.

Nevertheless, the drought state of emergency, declared by Governor Jerry Brown on January 17, 2014, remains in effect, with California residents reducing water use by 27.1% in the five months since emergency conservation regulations took effect in June 2016. This figure more than meets the governor's 25 percent mandate despite a decline in the statewide water-savings rate for October. Even if rainfall begins to increase, it will still take several years of above-normal precipitation for reservoirs and groundwater aquifers to recover. Therefore, continued water conservation efforts are needed. Visit http://drought.ca.gov for more information on the current state of the drought and tips for how you can help conserve water.



Conditions for major reservoirs in California as of November 30th, 2016. (*Source: CA Dept. of Water Resources http://cdec.water.ca.gov/cgiprogs/products/rescond.pdf)*

"Water year 2015-16...will be officially categorized as "dry" statewide, continuing California's five-year drought."

How To Measure Snowfall, Snow Depth and Snow Water Equivalent

by James Brotherton

With winter right around the corner, it is a great time for some reminders about the best snow measuring guidelines for CoCoRaHS Observers!

Accurate snow observations are some of the most important that CoCoRaHS observers can take. One big reason for that is that automated sensors, except for the most sophisticated (and expensive!), do a poor job of reporting and measuring snowfall and snow depth. In addition, snow observations are extremely important to integrate into National Weather Service's national observational network for purposes of accurate forecasts and warnings, community preparedness and response, climatology, and climate forecasting. Finally, winter recreational activities that depend on snow generate tens of billions of dollars of revenue and melting western-mountain snowpack provide beneficial moisture for human and agricultural consumption during the summer.

Be sure to take out the inner tube before the snow starts. (*Source: CoCoRaHS)*

This is a "quick and dirty" summary of the key elements to getting accurate snow measurements. For more details, and a wonderful video by Climatologist Nolan Doesken, please visit http://www.cocorahs.org/media/video/measuringsnow/default.aspx

Important Tips

Equipment:
You will utilize your existing 4 inch rain gage that you use to measure rain during the warm season. You must remove the inner cylinder and funnel so that an accurate snow/water content can be achieved (please do not simply use the 10:1 ratio as it is typically not very accurate!), also to reduce the risk of clogging and the inner tube cracking due to cold weather. Have a good yardstick ready, ideally one that measures to the tenth of an inch. Although not required, a snow board, painted white, is a good idea to get a flat and level location to measure the snow, well away from your house. Warm water may also be necessary; we'll get to that in just a bit.

Place your snow board away from large buildings and trees, and mark the location so it's easy to find after a storm. (*Source: CoCoRaHS)*

Measuring snow/water content (to the one-hundredth of an inch):
The simplest way to measure snow/water content is to first measure the snow collected in your 4 inch gage, and any snow that sticks to the rim of the top of the gage, and then carry your gage into the house. Let the gage sit in your warm house until all of the snow melts. Now measure the liquid water content. The ratio of the snow and liquid measurements is your snow/water content. If you are in a hurry, some people have been able to melt the snow creatively in their microwave, although this could be dangerous and is not really recommended. Another option is to add a known amount of warm water to the gage, and then take a measurement once the snow has completely melted. Just don't forget to subtract the added warm water!

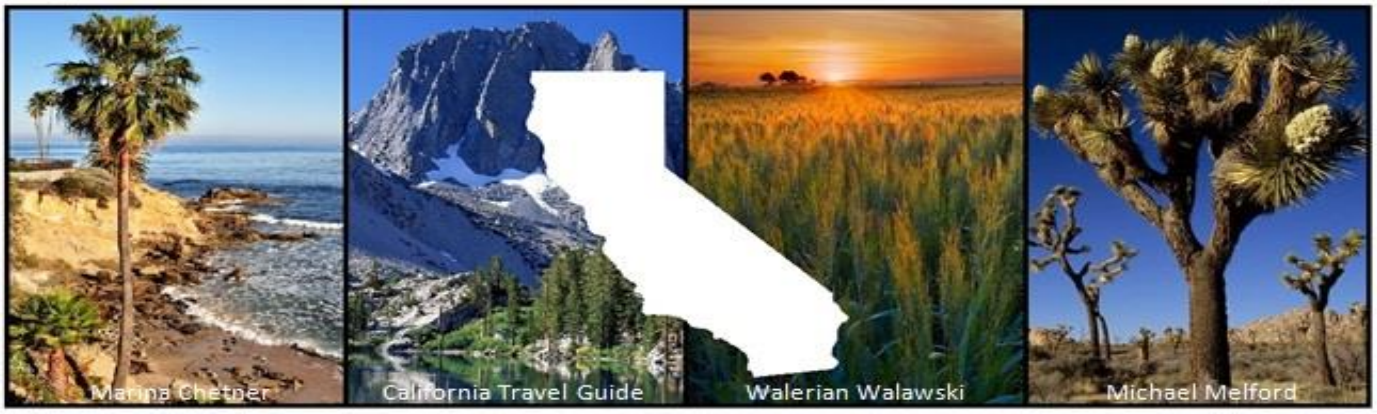
Measurement of New Snow (to the tenth of an inch):
New snowfall measurements ideally will include only the total new snowfall. To do this, you may have to take several intermediate observations before settling and melting occurs. Measuring new snow accumulation is easy when the snow falls without wind and isn't melting on the ground. But when the wind blows, measuring snow becomes a real challenge. The best way to get an accurate measurement when dealing with drifting snow is to take several measurements from a variety of locations and average them to get a representative measure. Also, be very careful with measuring snow on grassy surfaces, as you want to get the measurement of snow on top of the blades of grass, not necessarily all the way to the ground.

Measurement of Snow Depth (to the nearest half-inch):
Snow depth is typically measured once a day, at your normal observation time (typically around 7 am). Snow depth may include new accumulations and periods of settling and melting from the previous day, therefore it is typically less than the total snowfall from a snowstorm. This measurement may also include old snow that remains on the ground. It may be necessary to take several measurements to get a good average of the snow depth!

The National Weather Service wants to thank all of our CoCoRaHS Observers in advance of the winter season for all of their hard work and dedication! Obtaining accurate snow measurements can be more time consuming, but it is extremely important and invaluable! Have a great holiday season!

Measuring at eye-level will give you the most accurate reading. (*Source: CoCoRaHS)*

California CoCoRaHS



California Cumulonimbus

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What is CoCoRaHS?

CoCoRaHS, which stands for Community Collaborative Rain Hail and Snow Network, is a non-profit group of volunteer precipitation observers. Anyone can join, and it's easy to report the information. All you need is a 4 inch rain gauge, the internet, and a few minutes each day. The website is easy to navigate and has different instructional materials for anyone to learn how to record an observation.

The site also has daily maps of observer's reports showing where precipitation fell the day before. It's fun to compare the different amounts of precipitation that can fall in an area from just one storm. Not only is the information interesting to look at, it is very valuable for organizations such as the National Weather Service, hydrologists, farmers and many others.

Visit cocorahs.org to sign up, or e-mail Jimmy.Taeger@noaa.gov for questions. Join CoCoRaHS, today!

Rain gauge required for the program.

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cocorahs.org | California CoCoRaHS State Webpage | California CoCoRaHS | weather.gov