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California Cumulonimbus

Spring 2016

Welcome Message by Jimmy Taeger



Map of California divided up into different CoCoRaHS regions. Each region has one or more coordinators. (Source: CoCoRaHS)

howers are in bloom and the days are getting longer 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 winter precipitation in Bay area, a spring drought update, an observer spotlight, record-tying hail observed, the summer climate outlook and a description of this past El Niño.

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: Erich Horn

by Jimmy Taeger

Erich Horn has had a passion for weather throughout most of his life. He was born in Cincinnati, OH, and raised in Folsom, CA. After graduating high school, he began his 20-year career with the United States Air Force in the weather sector. Next, he continued on as a civilian Meteorologist Technician with the Air Force for 19 years. Now semi-retired, Erich works part-time as a contract weather observer at Ontario International Airport.

Erich has been an active CoCo-RaHS observer and a volunteer weather spotter for the NWS since 2008. He's a member of the Air Weather Association, American Meteorological Society, and the National Weather Association. What has fascinated Erich the most about weather throughout the years is it's changeability, and it's humbling effects when people think they have mastered it.

When not playing weatherman, he enjoys spending time with his loving wife of over 40 years, spending time with his kids and friends, and being outdoors tending to his yard or playing with their dog.

Thanks for your daily dedication to CoCoRaHS, Erich!



Erich standing next to his rain gauge.

Spring Drought Update

by James Brotherton

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VV ith the start of May, the rainy season is coming to an end across California. While May can still see some precipitation, on average, most locations, especially for southern and central portions of the state, do not typically see a whole lot of additional precipitation activity. With this in mind, it's a great time to take a look at the drought status and summary of the wet season.



FIGURE 1) Drought status over California as of May 10, 2016. The darker colors correspond to greater areas of drought. (*Source: The National Drought Mitigation Center*)

As the wet season comes to an end, we are able to analyze the long-tern drought situation which will set the stage for the coming summer season. With improved reservoir levels and streamflows in central and northern portions of the state, the latest U.S. Drought Monitor (Fig. 1) includes some improvement in the drought status compared to earlier this year. The main areas of improvement are over portions of the northern two-thirds of the Central Valley, and the western portion of the Northern Sierra Nevada foothills and mountains. Recent improvements in some areas have gone from D4 (exceptional drought) to D3 (extreme drought) and from D3 to D2 (severe drought).

Southern California has seen very little improvement in the ongoing drought. This is primarily due to continued below normal precipitation on a regional scale. Please see the precipitation comparison to normal graphic (Fig. 2) for the current water year that really demonstrates the multi-year drought across the state. These images are courtesy of the Western Regional Climate Center.

Central and Northern California snowpack is the largest since 2010. This will help to further replenish storage during the snowmelt season. Depending on the potential for heat waves and persistent abovenormal temperatures, this can act to abnormally speed up the snowmelt process potentially creating snowmelt flooding and excess runoff. Of course, runoff doesn't do much for water storage in California in the short-term, but it can help to gradually improve our long-term groundwater. Historically during times of prolonged drought, usage of groundwater in California can more than double, and that has been the case during this current prolonged drought.

Drought restrictions and conservation efforts are ongoing across the state, with varying degrees of participation and variance in local regulation and enforcement. Recent media reports suggest that some municipalities are considering lifting some of those efforts. According to Cindy Matthews, Senior Service Hydrologist at NWS Weather Forecast Office, Sacramento, "D4 classification is reserved for events that are in the top two percentiles of worst drought conditions. This year's precipitation and snowpack definitely did not fit into that category, and have helped improve water/drought conditions locally. Despite continuing to have drought impacts, we are no longer in the worst 2 percentile on record category. Also, remember that the D3 (Extreme Drought) Category still indicates bad drought conditions. In fact, it is an indicator of conditions in the worst three to five percentiles on record."

For your reference, the classification scheme of the U.S. Drought Monitor au-

thors use to help assign categories can be found here: http://droughtmonitor.unl.edu/AboutUs/ ClassificationScheme.aspx

If you would like to compare the latest drought depiction with previous time periods, please see the following link: <u>http://droughtmonitor.unl.edu/</u> MapsAndData/ComparisonSlider.aspx

Looking ahead as we enter the California dry season, little in the way of additional precipitation is expected to occur as the strong El Niño wanes. Therefore, the long range outlook indicates that the long-term drought is likely to persist in locations that are already experiencing drought conditions. For more details on the drought outlook, please see the latest drought outlook assessment from the NOAA - Climate Prediction Center, here: http://www.cpc.ncep.noaa.gov/products/ expert_assessment/sdo_summary.php



FIGURE 2) Percent of average precipitation for the 2015/2016 water year at of May 13, 2016. Portions of northern and central CA recorded near to or above average precipitation, while most of southern CA recorded below average precipitation. (Source: http:// www.wrcc.dri.edu/anom/cal_anom.html)

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Storm Produces Record-Tying Hail Stones

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he largest hailstones seen in California since 1960 fell in western Tehama County this year with a strong thunderstorm on January 23rd. There were a number of very unusual large, starfish shaped hailstones reported with this event. The largest hailstones were 3 inches in diameter, measured across the spikes. Communication with the Storm Prediction Center (SPC) in Norman, Oklahoma confirmed record-tying hail for the State of California. This record was previously set in southeast San Diego County on September 2, 1960.

In addition to the large hailstones, there were large quantities of small hail with this storm. This caused travel difficulties on area roads around Corning. Stretches of Interstate 5 had so much hail that snow plows were required to clear them. Also, minor flooding was reported due to storm drains being clogged by hail.



This fies the California record of largest hailstone set back in 1960 in Southeast San Diego County

California Summer Climate Outlook by Dan Gregoria



Summer (Jun-Aug) temperature probability outlook. California has a higher than normal probability of above normal temperatures this summer. (*Source: CPC*)

A fter last year's hot summer, many are left wondering what this summer will bring! The most likely scenario is for temperatures to run warmer than average across California. In fact, above average temperatures are forecast throughout the contiguous U.S., according to the Climate Prediction Center.

One potential contributing factor locally to a warmer-than-average summer is the continued above normal ocean temperatures off the California coast. Warmer water nearby leads to especially warmer nighttime temperatures compared to average.

So what about rainfall prospects this upcoming summer? Typically, summer rains come in the form of thunderstorms over the mountains and deserts when monsoonal moisture arrives in from the southeast. Rain is rare along the coast and in the valleys. There is no current indication that it will be drier or wetter than average this summer.

Here is a look at summertime average High and Low temperatures (°F) along with average rainfall (in.) for selected sites across the state:

LOCATION	JUNE	JULY	AUGUST
Downtown L.A.	78 / 69	83 / 73	84 / 74
	0.09	0.01	0.04
San Francisco	71 / 62	72 / 64	73 / 65
	0.11	0.00	0.04
Redding	90 / 76	98 / 82	97 / 80
	0.69	0.09	0.18
Palm Springs	102 / 71	107 / 77	106 / 78
	0.06	0.25	0.34
South Lake Tahoe	73 / 55	81 / 61	80 / 60
	0.59	0.43	0.45

Winter Precipitation in Northern California by Debbie Clarkson

As fall turned to winter, we anxiously waited to see if El Niño would bring us much needed rain in any part of California. How would it compare to the last strong El Niño of 1997/1998? I have been collecting rain data at my location in Sonoma County for 15 years before I started reporting as CA-SN-1 in Oct. 2008, and this is how the past two El Niños compared month to month. October: 0.05" in 2015 lost to 1.49" in 1997. November: 1.07" in 2015 lost to 9.65" in 1997. Then in December it finally started to rain more with 6.22" in 2015 v. 1997's 3.66". The rain continued in January with 9.11" in 2016, however it was still less than the 11.83" in 1998.

Then came February! Where was the rain? This past February I ended up with only 1.16" rain compared to 22.37" of rain in 1998 when rained 21 out of 28 days. It also rained every day from the 10th to the 23rd with 3.45" on February 19th, 1998 alone. This much rain on top of almost 12" in January 1998 led to some major flooding. Many locations in Sonoma County received much higher amounts of rain than I did in 1998. Sometimes in El Niño Years we are saved by a Miracle March. So as February came to a close we held our breaths and waited. Low and behold it started raining on March 2nd and continued every day through the 14th, with some additional rain starting again on the 20th. Unlike 1998 and even though it rained for 12 days straight, we had light rain days as breaks in between heavier rain days so our area did not have major flooding. It also helped that February was drier so the rain was not falling on saturated soil. Figure 1 is near the beginning of the Laguna de Santa Rosa Foundation on March 11th and the near same area in April.



FIGURE 1) Flooding near the Laguna de Santa Rosa Foundation (left) on March 11th, and that same area dry by April (right). (Source: Debbie Clarkson)

Areas farther north received more rain than us in February and also in March. Unfortunately, areas in southern part of state didn't get a big Miracle March. Even though the Russian River went above flood stage for a few days, there was no major flooding like in 1998. I ended with 9.75" in March 2016, compared to 3.89" in March 1998. Our ever famous gauge at Venado ended up with 23.41" of rain in March 2016. It is in the hills between Guerneville and Healdsburg, with creeks directly feeding into the Russian River and Dry Creek then into the river.

Finally, Figure 2 is Hinebaugh Creek and the Redwood Drive Bridge near Costco in March and April. I hope this comparison of the different El Nino's rainfall get you thinking about comparisons in your area. My last comparison is for total rainfall since October 1st thru April 27th. For 2016 it is 30.37" but 1998 still wins with 56.33" due to the different Februarys. Even though my location has observed 30.37" we are still below average and after a four year drought. Continued water conservation remains extremely important.



FIGURE 2) Hinebaugh Creek and the Redwood Drive Bridge in March (left), and that same area dry by April (right). (Source: Debbie Clarkson)

"Even though my location has observed 30.37" we are still below average and after a four year drought. Continued water conservation remains extremely important."



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El Niño 2015/2016: The Uncharacteristic Beast by James Thomas

hat happened to El Niño? Where are the storms? These questions have been rather common over the last couple of months. The term El Niño simply refers to the sea surface temperature deviation from normal in the Eastern Equatorial Pacific. Interestingly enough, the El Niño Southern Oscillation forecast issued by the Climate Prediction Center (CPC) verified with great accuracy. In Niño region 3.4, the sea surface temperature deviation soared to well above 2.0 degrees Celsius this past winter. By definition, this categorizes a strong El Niño event. It is difficult to pinpoint exactly why California was not deluged with flooding rain. However, there were a few atmospheric and oceanic differences to note. For example, a warm blob of water existed west of the North American Coastline, as well as enhanced convection over the Central equatorial Pacific waters.

The Pacific jet stream passed much further north when compared to past strong El Niño events (figure below). This synoptic weather pattern directed the storms into Central and Northern California, as well as the Pacific Northwest. In the north central Pacific, strong surface winds associated with a powerful zonal jet stream created large swells and monster waves on the beaches of Hawaii and California this winter. This is often the case during strong El Niño episodes.

The portions of the northern half of California were able to accumulate roughly 100%-130% of it's annual rainfall. On the flip side, southern California was left high and dry, receiving a disappointing 25%-70% of it's annual rainfall. During a typical strong El Niño winter, the Pacific jet dips south and southern California receives the bulk of the precipitation.

Unfortunately, no precipitation relief is in sight. La Niña conditions often follow strong El Niño episodes, and will be the likely trend through the winter of 2016. Sea surface temperature anomalies in region 3.4 have dipped below the -0.5 Celsius during the subsequent strong El Niño winters of 1982-1983 and 1997-1998. In addition, a typical La Niña pattern brings a more sporadic and weaker Pacific jet stream, which would promote the ongoing long term drought in California.

Jet Stream winds December 1 to March 31



A visual depiction of the average placement of the jet stream from the last three strong El Niño events. Many storms took a more northerly track this past El Niño winter, keeping areas of southern and central California drier than normal. (Source: Alex Tardy)

California CoCoRaHS



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SPRING 2016 CALIFORNIA CUMULONIMBUS CONTRIBUTORS

- James Brotherton: Author
 - Lead Forecaster NWS San Diego
- Debbie K. Clarkson, Sonoma County Coordinator: Author
- Dan Gregoria: Author

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- Lead Forecaster NWS San Diego
- Eric Kurth, California Regional Coordinator Northern Interior Region: Author General Forecaster - NWS Sacramento
- Jimmy Taeger, California State Co-Coordinator: Editor, Template Designer and Author General Forecaster - NWS San Diego
- James Thomas: Author Meteorologist - NWS San Diego

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!









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