

Coast to Cactus Weather Examiner



National Weather Service - San Diego



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October 2016

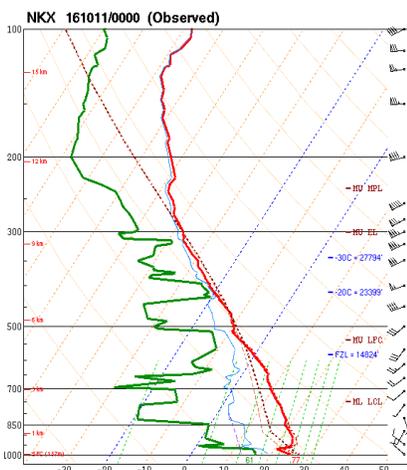
Making A Forecast by Miguel Miller

Have you ever wondered how forecasters from the National Weather Service make a forecast? Come along with me for a tour of the process, from my personal perspective.

When I arrive at the office for my forecast shift, I will work at either the public desk or the aviation/marine desk. Both desks usually cover fire weather forecasts and warnings. I receive a briefing from the forecaster finishing his/her shift (forecast offices are staffed 24/7/365 because of the responsibility to monitor weather and issue warnings any time day or night). The briefing gives me a good idea of the forecast issues of the day and where I should spend my efforts analyzing and forecasting. As I login to my workstation I look to see what the preceding forecasters have done by reading their Area Forecast Discussions. This gives me a more in-depth idea of what they have been thinking about and how I should prioritize my shift.

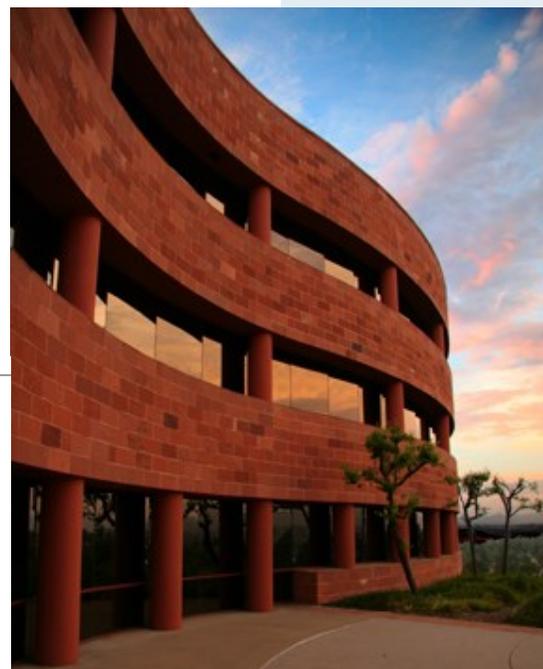
Then I look over several types of satellite images and loops, including the water vapor, infrared, visible, and fog images from the hemispheric scale down to the city scale. I also look at current weather observations to determine which weather elements are causing the greatest impact. Is rain slowing the commute or heavy enough to cause flooding? Are strong winds stirring up dust in the desert? Are temperatures causing heat problems? Is the fog dense enough to shut down airports? Is the humidity low enough for rapid fire growth? In the case of rain, I'll look at a long loop of Doppler radar imagery in order to determine the evolution and trend of the current rain pattern. Atmospheric sounding data, taken from the twice-daily weather balloon launch from Miramar, is totally indispensable and essential for understanding our

At right, the sounding shows the vertical profile of temperature (red), dew point (green), and winds (barbs at right).



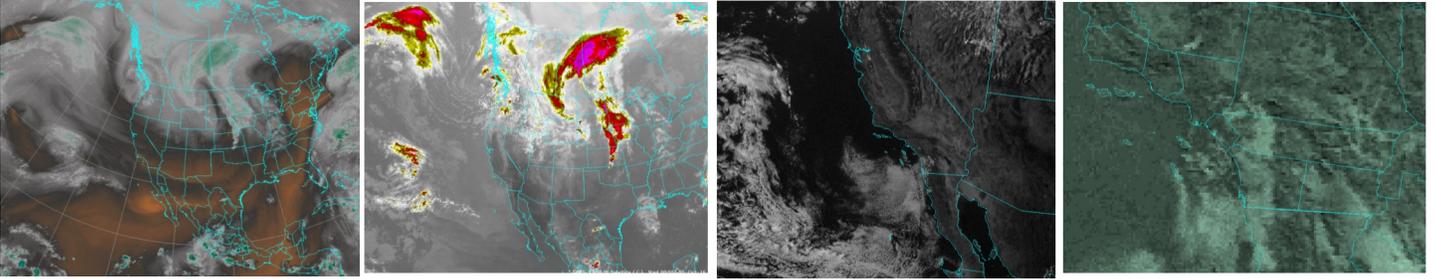
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The NWS Weather Forecast Office in San Diego is located in Rancho Bernardo.

Making A Forecast –continued



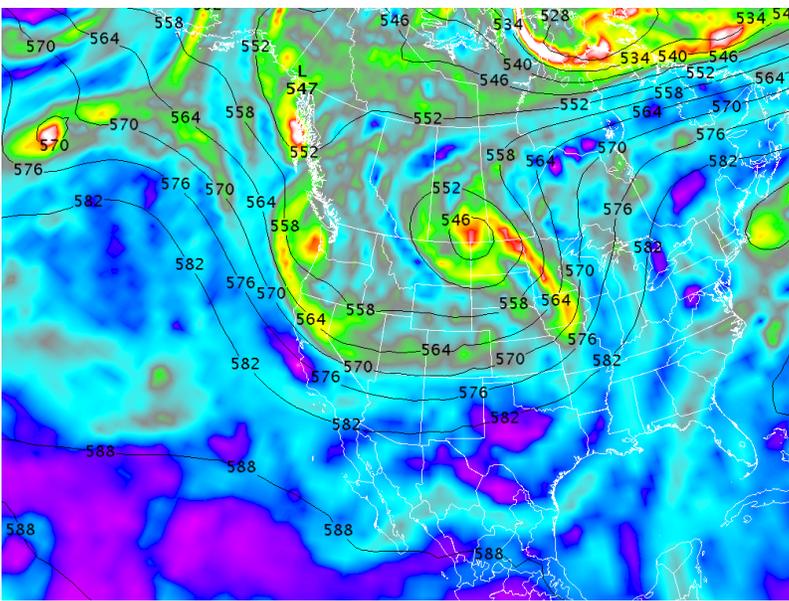
Some of the most useful satellite images we use every day are (above, left to right): Water vapor, Infrared, Visible (not useful at night), and Fog product (not useful in the day). Each of these can be zoomed in or out and looped in animations.

current atmosphere. I may also look over some webcams and time-lapse loops.

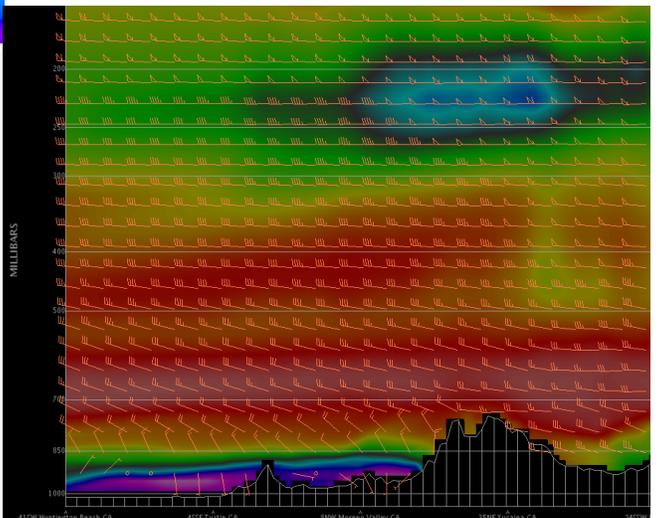
Once I get a good feel for our current weather situation, I begin to focus on the computer models from the hemispheric scale down to the Southern California regional scale. There are many to choose from. Some are large scale so I can get an overview of the upper level winds, pressure patterns, location and strength of the jet stream, moisture plumes, and any other large-scale weather makers across the continent and Pacific Ocean. These models depict a forecast out to ten days. I look to see if the initial forecast times between zero and six hours actually depicts

the reality of the current weather that I just analyzed. Much of the model analysis is done in the plan view, which is the traditional map view as if I'm in an airplane looking down over the region. But I can also look at model output from different angles and perspectives, such as cross sections in which I can see a vertical profile of the atmosphere, including the varying terrain. These different perspectives help me put together the many pieces of the forecast puzzle.

After looking at the big picture across the hemisphere, I'll zoom into our region. High-resolution models are able to



A large scale model (above) of 500 millibar height contours, which show low pressure troughs and high pressure ridges. The color shading is the vorticity, or spinning motion in the atmosphere, often correlated to rising air and precipitation. At right, a high resolution model shown as a vertical cross section along a line from Catalina (left) to Barstow (right); notice the mountains. Color shading shows humidity. Wind barbs show direction and speed of winds. In this example, purple shows the humid marine layer at the surface, while red shows the dry air above.



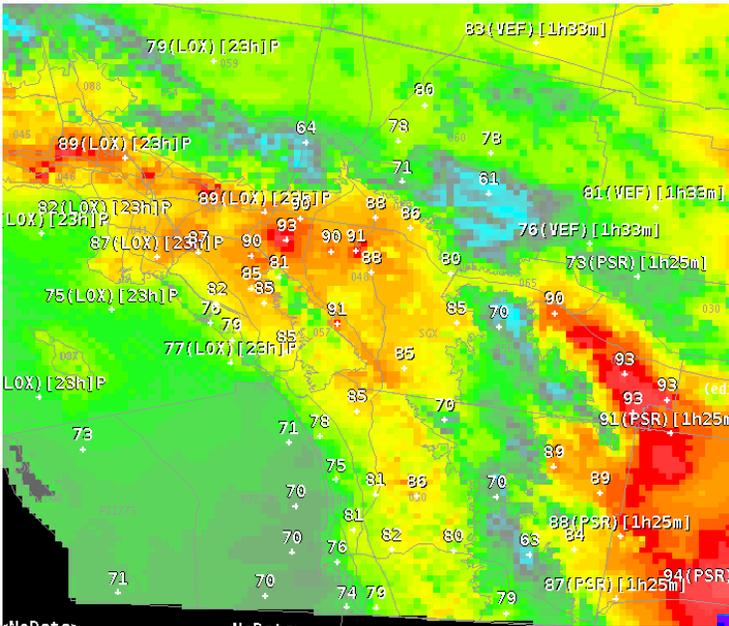
Making A Forecast—continued

depict many more details and features than the large scale models can. For example, the high-res models can resolve our mountains better resulting in better forecast rainfall amounts. Other examples include more detailed wind speed, direction, and timing, which varies quite a bit from place to place and from time to time. One drawback to the high-res models is they only forecast up to three and a half days into the future.

It's amazing to see how dead-on accurate some of these models are sometimes, but it's equally amazing (in a bad way) at other times to see how poorly they handle some situations.

Now that I have the forecast specifics in mind, it's time to take all that forecast information in my brain and put it into a graphical database. To do that I enter that database's editor which graphically displays each forecast weather field on a map. I can use tools to manipulate each field to represent my forecast. For many fields I can load the preferred model data into a weather element display for a certain day or hour to render the distribution of values on the map for that time period.

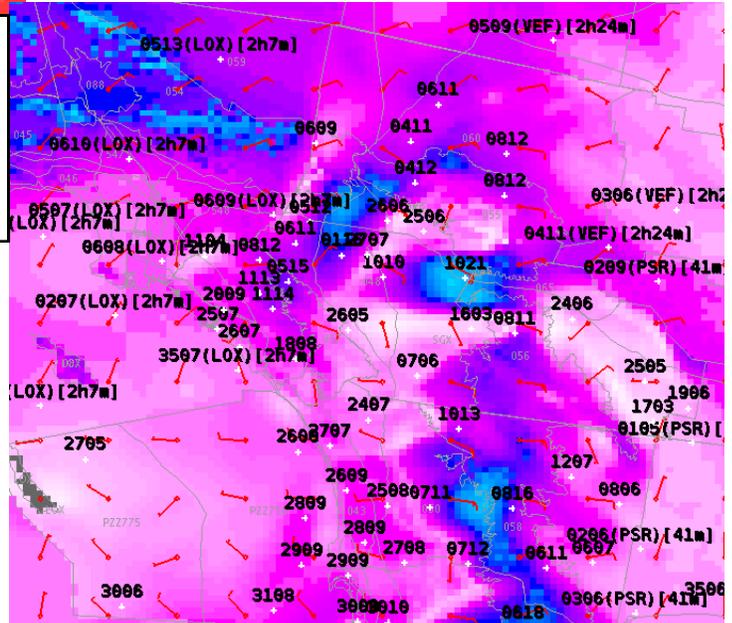
For example, let's say I want to forecast the high temperatures across the region for a day. I'll go into the editor and pull up a map displaying the latest forecast for the region with pixels, or grid boxes, containing a discreet



The gridded map forecast for maximum temperatures for a day (above) and for winds over a three-hourly period (right) are only two of the dozens of discreet maps containing our digital forecast weather conditions.

value of color-coded temperature (see map above). Each pixel in reality represents a 2.5 km square of real estate. One value is assigned to each pixel, or grid box. First, I'll load in the model guidance or a blend of several models that have been performing the best lately. I'll probably make a few manual edits and tweaks to arrive at the forecast I want depicted. I repeat this process for the rest of the seven days in our forecast. Then I do the same for the low temperatures for each day. Then I move on to the grids depicting chance of precipitation, weather (such as precipitation, fog, or blowing dust), dew points, relative humidity, rainfall amounts, winds, wind gusts, sky cover, and the list goes on and on. These weather fields may represent a time period of one day, six or three hours, or even one hour. With so many grids to edit, I have to decide which grids are worth my time to focus on and to perfect, and which grids are not as important. Finally, I run some tools to make some final checks for consistency and quality.

When the grids are finished, I upload them to the National Digital Forecast Database (NDFD)



Making A Forecast—continued

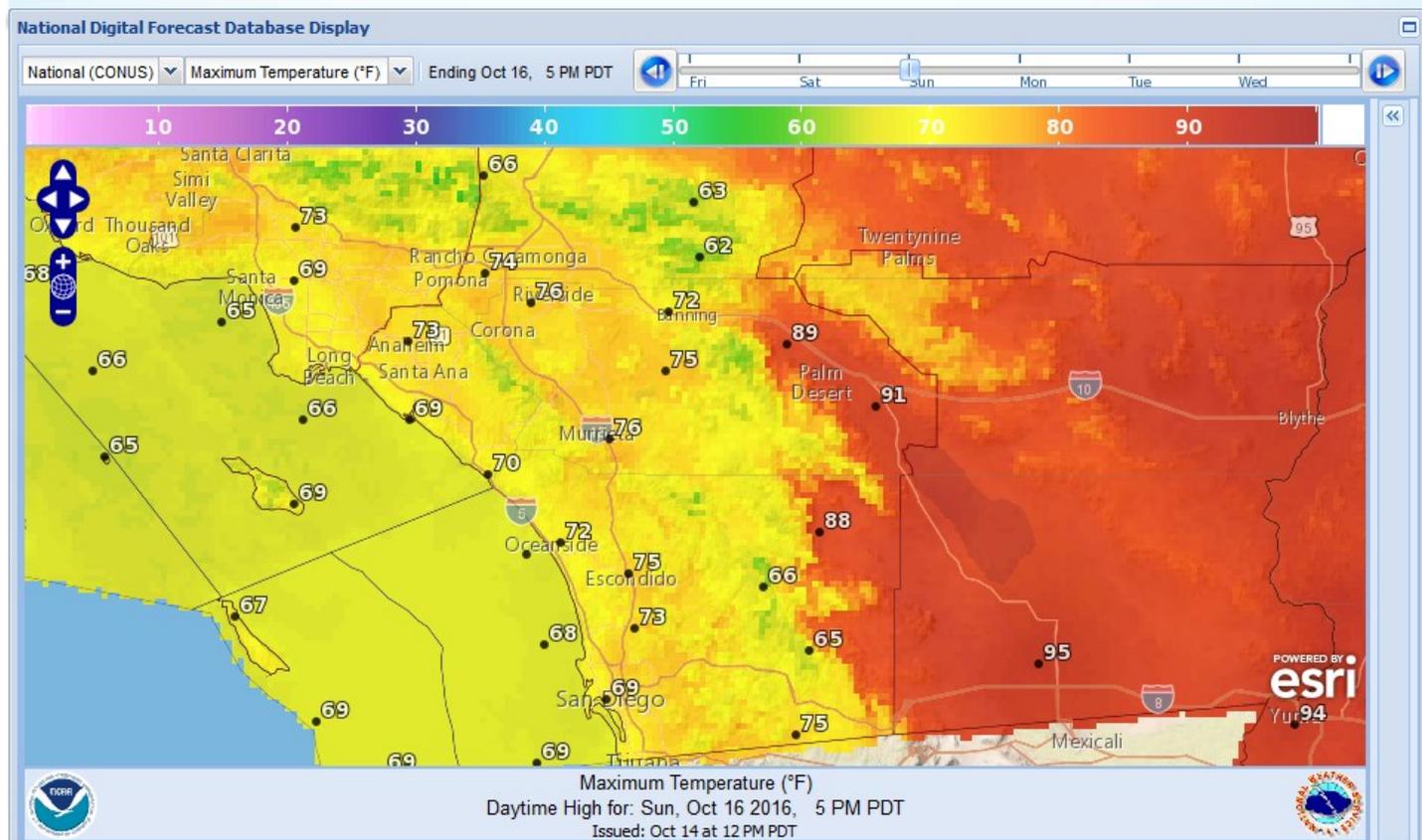
to join with the grids from the other 122 Weather Forecast Offices nationwide. These grids update all our digital forecasts found on our web pages. You can see many of the weather fields we edit in an interactive graphical display on the NDFD web pages on digital.weather.gov, linked from our home page (see example below). By manipulating this display, you can see graphically how all the weather variables change in time and space.

Graphical Forecasts

Weather.gov - National Digital Forecast Database Graphical Forecasts

National Weather Service

National Headquarters



The San Diego forecast office can uniquely boast the most dense observational database in the nation. This greater density of data allows us to generate high quality and finely detailed bias corrections in the forecast models for temperature. That means each model's output is compared to reality and the difference is averaged for each day over the previous month. In essence, this "teaches" the model when and where it has been too cool or too warm, and by how much. As we commonly use these bias-corrected models, greater accuracy results along with greater spatial and temporal resolution for forecast temperatures in our region of greatly varying microclimates.

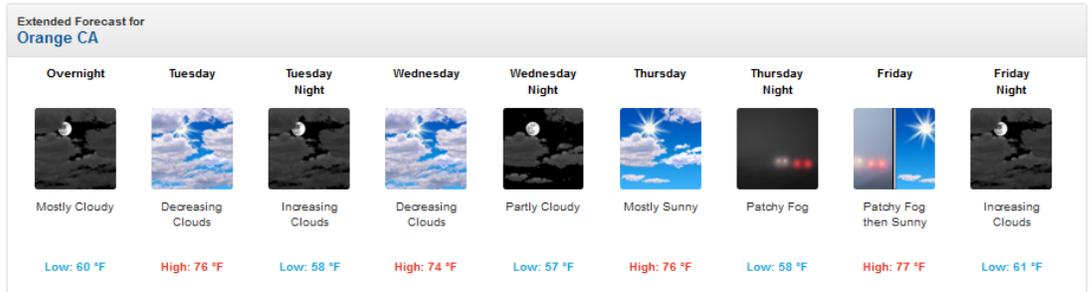
The next steps in the forecast process are to generate and issue the traditional text forecast products, like the zone forecast product and the area forecast discussion, and any needed watches, warnings, or advisories. This is done by converting the graphical data into text, reviewing the text, and issuing the products. Specialized tools make this graphic-to-text conversion and also add the necessary coding for proper distribution to external partners and the NOAA Weather Radio broadcast. The area forecast discussion and the weather hazard descriptions continue to be written mostly freehand.

When hazardous weather is in the forecast for the coming week, I'll send an email to select partners in emergency management and media. In it I'll explain what's going on and what hazards

Making A Forecast—continued

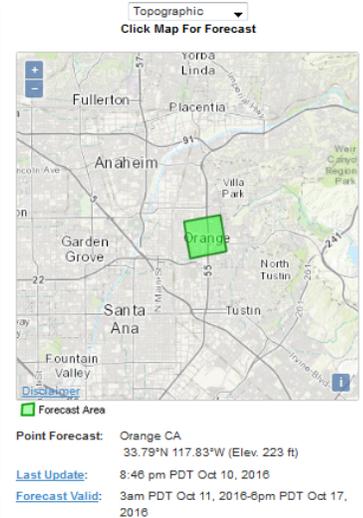
are possible and when. This is done as a courtesy and as a heads up well ahead of the hazardous event. As the hazard approaches, I'll share my thinking and proposed action with other forecasters within our office and with neighboring offices. After this coordination, when the consensus becomes confident the hazardous weather will come, we'll issue a weather watch that highlights the hazard and its impacts. It might be a winter weather watch, a high wind watch, a flash flood watch, an excessive heat watch, or a number of other things. When the hazard actually begins to unfold, we'll issue the appropriate warnings for the imminent danger and for those threatened to take immediate action.

For me, there's always a stimulating challenge in forecasting the weather for the coming week, even when there's no exciting or hazardous weather expected. It's gratifying when I see that reality matches my forecast. That's when I know my work has helped people to make informed decisions and to stay safe.

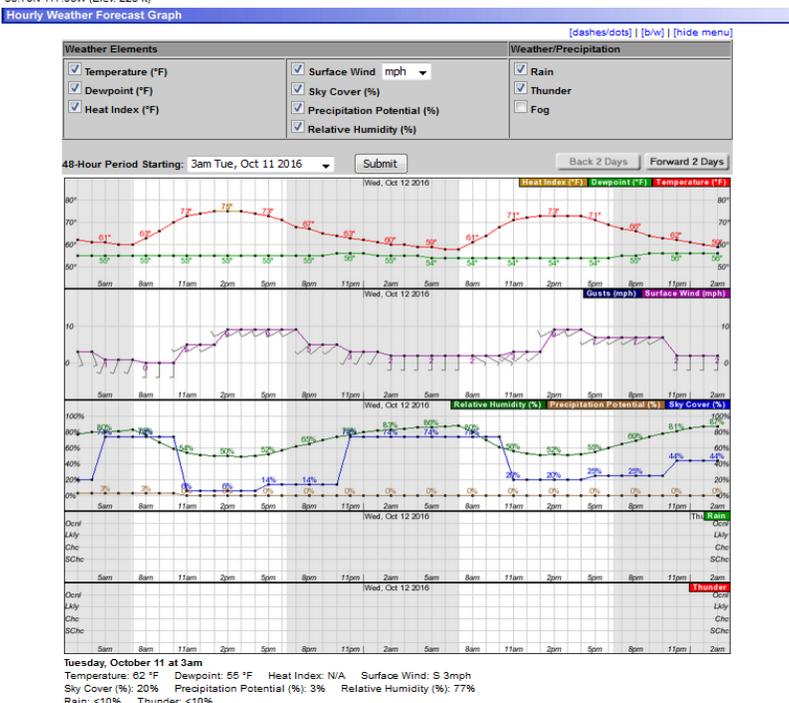


Detailed Forecast

Overnight	Mostly clear early, then becoming mostly cloudy, with a low around 60. South wind around 5 mph.
Tuesday	Mostly cloudy, then gradually becoming sunny, with a high near 76. Light south wind becoming southwest 5 to 10 mph in the afternoon.
Tuesday Night	Increasing clouds, with a low around 58. Southwest wind 5 to 10 mph becoming light south in the evening.
Wednesday	Mostly cloudy, then gradually becoming sunny, with a high near 74. Light south wind becoming southwest 5 to 10 mph in the afternoon.
Wednesday Night	Partly cloudy, with a low around 57. Southwest wind around 5 mph becoming calm in the evening.
Thursday	Mostly sunny, with a high near 76.
Thursday Night	Patchy fog after 11pm. Otherwise, increasing clouds, with a low around 58.
Friday	Patchy fog before 11am. Otherwise, mostly cloudy, then gradually becoming sunny, with a high near 77.
Friday Night	Increasing clouds, with a low around 61.
Saturday	Cloudy, then gradually becoming mostly sunny, with a high near 77.
Saturday Night	Increasing clouds, with a low around 61.
Sunday	Cloudy, then gradually becoming mostly sunny, with a high near 76.
Sunday Night	Mostly cloudy, with a low around 61.
Monday	Partly sunny, with a high near 76.



Point Forecast: Orange CA
33.79°N 117.83°W (Elev. 223 ft)
Last Update: 8:46 pm PDT Oct 10, 2016



A sample forecast web page (above) from weather.gov/sandiego. Icons give you a quick glance at the forecast, while the text at left provides greater detail for the entire upcoming week. The map with the green box indicates the spot on that the forecast represents, the grid box or pixel where you clicked. You can click around that map to fine tune your desired forecast to your neighborhood. At left, you can generate the hourly weather trends for many weather variables, which can help you plan your day from one hour to the next. This added value in our detailed forecast pages is available because of our dense network of observations and our bias corrections.

WeatherFest Rally 2016 by Alex Tardy

The WeatherFest Rally at the NWS Forecast office in San Diego was held at the Rancho Bernardo office on September 17, 2016. This Weather-Ready Nation event was advertised on social media, email, web page headlines, and also on NBC7 San Diego. It featured Owlie Skywarn, NBC7 Storm Ranger, and the Young Meteorologist Program (YMP) games.

Over 600 public guests attended with 100 partners staffing 40 separate booths and displays. For kids there was a separate game tent with laptops donated by San Diego County libraries where kids could earn their YMP certificate. There were several fire engines and a flash flood damaged vehicle hosted by Ocotillo Wells State Park. Partners from northern California included FEMA (PrepareAthon event) and California Geological Survey.

The NWS San Diego forecast office provided tours of the forecast operations to nearly 200 people.



Owlie Skywarn (Steve Harrison) from PlanIT Now and the NWS hung with kids and partners.



Storm Ranger NBC7 Doppler on Wheels was a popular attraction.

Science Center.

The event was a collection of core partners, first responders, researchers, and media showcasing their services to the public and highlighting natural hazard threats such as fire weather and floods.



Kids played the featured Young Meteorologist games and could either play on San Diego County library laptops or on a big screen.

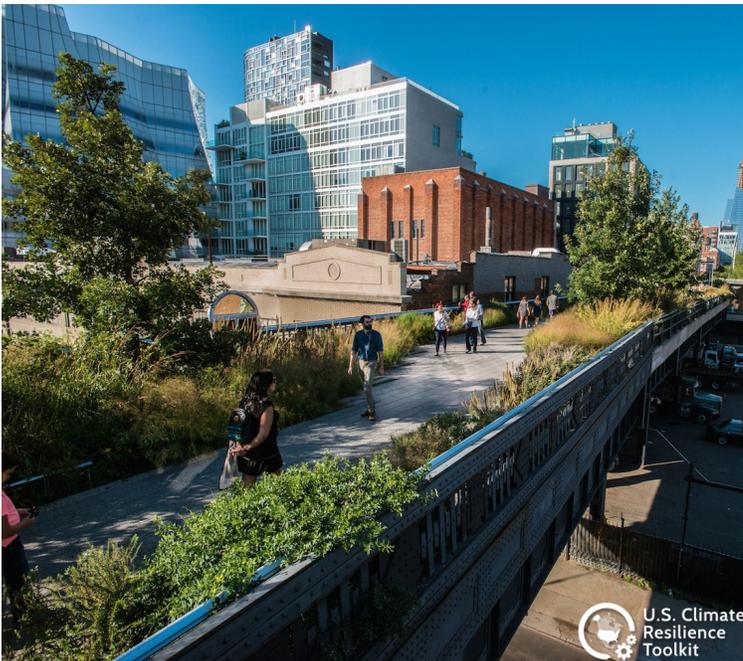
New Climate Change Tool NOAA Story

Our nation's city planners, and business and community leaders have been grappling with weather- and climate-related impacts for decades. Now they have a set of tools to help them plan and prepare: The Built Environment section of the U.S. Climate Resilience Toolkit at toolkit.climate.gov is designed to help address a wide range of risks facing cities and towns.

About 325 million people live in the United States today, and about eight out of ten live in or near a city or town. Extreme events that hit these urban areas — heat waves, heavy downpours, floods, and storm surges — often come with devastating and lasting impacts to property, lives, and livelihoods. Economic inequality, environmental degradation, and deteriorating public infrastructure can make some communities more vulnerable to weather and climate extremes than others.



Severe flooding in Nashville's downtown in May 2010 demonstrated the need for cities and towns to plan more resilient buildings, transportation systems and other infrastructure. The Climate Resilience Toolkit provides cities and towns with new tools on the Built Environment to address this need. (Kaldura)



The High Line public park created from an abandoned elevated freight line in New York City harnesses the power of nature, trees and other vegetation to give the public a cool getaway in the face of climate warming to America's largest city. (USDA)

“We worked with experts in the field and communities that would use the tool to ensure it meets the needs of urban and suburban planners,” said Nancy Beller-Simms, Ph.D., who led the project with experts from the U.S. Forest Service and Harvard University’s Graduate School of Design.

The toolkit’s new Built Environment feature provides authoritative, peer-reviewed information, real-world case studies, science-based decision-support tools, planning guides, training courses, reports, action plans, and links to regional experts — all freely available to the public.

“We wanted to be sure the tool included information on how to harness the benefits of trees, wetlands and other natural resources to strengthen the health, wellbeing, and sustainability of our cities and towns,” said Lauren Marshall, of the U.S. Forest Service’s Urban and Community Forestry Program.

“In terms of resilience planning, this tool can help shift the conversation from one of recovery to one of proactive planning,” said Jesse M. Keenan, Ph.D., of the Graduate School of Design at Harvard University.

Quarterly Summary by Tina Stall

July

The month of July began with a trough of low pressure along the West Coast, creating cooler, breezy weather, and a deeper marine layer. A weak disturbance moved through this trough, setting off a few thunderstorms over the San Bernardino County mountains and high deserts on the 1st. Flooded roads were reported in Helendale along Highway 66, and near Big Bear at Baldwin Lake. Doppler radar estimated rainfall of 2-3 inches over rural areas west of I-15, northwest of Victorville.

Varying levels of troughiness along the West Coast kept fair and seasonal weather for SoCal through the 12th. High pressure over the southern states expanded westward on the 13th, allowing warmer weather to return through the 15th. Another trough formed along the West Coast through the 19th for more cooling and a deeper marine layer, before high pressure aloft built back into the region on the 21st. This ridge of high pressure brought significant warming inland, with temperatures five to ten degrees above July averages. A ridge of high pressure over the Desert Southwest set up a southeasterly monsoonal flow aloft, sparking thunderstorm activity over the mountains of Riverside and San Bernardino Counties, and the high desert areas. These storms produced 0.5 to 1.5 inches of rainfall over the higher elevations in San Bernardino County, but no significant flooding was reported. On the 31st, scattered thunderstorms formed from the San Diego County Mountains, northward across the high deserts. Rainfall was light, but one of the stronger cells near Julian produced 0.5 to 1.5 inches of rainfall over the S2 and Highway 78.

Average monthly temperatures were mostly two to three degrees above normal for July.

San Diego Data - July				
	Max	Min	Avg	Rain
Actual	75.8	66.0	70.9	Trace
Normal	74.6	65.4	70.0	0.03
Anomaly	1.2	0.6	0.9	-0.03
% of normal				0
Max	85	69		Trace
Min	68	63		

August

The month of August began with a large area of high pressure aloft over the entire southern half of the nation through the 5th. Southern California was on the western fringes of monsoonal moisture during this period, and enough monsoonal moisture made its way into the mountains and deserts to set off a few thunderstorms, mainly in southwestern San Bernardino County. A spotter reported an area of water around six inches deep and about 50 feet wide flowing down Buena Vista Road near Lucerne Valley. There was also dirt and rocks on the roads, including Highway 18 and Custer Road, with a total rainfall of 1.5 inches reported. Another spotter measured one inch of rain in ten minutes elsewhere in Lucerne Valley.

San Diego Data - August				
	Max	Min	Avg	Rain
Actual	77.7	67.9	72.8	0.00
Normal	76.4	66.7	71.6	0.02
Anomaly	1.3	1.2	1.2	-0.02
% of normal				0
Max	84	71		0.00
Min	71	62		

A trough of low pressure along the West Coast brought dry, southwest flow with near to slightly below average temperatures through the 11th. High pressure aloft built back in over the Southwest on the 12th, bringing much warmer and drier weather with temperatures 5 to 10 degrees above average through the 17th. A trough of low pressure developed along the West Coast on the 18th to begin a cooling trend through the 20th. During an otherwise dry period,

Quarterly Summary—continued

some subtropical moisture crept north from Baja during the 19th-22nd, resulting in a few thunderstorms over the San Diego and Riverside County deserts, though no significant impacts occurred. Alternating weak high pressure and troughing aloft continued fair and seasonal weather through the 27th. Stronger high pressure returned on the 28th, for a late August warm-up through the end of the month.

Average monthly temperatures were mostly between half and two degrees above normal for August, with inland areas the most above normal.



The Pilot Fire in the San Bernardino Mountains provided a dramatic sunrise for Hesperia on 7 August. Photo Shane Schubert.

September

The month of September began with a transition from high to low pressure aloft. A trough of low pressure moved inland through the western states through the 5th, bringing stronger onshore flow and cooler conditions. Warmer conditions returned as the trough weakened through the 7th. Some subtropical moisture from the remnants of Tropical Storm Newton drifted up into SoCal over the next couple of days, but not enough for much in the way of showers, even over the mountains. Fair and warm weather continued through the 11th. Another upper-level trough moving southward into California and Nevada brought another round of cooler and breezy conditions with a deeper marine layer through the 14th, before weakening and returning temperatures back to near normal by the 16th. Temperatures rose through the 18th due to a period of offshore flow.

An upper-level trough off the SoCal coast pulled tropical moisture from former Hurricane Paine northward into the area, bringing significant rainfall on the 20th and 21st. The bulk of the rain fell over San Diego and Riverside Counties, with one-quarter to one-half inch in the coastal and valley areas, and one-half to one and a half inches in the mountains and deserts. The rainfall resulted in a 110 minute rain delay in the San Diego Padres baseball game at Petco Park on the 20th. Three Urban/Small Stream Flood Advisories were issued for this event, but no significant flooding was reported. Despite the relatively low rainfall amounts, several stations broke their single-day rainfall records on each of these days. Because September is a historically a dry month, a few stations surpassed their daily record by nearly five times.

San Diego Data - September				
	Max	Min	Avg	Rain
Actual	78.1	66.0	72.0	0.32
Normal	75.9	65.2	70.6	0.15
Anomaly	2.2	0.8	1.4	0.17
% of normal				213
Max	101	74		0.16
Min	70	61		

Quarterly Summary—continued



Skies were pretty gloomy as seen looking south from Newport Beach on 13 September. A deep marine layer brought some drizzle to the region on that day. Photo by NWS forecaster Dan Gregoria.

This trough finally moved inland on the 22nd to usher in cooler and breezy conditions. Strong high pressure aloft and surface high pressure over the Great Basin combined to bring dry, hot and windy Santa Ana conditions west of the mountains through the 26th. The high pressure weakened over the next few days as an upper-level low drifted over the area from the south through the 28th, which set off a few showers and thunderstorms over the mountains. Warm weather continued through the end of the month ahead of a longwave trough off the coast.

Average monthly temperatures were one to two degrees above normal at the coast, and one to two degrees below normal for inland areas.

National Weather Service San Diego Volunteers by Jimmy Taeger

Every year the National Weather Service (NWS) has one week officially dedicated to encouraging local offices to reach out to those in need in their community. This week is called the “NWS Week of Service”, and was held from September 25th through October 1st. Last year the office conducted a food and clothing drive, where 64 food items were donated to the San Diego Food Bank, and 57 clothing items were donated to the American Cancer Society. The year prior the office volunteered for an evening at the San Diego Food Bank. This year, they decided to do something different.

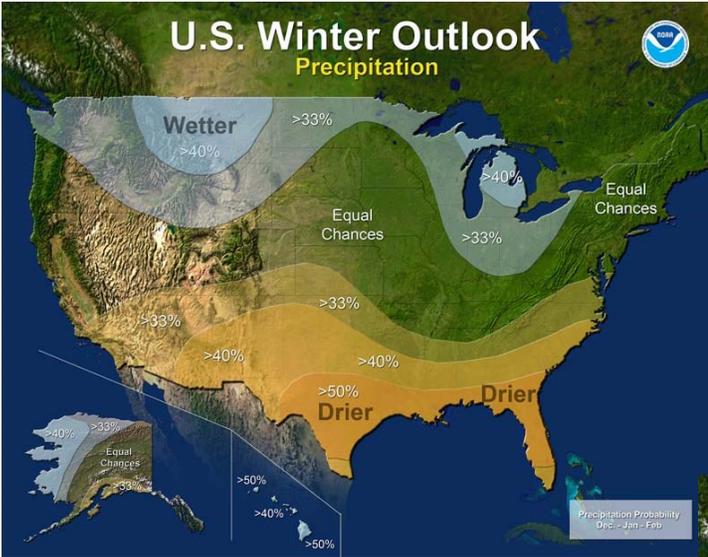
On October 1, 2016, the Taking Control of Your Diabetes Conference was held at the San Diego Convention Center in Downtown San Diego. The American Diabetes Association needed volunteers to staff their booth for the afternoon at the conference, so NWS San Diego stepped in to help out! Three of the staff and a family member chatted with those walking by the booth, passed out fliers and helped dismantle the booth at the end of the conference. Many of those in the office know someone personally diagnosed with Type 1 or Type 2 diabetes, and this volunteering experience for the Week of Service was a great opportunity for them to learn a little more about the disease while lending a helping hand.



Left to right: Jimmy Taeger, Stefanie Sullivan, Steve Harrison, and Jessica Garza volunteering at the American Diabetes Association Booth for the Taking Control of Your Diabetes Conference on October 1, 2016.

Winter Outlook (December through February) adapted from NOAA press release

Forecasters at NOAA’s Climate Prediction Center (CPC) issued the U.S. Winter Outlook on 20 October, saying that La Niña is expected to influence winter conditions this year. The CPC issued a La Niña watch this month, predicting the climate phenomenon is likely to develop in late fall or early winter. La Niña favors drier, warmer winters in the southern U.S and wetter, cooler conditions in the northern U.S. If La Niña conditions materialize, forecasters say it should be weak and potentially short-lived. See a video of this outlook on www.climate.gov.



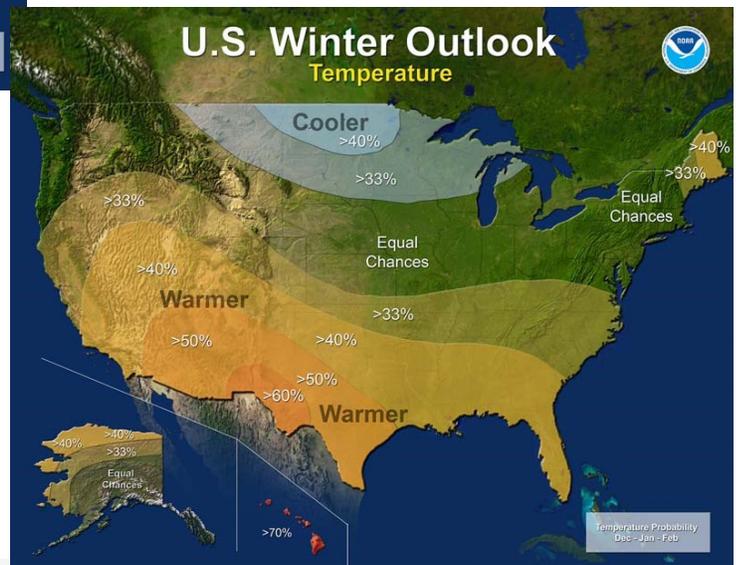
Precipitation (Dec-Feb)

Wetter than normal conditions are most likely in the northern Rockies, around the Great Lakes, in Hawaii and in western Alaska.

Drier than normal conditions are most likely across the entire southern U.S. and southern Alaska.

Temperature (Dec-Feb)

Warmer than normal conditions are most likely across the southern U.S., extending northward through the Great Basin, in Hawaii, in



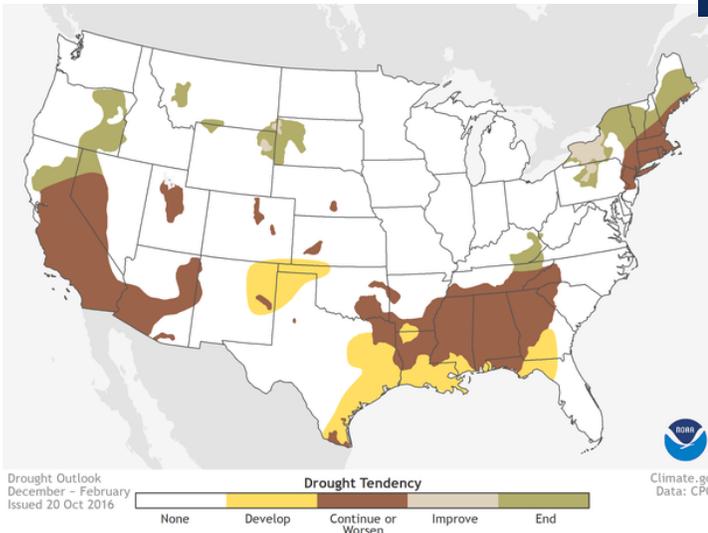
western and northern Alaska and in Maine.

Cooler conditions are most likely across the northern central states.

The rest of the country falls into the “equal chance” category, meaning that there is not a strong enough climate signal in these areas to shift the odds, so they have an equal chance for above-, near-, or below-normal temperatures and/or precipitation.

Drought

Drought will likely persist through the



winter in many regions currently experiencing drought, including much of California and the Southwest.

Drought is expected to persist and spread in the southeastern U.S. and develop in the southern Plains.

New England gets a mixed bag, with improvement in the western parts and persistence to the east.

Drought improvement is anticipated in northern California, the northern Rockies, the northern Plains and parts of the Ohio Valley.

Get Ready for Winter with these Weather Spotter Tips

1. Review the weather spotter reporting criteria. Go to this web page to download the reporting criteria page www.wrh.noaa.gov/sgx/spotter/spotter.php (click on “what to report”). Print the page and put it in a visible location (like the refrigerator door) to know when and what to report.
2. Make sure you have the toll free spotter phone number handy. Remember it’s a restricted line. It’s a good idea to have it saved in your cell phone.
3. Review and bookmark the online reporting form: www.srh.noaa.gov/StormReport/SubmitReport.php?site=sgx. Become familiar with the new look and feel, and how to report.
4. If you have weather equipment, check to make sure it is operating properly. Check the rain gauge bucket and clean out any debris.

The new online report form is more phone-friendly and easier to use. The graphics below show a sample as seen on a cell phone. Select the event type (shown at left), review the generated report (shown at right), and submit!

With the winter season approaching, spotters will have more opportunities to report hazardous weather to the National Weather Service. Each submitted report goes to the weather forecaster on duty and Alex Tardy’s email (NWS skywarn program manager). We look forward to many timely, accurate, and useful spotter reports this winter! We appreciate your support to help save lives and property while improving warnings and forecasts.

2. Event Type (Select all that apply)

- Dense Fog
- Dust Storm
- Flood
- Hail
- High Wind Speed
- Rip Currents
- Tornado/Funnel Cloud
- Wind Damage
- Snow
- Freezing Rain/Icing
- Heavy Rain

3. Additional Details

Provide any additional information that may be helpful to the forecaster.

below.

A Storm Report Has Been Submitted Via The Internet
Submission Time: Oct 21, 2016 11:00 PDT
Office: SGX (San Diego, California)
Event Time: 10/21/2016 10:45 AM
Reported By: Alex Tardy
Spotter Id: Program leader
Profile: NWS Employee
Email: Alexander.Tardy@noaa.gov
Phone:
Location: San Diego-Rancho Bernardo CA
LAT: 33.03
LON: -117.08
County: San Diego, CALIFORNIA
Translated IP address: 10.1.5.157
IP address: 70.209.192.120

Event: Dense Fog
Details: Visibility <=1/4 mile

NOTICE: Information provided on this form may be used by the National Weather Service (NWS) for official purposes in any way, including public release and publication in NWS products. False statements on this form may be subject to prosecution under the False Statement Accountability Act of 1996 (18 U.S.C. § 1001) or other statutes. Pursuant to 18 U.S.C. § 1001, knowingly and willfully make any materially false, fictitious, or fraudulent statement or entry on this form is a crime punishable by fine and imprisonment.

I have read and understand the [NOTICE](#)

Submit Report Back