

# Coast to Cactus Weather Examiner



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## NWS San Diego at the AMS Hurricane Conference

by Casey Oswant and Alex Tardy

The 2023 hurricane season in Southern California provided a lot to discuss at this year's American Meteorological Society Hurricane Conference. NWS San Diego meteorologists Elizabeth Adams and Casey Oswant, along with Warning Coordination Meteorologist Alex Tardy, all presented on forecast operations, messaging hazards, and impacts during Tropical Cyclone (TC) Hilary. TC Hilary was a historical storm for Southern California, with the first ever Tropical Storm Watches and Warnings for the US West Coast issued due to expected impacts from the tropical system.

The conference was held in Long Beach and featured several National Hurricane Center specialists, research scientists, social scientists, and students. Attendance was just over 600 for the five-day conference. NWS San Diego meteorologists presented during the Societal Impacts and Risk Communication of Tropical Weather session. Casey and Elizabeth's talk focused on what it was like in NWS San Diego operations ahead of and during the event, as well as the Decision Support Services the office provided to partners. The talk also briefly touched on messaging successes and challenges surrounding such a unique event. The biggest success was that the message about the potential hazards and impacts was taken seriously by the public and partners, supported by no noticeable increases in traffic accidents and very few fatalities. Conversely one of the main challenges was battling misinformation about the tropical system and impacts.

Alex's presentation followed and covered the impacts from TC Hilary. It brought rain and wind to all areas, but catastrophic rainfall and flooding to many mountain and desert communities, where 3 to 8 inches of rain fell in less than 18 hours. The greatest rainfall was 13.54 inches on the desert side of the San Bernardino Mountains at 8,000 feet, which resulted in massive flooding and debris flows downstream that closed the I-10 in the Coachella Valley. In addition to major road closures, widespread flooding in the mountains and deserts resulted in search and rescue efforts and bridge washouts.

These presentations complimented each other and gave conference attendees a well-rounded understanding of what went on behind the scenes at NWS San Diego's first chance to work tropical weather operations.

### Inside this issue:

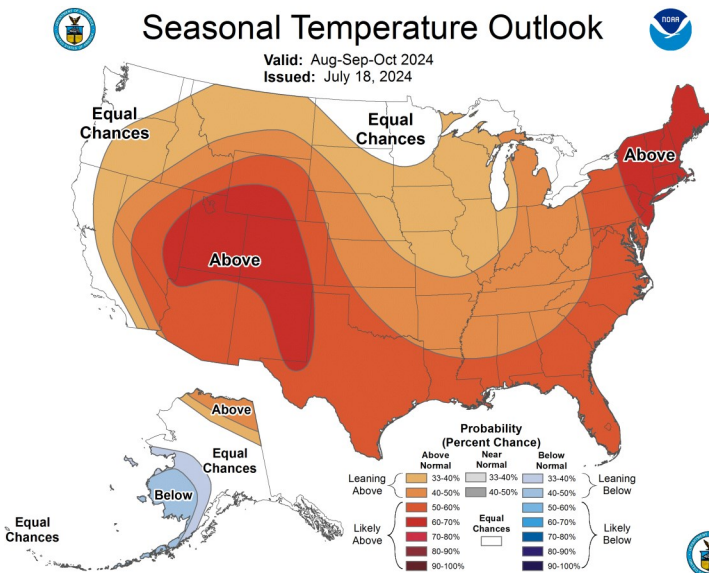
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Elizabeth Adams (left) and Casey Oswant (right) present at the Hurricane conference.

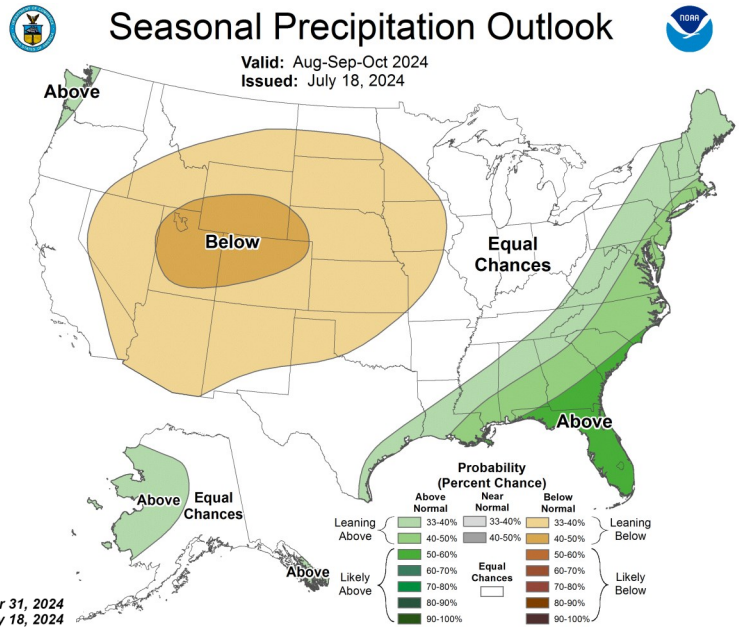
# Seasonal Outlook

On July 18, the Climate Prediction Center (CPC) released their seasonal (three-month) outlook for August, September and October.



The Temperature Outlook (left) shows the chances of a warmer-than-average **August-October** (orange and red) are higher than any other below or near normal outcome for nearly all of the country during this period. This is especially true for the interior West and New England. It looks like the SoCal deserts will continue unseasonably hot for at least the rest of the summer.

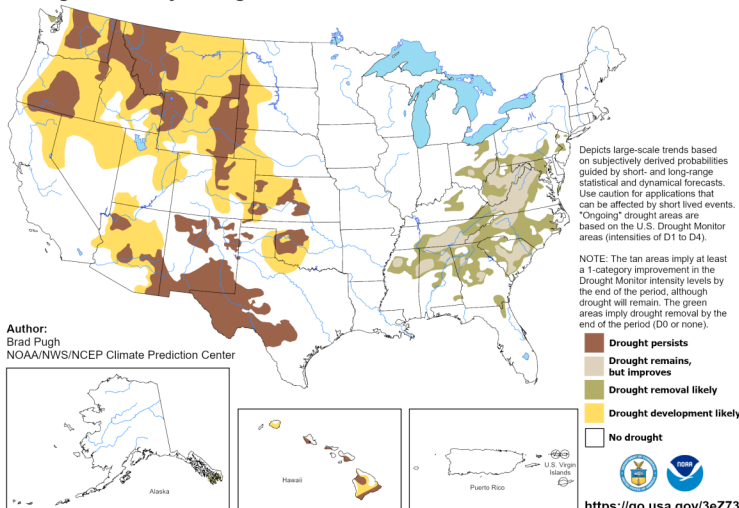
Out of three possible precipitation outcomes—wetter than average, drier than average, or near average—the outlook for **August-October** (right) says that odds are leaning toward a drier than average period for much of the West and Central U.S. The indication of a muted monsoon season is apparent. Odds tilt toward a wetter than average period across the Southeast and Northeast.



## U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for July 18 - October 31, 2024  
Released July 18, 2024



The Drought Outlook through October (left) indicates persisting and developing drought across most of the West. A subpar monsoon season and higher than average temperatures are the leading factors. Drought improvement is expected in much of the East.

## Mark Moede Retires

After more than three decades in federal service, lead forecaster Mark Moede retired at the end of June. Mark arrived at the San Diego National Weather Service office in October of 1995. His experience, knowledge and good nature will be missed. We wish him all the best in retirement.

Here Mark recounts his five most memorable moments.

**Firestorm:** On September 2, 1998, firefighters in Orange County were battling a large wildfire over the Santa Ana Mountains that was sparked by lightning strikes the previous day. Monsoon thunderstorms were in the vicinity, and I provided frequent radar updates to Pete Curran, the Fire Captain with the Orange County Fire Authority. I kept him apprised of a developing line of strong thunderstorms over the Riverside County Mountains that was moving toward the wildfire. The storm was 30 miles east of the fire when I issued a Severe Thunderstorm Warning for the Santa Ana Mountains. I called Pete and told him this thunderstorm will produce strong, erratic downburst winds of 60 mph as it passes directly over the wildfire. He evacuated the crews from the fire line and ordered them back to their safety zone. Afterward, firefighters reported that the fire line they had evacuated had been completely burned over, and if the call to evacuate hadn't been made, in all likelihood a number of firefighters would have been killed.



**The 2006 California Heat Wave:** After the July 2006 California Heat Wave killed 131 people, I got involved with the Heat Program. I noted the Heat Index Warning criteria that was the popular heat criteria at the time wasn't even met during this prolonged heat wave. I was able to work with Alex Tardy (Warning Coordination Meteorologist) to implement new heat criteria (the precursor to the Heat Index) into NWS San Diego operations.

**Service Assessment Team:** As a member of the Service Assessment Team for the destructive December 2007 Pacific Northwest Winter Storm, the Service Team recommendations resulted in the approval and installation of a new doppler radar on the Washington coast. Until then, the Washington State coastline had no weather radar coverage.

**Japan Tsunami reaches the West Coast:** I was the Tsunami Program Focal Point and was working the night of the Honshu, Japan, 9.0 earthquake and subsequent tsunami on March 11, 2011 that reached the West Coast early on the morning of March 12th. I did media interviews with local radio, reassuring the public that the widespread overnight devastation seen in Japan would not reach the California coast, but urged the public to stay out of the water due to the powerful ocean currents. Damage estimates were \$250,000 in San Diego County.

**The day the rain cancelled the Padre game:** The Sunday May 7, 2017 Padre game was cancelled on Saturday, May 6th after a lengthy conference call with the San Diego Padre Board of Directors about the projected cold, windy and wet weather forecast for Sunday. A missed forecast would have cost them tens of thousands of dollars, maybe more. Based on the forecast, the Padre executives decided to cancel the game on Saturday afternoon, thereby not having fans come out to the stadium for a game on Sunday that wouldn't be played if the forecast verified. Batting practice and pregame warmups were also cancelled. The high on Sunday was 59, cold northwest winds were 10-20 mph, and 0.79" of rain fell nearby at the San Diego Airport.

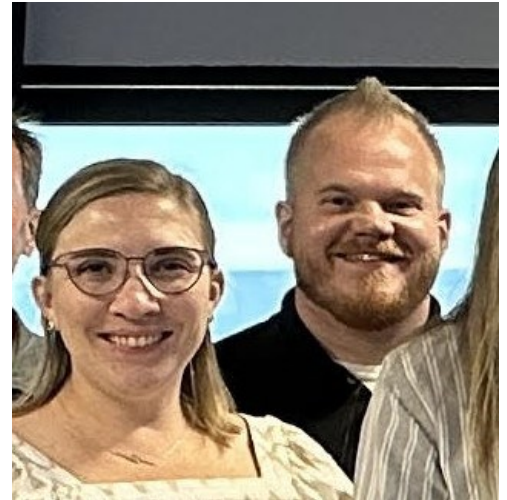
Working for the NWS was the best job I ever could have had. It's been a great career!



## Goings and Comings

**Elizabeth (Liz) and Brian Adams** have accepted new positions at the National Hurricane Center (NHC) in Miami, Florida. Liz accepted a position as a Marine Forecaster and Brian will be a Surface Analyst Forecaster.

Liz arrived at NWS San Diego in June 2020 and started her NWS career just as the global pandemic was getting underway. She was forced to telework (as much of the professional world was) for much of her training. Despite that challenge, she learned to be an operational forecaster quickly. She also worked extensively in gathering Storm Data (severe weather reports) for publication, became radar specialist and helped establish best practices for social media. More recently, she was instrumental in developing NWS San Diego's first tropical weather program in the spring of 2023, a program that was put to the test just in time for Hilary to strike our region a few months later!



Brian arrived at NWS San Diego in December 2021 and hit the ground running to gather Storm Data and to help build our social media presence. He studied and trained to become an Incident Meteorologist (IMET), a forecaster deployed to wildfires to provide weather support for firefighters. Over the years, he became a seasoned IMET in providing on-site decision support for fires in Oregon and California. He also contributed to streamlining the fire weather program at NWS San Diego.

Brian recently summed up how he and Liz feel about the NWS San Diego experience: “We’ve had a wonderful few years here... years we’ll never forget. We could not be more thankful for everyone’s hard work, hospitality, and guidance since we arrived.”

Liz and Brian will be greatly missed, and we wish them well in their new tropical home.

## Chandler Price

Hi, I’m Chandler Price, a new meteorologist here at NWS San Diego. I was actually born and raised in San Diego, and I’m so happy to be back! I’ve always been fascinated with natural sciences, and used to drag my long-suffering dad out into the desert southwest in summer to watch the monsoonal thunderstorms. We had to high-tail it back to the car on more than one occasion when a storm unexpectedly headed right towards us.

Despite this early love for the weather, I didn’t decide to go into meteorology until my second year of college after exploring my options in other natural sciences. I finally did decide on meteorology, however, and received my B.S. from San José State University in 2022 with a minor in mathematics. While I was in school, a particular interest of mine was terrain effects on weather. I also did a lot of coding, web design, data science, and GIS work.

I started my career with the National Weather Service in Medford, Oregon in October 2022 soon after graduating. While I loved southern Oregon, when I saw the position opening in my hometown I had to go for it, and I started here in San Diego on June 1st this year.

I’m excited to be back to nice beaches and California burritos, of which I’ve already eaten far too many. When I’m not geeking out about weather, I can be found reading piles of books, hiking, swimming and body surfing.



## Goings and Comings—cont'd

### Sam Zuber

Hello all, my name is Sam Zuber, and I am originally from the Northern Virginia area right across the water from Washington, DC. Born and raised there, I was given the chance to experience all types of weather, including some bigger ones: Nor'easters (snowstorms) and hurricanes.

From a young age I was intrigued by how the weathermen on TV could “predict the future” before these weather events happened, and by high school I knew that I wanted to be a meteorologist, already eyeing up the National Weather Service, given my proximity to the federal government.

Much of my extended family lives in California (many of them here in San Diego), so I picked UC Davis for their meteorology program and graduated in March of 2019 with a degree in Atmospheric Sciences and a minor in Geographic Information Systems (GIS).

After graduation I moved to California's Central Valley and did a five-month internship at NWS San Joaquin Valley located in Hanford, where I got my first taste of what it meant to work for the NWS.

My time at Hanford led to a full-time meteorologist position at the Midland, TX office and, for the second time in my life, I picked up and moved to a new state. I was at the Midland office for four and a half years before being offered a meteorologist position here in San Diego, and I am so excited to be back on the West Coast and look forward to learning about all of the complex weather systems and terrain influences that this region experiences.



### Dave Munyan

I am originally from West Deptford, a suburb of Philadelphia in southern New Jersey. My passion for weather started when I was young, constantly watching The Weather Channel and getting (probably too) excited when a Nor'easter snowstorm or a line of severe thunderstorms came my way.

I then went on to study the weather at The Pennsylvania State University and graduated with my B.S. in Meteorology and Atmospheric Science in the Spring of 2020. During my time in college, I quickly gravitated towards enjoying forecasting and operational meteorology, especially whenever it dealt with winter or severe weather.

Not long after graduation, I was hired on as a meteorologist at the National Weather Service in Midland, TX in June of 2021.

After three years of serving the people of West Texas and Southeast New Mexico, I will be transferring to San Diego at the end of July. While I am a big fan of seeing the four seasons throughout the year (especially some winter weather!), I am still looking forward to the (usually) sunny and temperate Southern California and the meteorological challenges that the complex terrain and marine layer bring. During my time in Midland, I focused a lot on effective communication to our partners and the public and I cannot wait to take these experiences with me and continue to do so at NWS San Diego!



## Wave Detail is Here! by Casey Oswant, Lead Meteorologist

In May 2024, the National Weather Service (NWS) made a couple of changes to enhance the Coast Waters Forecast (CWF). The main change to the format of the CWF was to add detailed wave information, including height, direction, and period of the top three steepest wave systems.

Old Format	New Format
Wind waves 3 to 5 ft. W swell 5 to 8 ft at 14 seconds.	Seas 6 to 9 feet. Wave Detail: West 8 feet at 14 seconds and west 5 feet at 6 seconds.
Wind waves 2 ft or less. S swell 6 to 8 ft at 16 seconds.	Seas 6 to 8 feet. Wave Detail: South 8 feet at 16 seconds.
Wind waves 6 to 8 feet. Mixed swell W 4 to 6 feet at 12 seconds and S 2 ft at 18 seconds.	Seas 7 to 10 feet. Wave Detail: Northwest 8 feet at 8 seconds and west 6 feet at 12 seconds.
Combined seas 7 to 10 feet dominant period 10 seconds.	Seas 7 to 10 feet. Wave Detail: Northwest 8 feet at 10 seconds and west 6 feet at 18 seconds.

In addition to adding more detail, the terms “wind wave” and “swell” have been removed. That information is still provided, but is described using direction and period instead of labeled. The type of wave can be identified by the period, with wind waves usually having periods 8 seconds or less and swells usually having periods of 10 seconds or more.

The terms “wind wave” and “swell” are not used everywhere in the country and having the forecast in a consistent format across the country was a key motivator to make these changes. The removal of those terms also helps mariners identify which wave groups will be the most impactful to them in situations when wave groups do not clearly fall in the definition of a wind wave or swell.

The enhancements made to the CWF also provide more insight to the surf zone and can help identify coastal flooding hazards. These changes have helped standardize and enhance forecast information found in the CWF, so no matter where you are boating your NWS forecast will use the same wave detail and terms. For more information, please visit [weather.gov/marine/wavedetail](https://weather.gov/marine/wavedetail).

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Coastal Waters Forecast for California
National Weather Service San Diego CA
124 PM PDT Wed Jun 5 2024

San Mateo Point to the Mexican border out 60 nm

PZZ700-060900-
124 PM PDT Wed Jun 5 2024

.Synopsis for the far Southern California coast...At 1 PM, a 1018
mb high was near Reno Nevada, a 1020 mb high was over western
Nevada and a 1006 mb low was just south of Needles California.
Weak onshore flow will prevail through Sunday, with a coastal eddy
today and again this weekend.

$$

PZZ750-060900-
Coastal Waters from San Mateo Point to the Mexican Border and out
to 30 nm-
124 PM PDT Wed Jun 5 2024

.TONIGHT...Wind variable less than 10 kt. Seas 3 ft. Wave Detail:
W 2 ft at 10 seconds and SW 2 ft at 15 seconds.
.THU...Wind variable less than 10 kt, becoming W 10 kt in the
afternoon. Seas 3 ft. Wave Detail: W 1 foot at 4 seconds, W 2 ft
at 9 seconds and SW 2 ft at 15 seconds.
.THU NIGHT...Wind variable less than 10 kt. Seas 3 ft. Wave
Detail: W 1 foot at 4 seconds, SW 2 ft at 15 seconds and W 2 ft
at 15 seconds.
.FRI...Wind variable less than 10 kt, becoming W 10 kt in the
afternoon. Seas 3 ft. Wave Detail: W 1 foot at 4 seconds, W 2 ft
at 14 seconds and SW 2 ft at 15 seconds.
.FRI NIGHT...Wind variable less than 10 kt. Seas 3 ft. Wave
Detail: W 1 foot at 4 seconds, W 2 ft at 12 seconds and SW 2 ft
at 14 seconds.
.SAT...Wind variable less than 10 kt, becoming SW 10 kt in the
afternoon. Seas 3 ft. Wave Detail: SW 1 foot at 4 seconds, W 2 ft
at 12 seconds and SW 2 ft at 14 seconds.
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# Quarterly Summary

## April

With a cold storm system departing, April began in a cool way, but offshore flow and a high pressure ridge boosted temperatures west of the mountains on the 2nd and 3rd.

The next deep trough swooped into the region on the 4th and 5th, bringing some rain to the area, along with some snow to the mountains. Rainfall ranged from a few hundredths to around 0.50 inch from the coast to the valleys, all the way up to 1.11 inches in Pine Hills of San Diego County. Snowfall topped out at 9 inches at Palomar Mountain–Birch Hill, while Julian received 3 inches at merely 4,200 feet elevation. The San Bernardino Mountains received

San Diego Data - April 2024				
	Max	Min	Avg	Rain
Actual	67.1	54.6	60.9	0.16
Normal	68.8	57.1	62.9	0.65
Anomaly	-1.7	-2.5	-2.0	-0.49
% of normal				25
Max	74	60		0.11
Min	60	47		



Some spring snowfall on the 5th extended the ski season at resorts around Big Bear (webcam image).

light snow. Thunderstorms erupted in the south slopes of the San Gabriel Mountains and around Running Springs and Valley Center. This system also brought wind, especially to the desert slopes of the mountains on the 5th. 80-mph gusts were clocked at Burns Canyon and 70 mph at Cushenbury Springs. Victorville and Lucerne Valley had gusts to 68 mph. It was a very cold night on the 6th with temperatures falling into the 30s in many valleys, and into the 20s and even some teens in the mountains.

Several days of fair weather and a rebuilding marine layer followed under a weaker trough pattern. Warmer weather came from the 9th to the 11th, with temperatures rising just above normal.

The next trough barreled into Southern California on the 12th and 13th, bringing more wind and precipitation. A few top gusts in the desert foothills exceeded 50 mph. Rainfall on the 14th and 15th reached around 1.50 inches in the front range of the San Bernardino Mountains while lowlands generally received 0.10 to 0.50 inch. 3 inches of snow fell at Running Springs and vicinity, with lesser amounts elsewhere.

A weak ridge was followed by a weak trough for several days. The trough and cool ocean waters helped to build a robust marine layer, providing a lot of cloudiness west of the mountains.

A stronger trough by April standards came off the Pacific and brought another round of wind and rain to the region on the 24th and 25th, with a secondary wave of energy on the 26th and 27th, which brought additional strong winds. Both the high and low deserts got the brunt of the winds, with many areas recording gusts of 50 to 60 mph. Whitewater was the clear wind winner hitting 75 mph. Precipitation was very light, with the heaviest report of 0.24 inch at Cable Canyon, and most areas received less than 0.10 inch.

Fair weather with a rebuilding marine layer finished out this cooler-than-normal month.

## Quarterly Summary—continued

### May

May started out in a weak trough pattern, with a healthy marine layer and cooler than normal weather for the first few days.

On the 5th, a deeper trough moved through California, producing gusty winds in the mountains and deserts. Strongest winds with gusts over 50 mph and up to 66 mph (at Silverwood Reservoir) were measured along ridges and into adjacent deserts. A deepened marine layer brought light rain to the lowlands, generally less than 0.10 inch. But in the foothills and front range of the mountains, the rain accumulated to 0.25 to 0.50 inch, and Panorama Point managed to squeeze out 0.67 inch.

A weak troughing pattern over the western U.S. persisted for the rest of the month. This brought generally cooler than normal weather. When it was weak, temperatures were around normal and the marine layer was of moderate depth. Coastal clouds extended into valleys most nights and mornings.

From the 15th to the 26th, a stronger trough pattern persisted, keeping the marine layer strong and deep and extending coastal clouds into valleys and even into foothills on many nights and mornings.

On the 15th, a moist and unstable air mass floated over a very stable marine layer. A modest intrusion of monsoon moisture led to a few thunderstorms erupting in the mountains around and north of Big Bear Lake and also the high desert west of Victorville. This was on the same day a deep marine layer produced drizzle west of the mountains.



A radar image in the late afternoon of 15 May shows thunderstorms north of Big Bear Lake and west of Victorville.

### San Diego Data - May 2024

	Max	Min	Avg	Rain
Actual	67.5	59.0	63.2	0.07
Normal	69.5	60.0	64.8	0.28
Anomaly	-2.0	-1.0	-1.6	-0.21
% of normal				25
Max	70	61		0.04
Min	63	50		

Strong onshore winds developed in the mountains and deserts on the 20th, producing wind gusts up to around 60 mph through mountain gaps and on desert slopes of the mountains. Whitewater topped the list with a 61-mph gust. A very similar wind episode unfolded on the 23rd into the 24th.

There was some measurable coastal drizzle that developed in a very deep marine layer on the 24th and 25th. The foothills again harvested more than their share, with Cable Canyon receiving 0.16 inch. Temperatures were well below normal.

Weaker low pressure allowed temperatures to rebound closer to normal at the end of the month.



## Quarterly Summary—continued

### June

The weak trough pattern from May continued into June for the first few days, bringing weather on the cool side of seasonal.

A high pressure ridge developed over California on the 4th and 5th, tamping down the marine layer and the coastal cloud coverage. It also boosted temperatures well above seasonal average, at least for inland areas. A stubborn marine layer kept coastal areas mostly cloudy, even during some of the afternoons. The inland heat helped dry out vegetation and led to several fires in the Inland Empire, near Julian, and even in the high desert near Hesperia.

The second week of June featured a breakdown of that high pressure ridge, and a return of below normal temperatures and an enhanced marine layer.

Another trough amplified over the West Coast on the 17th and 18th and persisted through the 20th. The marine layer resurged and coastal clouds extended well inland.

High pressure gradually built from the 21st to 23rd, and prevailed through the 26th. This brought a significant warming trend, and the season's first legitimate heat wave just in time for the start of summer. On the 22nd, temperatures soared to 115 at Palm Springs, and 103 at Riverside.

At 84 degrees, San Diego got its warmest day since October.

The ridge weakened only a little for the last few days of the month, ensuring temperatures stayed above normal.

San Diego Data - June 2024				
	Max	Min	Avg	Rain
Actual	71.4	63.0	67.2	Trace
Normal	71.7	62.6	67.2	0.05
Anomaly	-0.3	0.4	0.0	-0.05
% of normal				0
Max	84	69		
Min	66	59		



The Great Fire erupted at the end of May just north of Julian. This image shows the green grasses (fine fuels) from winter rains rapidly curing with the onset of summer. Webcam photo SDG&E.