# Coast to Cactus Weather Examiner

National Weather Service - San Diego

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## Odds and Year Ends by Miguel Miller

Inside this issue:



### December 17 Snowstorm

A snowstorm of a magnitude that hasn't occurred since 1979 descended on the mountains and high deserts of Southern California during the middle of December 2008. The Polar Jet Stream shifted south, and opened the door to cold fronts moving out of the Gulf of Alaska. A pair of storms pounded the region between the 14th and the 18th with heavy rain and snow. The result was some very impressive snow totals including 54 inches at Big Bear, almost 36 inches at Wrightwood, 20 inches at Pinon Hills, and 16 inches at Hesperia, Idyllwild and Julian. Our records indicate nothing has happened quite like this in 29 years.

### Hawaiian Warmth in January?

This past January 13th, the minimum temperature at Santa Ana of 73° not only set a record high minimum temperature for the date and month, but also for the entire winter season. Incredibly, the minimum is tied for the 23rd highest minimum temperature on record (and this was in January!). Persistent Santa Ana winds and strong high pressure were the causes.

20 inches of snow in the desert? Yes! In Pinon Hills on December 17, 2008. Photo courtesy Phil Barone.

### 2008

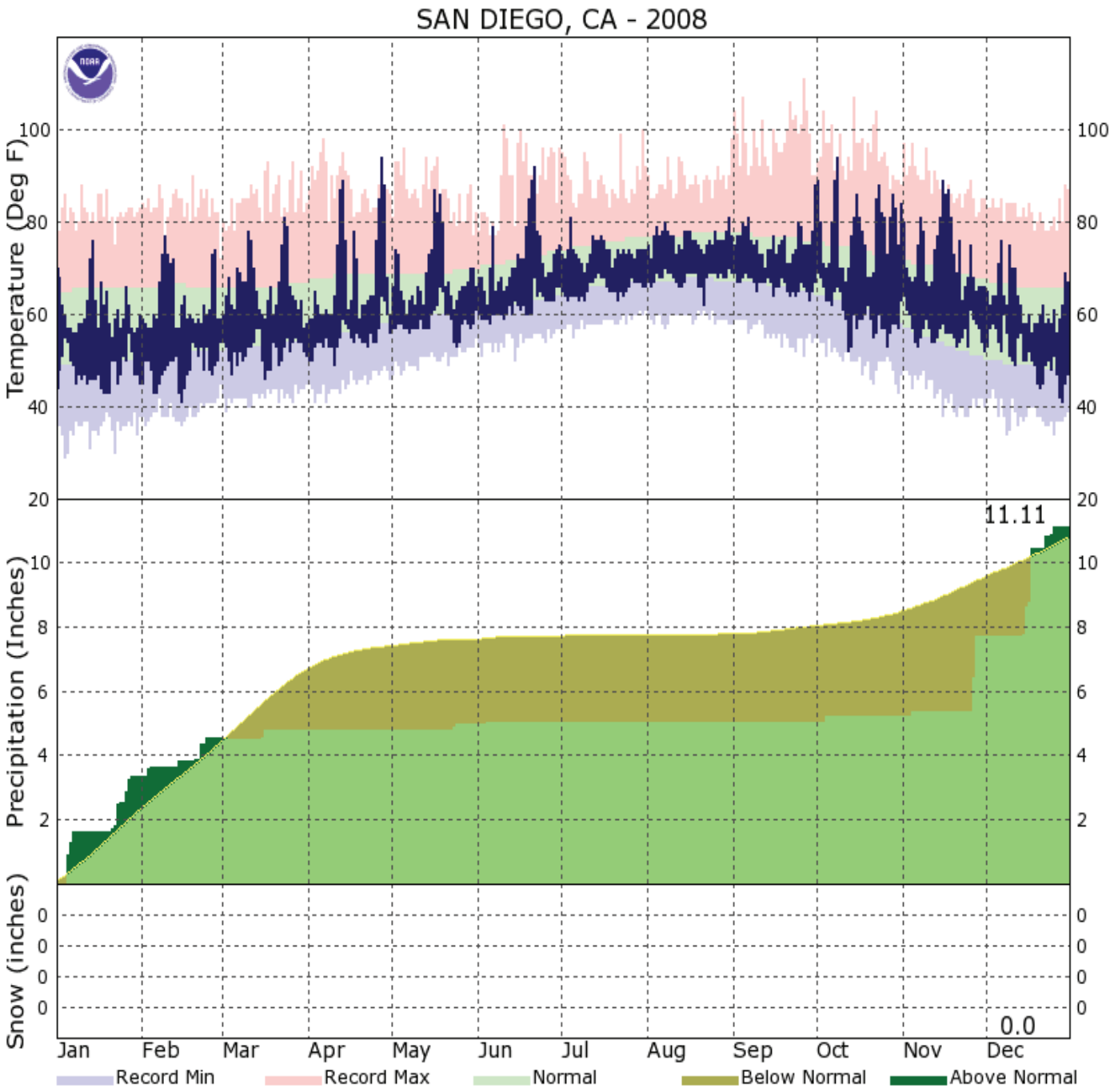
2008 will be remembered for its flip flopping nature between cold and warm periods. The year began and ended rather wet, with an exceptionally long dry period in between.

Overall the average annual temperature for the year at San Diego was 63.7 degrees, 0.7 degrees below the normal of 64.4. That is about as close to a normal

## Odds and Year Ends—continued

year as we can get, and is also misleading, because we all know 2008 was either much warmer for a few days at a time or just a little cooler than normal for long stretches.

Interestingly, the annual precipitation at San Diego during the calendar year 2008 was 11.11 inches, a little above the *seasonal* normal of 10.77 inches. But since we compute seasonal normal from July 1 to June 30, the seasonal rainfall ended up on June 30 below normal at 7.25 inches (only two-thirds of normal). Thanks to a wet November and December, San Diego was back up to about 6 inches, 200% of normal, at the end of 2008, halfway through the 2008-09 season. But once again, a long dry period this January 2009 has brought us back down close to normal. The following graph illustrates these trends.



## Odds and Year Ends—continued

**What are the Odds?**


There is a great, inherent uncertainty in weather forecasting in general, but in forecasting precipitation in particular. The idea to use probabilities for whether it was going to rain or not began with the National Weather Service in 1965. The original concept was to provide a risk-benefit assessment for people to whom the occurrence of rain was critical. For example, a contractor might decide to pour concrete if the chance of rain is only 30 percent, but might decide not to pour if it's 60 percent.

***PoPs express the likelihood of measurable precipitation during a specific period of time for a forecast point.***

**Probability of Precipitation (PoP)** is the likelihood (expressed as a percent) of measurable liquid precipitation (or the water equivalent of frozen precipitation) during a specified period of time for any forecast point. **Measurable precipitation is defined as at least 0.01 inch.** PoPs accompany **expressions of uncertainty** or **areal qualifiers** within the forecast narrative. For example, a slight chance of rain (20%) is an expression of uncertainty that means at least one location in a zone should receive measurable precipitation 2 out of 10 times (20%) given a similar weather situation. Or, to state the converse, rain is NOT expected 8 out of 10 times. The expression of uncertainty has nothing to do with the rain amount, duration, or the percentage of the area that will get rain. When there are showers already in the area, but with incomplete coverage of the area, we express pop as an areal qualifier. The probability then refers to the amount of the area in the forecast that will receive measurable rain. For example, "scattered showers" means that 30 to 50 percent of the forecast area gets hit by at least one shower producing at least 0.01 inch. The table below illustrates these two descriptive methods and their relationship to PoPs.

| PoP Percent | Expression of Uncertainty | Equivalent Area Qualifiers |
|---|---|---|
| 10-20 percent | slight chance | isolated |
| 30-40-50 percent | chance | scattered |
| 60-70 percent | likely | numerous (or none used) |
| 80-90-100 percent | (none used) | (none used) |

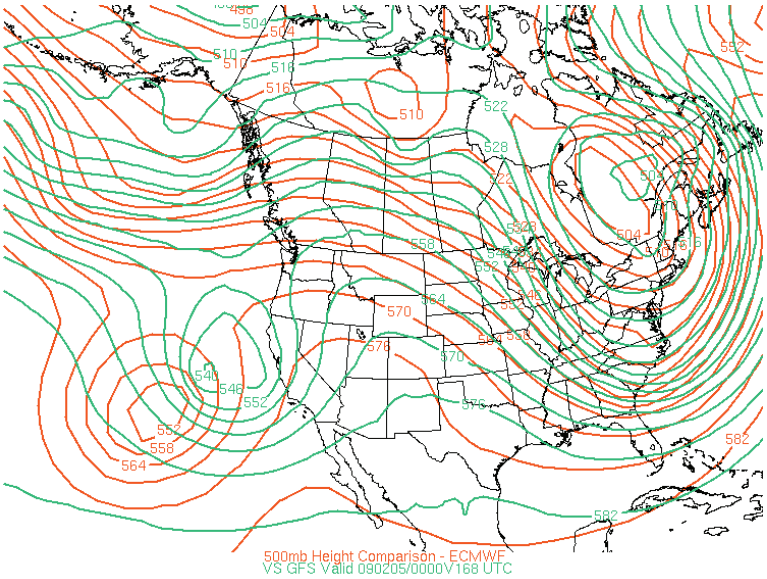
**The Models**

One of the main reasons for all this uncertainty is the variability of weather forecast models. Because of the inherent complexity and unpredictability of the atmosphere, it is expected that even our best science and computer power cannot provide consistently accurate forecasts. This has been painfully apparent during our current wet season in Southern California. We use several forecast models to forecast, but to illustrate model disagreement, let's look at the two

The European Centre's Computer Facility

## Odds and Year Ends—continued

main models we use for the 4-7 day period. The Global Forecast System (GFS) model from the NWS' modeling branch at the National Centers for Environmental Prediction (NCEP) located in Maryland, and the European Centre for Medium-Range Weather Forecasts (ECMWF) model ("the Euro" for short), located in the United Kingdom.




In recent months the Euro has clearly been both the more *consistent* model, and the more *accurate* model. Consistency means the model solutions do not vary as wildly from one model run to the next. For example, in the picture at right, the 00z run of the GFS model solution (in green) shows a storm arriving in Southern California one week away, while the Euro model solution (in orange) shows the storm remaining offshore. A consistent model would show something very similar with the subsequent 12z model run. An inconsistent model would show a very different picture. An accurate model obviously is one that forecasts a feature that actually verifies close to the timing and strength that was predicted, for example, whether that storm one week away actually occurs or not.

***Recently, the Euro has clearly been the more consistent model, and also the more accurate model.***

Why the Euro is beating the GFS is a matter of current ongoing research, but one clue is the way the model starts its journey into the future, or its initialization. The Euro model is better initialized than is the GFS model. A model must have a clear and accurate snapshot of the current global weather conditions to begin with. Similar to the way a golf club meets the golf ball, the angle and speed of the club face has everything to do with where the ball ends up. So it is with medium range models like the GFS and Euro, the better the initialization, that starting point, the better chance we have of producing an accurate forecast.

# Quarterly Summary

## October

The first week of October brought the first widespread rain of the season as a vigorous low pressure trough swept through the region. Otherwise, high pressure and weak offshore flow kept it quite warm and dry well into the second week. Another, stronger and colder upper-level trough enveloped the western states by the 12th. No rain fell across southern California, but it did bring our first true Santa Ana wind event of the season on the 13th and 14th, with more

**San Diego - Lindbergh Field Data - October**

| | Max | Min | Avg | Rain |
|---|---|---|---|---|
| Actual | 78.1 | 59.9 | 69.0 | 0.18 |
| Normal | 74.0 | 61.2 | 67.6 | 0.44 |
| Anomaly | 4.1 | -1.3 | 1.4 | -0.26 |
| % of normal | | | | 41 |
| Max | 94 | 69 | | 0.18 |
| Min | 67 | 52 | | |

## Quarterly Summary—continued

dry and warm weather through mid-month. A series of weak upper-level troughs brought cooling through the 20th. Then, high pressure aloft and weak offshore flow brought a return of very dry conditions with warm to hot days until Halloween, when a weak upper-level trough brought some cooling and limited moisture from the south. For the month, most sites had little rain. Except for a few spots on the coast, including Lindbergh Field, all reported less than 25% of normal, and most were less than ten percent.

Temperatures were generally between two and four degrees above normal.

## November

November started out quite warm, but quickly cooled as an active northwest flow pattern brought onshore flow and two light rain events to extreme southwestern California during the first ten days of the month. By mid month, a broad area of high pressure aloft was moving over California from the east Pacific setting up an extended period of warm and dry weather with offshore flow. Santa Ana winds brought hot and windy weather which set off fire storms on the 14th scorching thousands of acres and damaging or destroying hundreds of homes and businesses, including more than 30,000 acres in the Freeway Complex Fire around Yorba Linda. Many record high temperatures were tied or broken between the 14th and the 18th. High pressure weakened after the 19th allowing some cooling and opening the door for a storms. A cut-off low pressure area moved slowly east over southern California bringing periods of rain and showers beginning late on the 24th and ending on the 27th. Even a few isolated thunderstorms were observed. This was the first widespread moderate rain event of the season. Rainfall ranged from one to three inches from the mountains west, between one-half and one-and-one-half inch in the high deserts, and around one-half inch in the southern deserts. The storm system greatly reduced the wildfire danger. By the end of the month, most sites sampled were close to, or had exceeded 100% of normal November rainfall, with the exception of the mountains in Riverside County where Idyllwild reported less than 50%. Very warm to hot conditions during the middle of the month pushed the average monthly temperatures to between 3 and 5 degrees above the 30 year normals.

**San Diego - Lindbergh Field Data - November**

| | Max | Min | Avg | Rain |
|---|---|---|---|---|
| Actual | 72.8 | 56.4 | 64.6 | 2.49 |
| Normal | 69.9 | 53.6 | 61.8 | 1.07 |
| Anomaly | 2.9 | 2.8 | 2.8 | 1.42 |
| % of normal | | | | 233 |
| Max | 89 | 64 | | 1.26 |
| Min | 63 | 52 | | |

The Freeway Complex Fire burned more than 30,000 acres and destroyed or damaged more than 300 homes and businesses. Photo courtesy Rob Balfour.

## Quarterly Summary—continued

### December

| San Diego - Lindbergh Field Data - December | | | | |
|---|---|---|---|---|
| | Max | Min | Avg | Rain |
| Actual | 62.9 | 50.3 | 56.6 | 3.38 |
| Normal | 66.3 | 48.9 | 57.6 | 1.31 |
| Anomaly | -3.4 | 1.4 | -1.0 | 2.07 |
| % of normal | | | | 258 |
| Max | 76 | 60 | | 1.60 |
| Min | 56 | 41 | | |

High pressure over the east Pacific and low pressure over the continent brought a dry, northwest flow over southern California for the first ten days of the month. The strong upper-level high finally moved east by mid month, allowing the Polar Jet to shift south, exposing all of California to cold storms moving out of the North Pacific. From December 13th to the 17th, a strong cold front, and a vigorous, cold low pressure center, brought periods of heavy rain and snow to much of southern California. Precipitation totals from late on the 13th through early on the 18th were between two and one-half and six inches. Urban and small stream flooding was widespread, along with a few minor debris flows. One moderate debris flow was documented on the morning of the 15th in the Santiago Burn in Orange County. The storm on the 16th was notable in that it brought heavy rain to the lower deserts, and one to two feet of snow to the mountains and the high desert areas. It was cold enough for all snow in the higher mountain areas for both storms. Snow totals were 54 inches (4.5 feet!) at Big Bear, almost 36 inches at Wrightwood, 20 inches at Pinon Hills, and 16 inches at Hesperia, Idyllwild and Julian. This series of storms was followed by several weaker systems between the 22nd and the 26th. On the 22nd and the 23rd, a weak cold front brought light to locally moderate precipitation across the area. Amounts were mostly under one-half inch, except in the San Diego County mountains where amounts were slightly greater. Palomar Mountain reported the most with 1.3 inches total. Another pair of systems brought rain and mountain snow over Christmas. High pressure rebuilt over the area with some drying during the last few days of the month. The generous rains helped to ease short-term drought conditions considerably. By the end of the month, all sites exceeded 100% of normal, and many sites sampled were between 200% and 400% of normal. Seasonal totals for most sites now exceeded 100% after some dryness early in the season.

With Mt. San Jacinto in the distance, residents of Corona Horsethief Canyon awoke on December 18th to a winter wonderland. Photo courtesy Tom Halderman.

After a mild start, the month turned cold due to an active storm pattern. Average monthly temperatures ranged between 1 and 3 degrees below the 30 year normals.

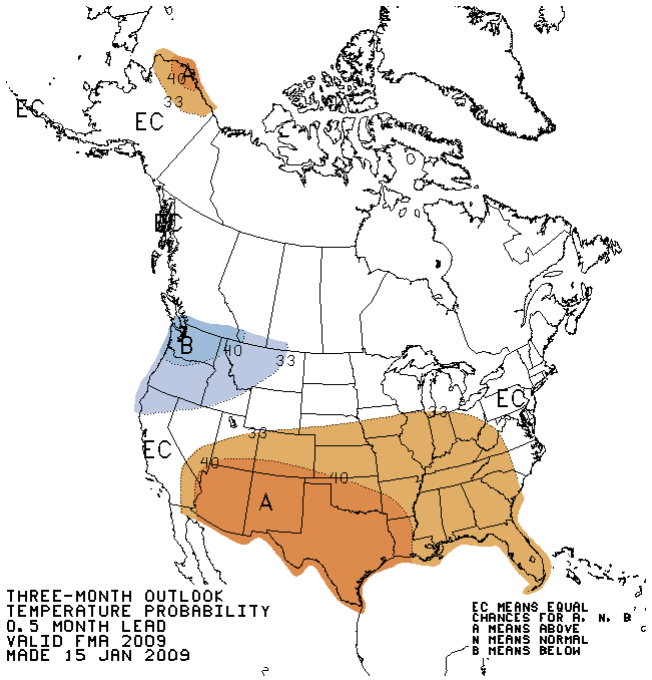
## Late Winter and Early Spring Outlook

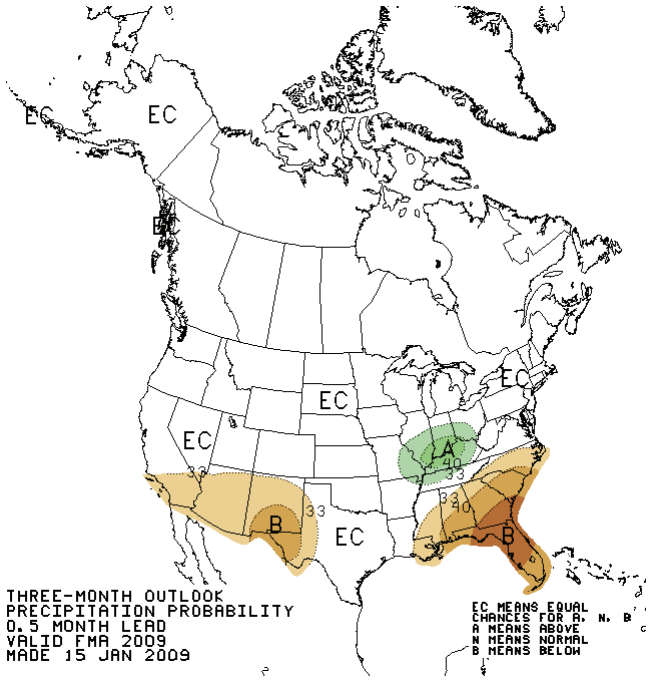
The persistent upper ridge over the west coast should begin to break down and lose its dominance during February. ENSO-neutral conditions (i.e., no El Niño nor La Niña) which had continued between mid-November and mid-December 2008 suddenly turned into modest La Niña conditions in late December. Sea surface temperatures along the equator are now more than 1 degree C below

## Late Winter and Early Spring Outlook—continued

normal throughout most of the eastern Pacific Ocean. These weak La Niña conditions remain in place as of late January, but neutral conditions could return as early as April.

The three month outlook from February through April calls for above normal temperatures across the south and central U.S. and below normal temperatures in the Northwest. Precipitation is expected to run below normal across much of the southwest and southeast, with above normal conditions in the Ohio River Valley.




While NWS San Diego forecasters are not climate outlook experts nor researchers, there is some conjecture about the rainfall for the rest of the winter. Looking back at years where there was a dry spring, it was very often followed by a wet fall. 2008 bore out this theory, with the extremely dry spring in February and March followed by the wet fall of November and December. Extrapolating that theory, when we get a wet fall, where November and December totaled more that five inches of rainfall, January and February often ended up dry, but then were followed by a very wet March. That seems to be the pattern we are in, and only time will tell if we get that wet March.

## Staff Injections

The NWS office in San Diego has been notorious for its relative lack of staff turnover, but in the past year there have been a few changes that amount to the most staff turnover in a decade.

In January of 2008, Stefanie Sullivan joined the office as a Meteorologist Intern. The Simi Valley native earned her Masters degree in atmospheric science from UCLA in December 2007. For most of her first year she has served in the public service unit, and has answered more than her share of the calls from the public and partners in emergency management and media. She has also begun forecasting at the aviation and marine desk. Her incredible technical skills have produced those handsome weather maps available on our web page. She is also responsible for the RTP product enhancement and is currently

## Staff Injections—continued

training to be an Incident Meteorologist (IMET) to provide on-site weather support for wildfires or other incidents.

During the summer, Mike Lavis, forecaster and Fire Weather specialist, left the NWS and the forecaster vacancy was filled by Philip Gonsalves in December. Phil had been an intern here in San Diego for many years and he has provided valuable support in the areas of the weather radio and the upper air (weather balloon) program. Our newest intern Tina Stall just arrived on the scene this December, but I'll let her tell her story.

## The New Weather Lady on the Block by Tina Stall, Meteorologist Intern

Hello everyone! I wanted to take this opportunity to introduce myself to all of you.

I am originally from Cincinnati, OH, home of the world-famous Skyline Chili. For my undergraduate work, I traveled the 100 miles northeast along Interstate 71 to attend The Ohio State University from 2001-2005. Although my undergraduate career began in Astronomy, it ultimately concluded with a Bachelor of Science in Meteorology, magna cum laude.

After college, I wasn't really sure which meteorological career path I wanted to follow, but decided to take the opportunity to volunteer at the National Weather Service office in Wilmington, OH. While there, I met many wonderful people and also trained to launch weather balloons. I had also visited a local television news station to speak with one of the meteorologists about career options and weather in general. At the time, he informed me that volunteering would get me nowhere and that I had better start doing jobs that earned me money. Well, if only he could see me now! Little did he, or even I, know how valuable that volunteer time would be.

I decided to apply to the graduate meteorology program at the University of Arizona in Tucson, AZ to earn my masters degree. After a short time there I applied for, and received, the SCEP (student career experience program) position at the Tucson National Weather Service office located on campus. In a meeting with the Meteorologist in Charge, I was informed that the ultimate deciding factor in choosing me over the other candidates was, in fact, my volunteer work in Wilmington, OH and a glowing recommendation from a member of the management team at that same office. I absolutely loved my time in Tucson and cherish the people I met and the opportunities I received. While there, I received significant training in issuing products, learning the ropes of forecasting using the Graphical Forecast Editor, and earning my upper air (weather balloon) certification.

Approximately a year and a half after I started work in Tucson, I received my Master of Science degree in Meteorology and began my search for a full intern position with the National Weather Service. Four nerve-racking months later, I received an offer from the NWS office in San Diego, CA. Despite having to leave my boyfriend to finish his PhD in Tucson, I jumped at the opportunity to further my weather career in what is easily the most gorgeous city in the country, in my humble opinion. I love it here so far and look forward to seeing you or speaking with you on the phone.

Well, I guess volunteering got me somewhere after all!

## Spotter and Skywarn News

## Spotter and Skywarn News

I hope this newsletter finds you well and reminds you of your commitment to be a quality weather spotter. If you haven't reported in a long time, either because you have not witnessed anything noteworthy, or you feel out of the loop, the time to refresh your knowledge is now. Weather spotter training online is always available for review at any time. You need not complete the test or sign up again. If you feel not quite up to speed, please review the training and reporting criteria.
**www.wrh.noaa.gov/sgx/spotter/spotter-info.php?wfo=sgx**

During the storms of mid December, it was noted that the snowfall reports were much more plentiful. Of course, that may be because the snow was that much more remarkable! In any case, thank you for those quality snowfall and snow depth reports. Without any automated equipment to report snowfall, we are truly blind here in San Diego with regard to the snowfall amounts. We can check the web cameras, but it is so often difficult to ascertain snowfall (new snow) and snow depth. It certainly requires good spotters like you who know how to report it.

Timeliness of reports is also important. On some occasions this winter, reports of rainfall, snowfall, or wind speeds came in too late to help with the warning decision process. The reports were very useful to help us verify or not the warnings we issued, so "better late than never" certainly applies to spotter reports. However, please remember the most useful reports are the ones reported as they happen. Your spotter reports can make a big difference that can save lives and property and we thank you for your participation!

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Feedback on weather products and the NWS San Diego website: www.wrh.noaa.gov/sgx/mail/feedback.php?wfo=sgx (don't forget to manually include your return email address if you wish a response!).

Spotter reports online: espotter.weather.gov

Weather Spotter web site: www.wrh.noaa.gov/sgx/spotter/spotter.php

(*Coast to Cactus* can always be found on this page.)

The *Weather Guide*, a weather companion and reference, is available online at:

www.wrh.noaa.gov/sgx/research/Guide/weather_guide.php?wfo=sgx

Southwest California Skywarn© web site: swskywarn.org , e-mail: swskywarn@swSkywarn.org

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