2022

January

The month and the year started off with several cool days and rather chilly nights as late December storms ushered in a cold air mass over the West.

A weak high pressure ridge brought warm weather on the 5th and 6th. That ridge also allowed shortwave troughs to move through the region every couple days or so during the first couple weeks.

Numerous trees and power poles were snapped or toppled in Upland by Santa Ana winds on 22 January. These are only a few of many damages. Photos City of Upland.

The ridge amplified on the 9th through the 12th, bringing temperatures in the 70s and even a few 80s. Temperatures west of the mountains were boosted by offshore flow from the 10th to the 12th. Wind gusts ranged from 40 to 50+ mph mainly in foothills of River-side and San Diego Counties.

A weak upper low to the southwest brought very light rain (less than one-tenth inch) to mainly coastal areas on the 15th.

This was followed by more offshore flow on the 19th and 20th, strengthening to a particularly strong Santa Ana wind event on the 21st and 22nd. This was driven in large part by a trough of low pressure diving into Baja California from the northeast, providing ample upper wind support for the Santa Anas. Peak wind gusts in the foothills of the San Gabriel and San Bernardino Mountains and adjacent valleys ranged from 50 to 80+ mph. Numerous trees

and power poles in Upland, Ontario and Claremont were downed, crushing several vehicles, damaging homes and knocking out power.

Dry weather prevailed for the last week of the month, with a ridge of high pressure along the West Coast disallowing any storm's entry into California. Offshore winds blew on the 28th, with top gusts topping 60 mph in the foothills.

February

The dry offshore pattern continued for most of February, with many episodes of north-east winds.

The first of these came on the 2nd with peak gusts in the foothills and in the Inland Empire reaching 40 to 60+ mph. Riverside city suffered some tree damage as a result. Where it was calm overnight, it was cold, with widespread temperatures in the 30s at lower elevations.

Then came eight days of strong high pressure, offshore flow and temperatures well above average. 80s were common many of these days and several spots reached into the 90s, good for setting daily high temperature records. On the 12th, San Diego hit 91 and Chula Vista 93, each setting the highest February temperature on record.

A cold upper low dove down the state on the 15th and 16th, bringing wind, showers, a few thunderstorms, mountain snow dropping into the high desert. Up to 12 inches of snow was reported in the San Bernardino Mountains, including two inches at Cajon Summit. One inch was observed in Apple Valley and Palomar Mountain. Lightning strikes were common across parts of Orange and L.A. Counties, the Cajon Summit area and northern San Diego County. Thundersnow was reported from Lake Arrowhead. Rainfall was highly variable; mountains received 0.50 to 1.50 inch, and some lower elevations approached one inch, but other areas barely measured with a few hundredths.

Heavy snow of 10-13 inches accumulated at the Palomar Observatory on 22-23 February. Photo Kajsa Peffer - Caltech Astronomy.

A few days of dry offshore flow and local winds followed. The dry and cold air mass led to some valley frost where the winds calmed.

Another deep, cold trough bore down on Southern California on the 22nd and 23rd. This brought another round of wind, rain and mountain snow with low snow levels. This storm favored San Diego County with the greater amounts, including 2.50 inches in Pine Hills and Pine Valley and impressively 0.79 inch in Borrego Palm Canyon. Lower elevations logged between

just a few hundredths in parts of Orange County and the northern Inland Empire, to about one inch in inland San Diego County. Snowfall exceeded one foot in the higher mountains, with 14 inches tops at Mt. Laguna. Snow levels dropped below 3,000 feet, dusting Campo with a light covering.

The clearing skies in the cold air mass led to a few record low temperatures on the morning of the 25th, including a frigid 38-degree reading in San Diego.

Weak offshore flow returned once again from the 26th to the end of the month.

March

Fair weather started off March like a lamb, but then a double-barreled low pressure trough moved through Southern California from the 3rd through the 6th.

The first of these two waves cut off from the jet stream and brought wind, rain and mountain snow. The second wave dropped down from the north in the wake of the first wave. This brought colder air, lower snow levels and greater snowfall. Totals for both waves were quite variable: 1 to 2 inches in most of the mountains, one quarter to three quarters of an inch much of the coast and valleys, but less than one quarter inch in Orange County. Snowfall in the mountains ranged from 1 to 9 inches, except a foot or more at the Big Bear ski resorts.

On the 10th, an inside slider trough rotated through the region. It produced off-shore winds, with top gusts in the foothills from 50 to 70 mph. The air mass held enough instability and moisture to generate showers and thunderstorms in the mountains and deserts of San Diego County.

A series of fast-moving troughs followed by weak, fleeting ridges zipped through the western states from the 11th through the 19th. Each wave enhanced winds, particularly in the mountains and deserts where gusts of 40 to 60 mph were common.

On the 20th a trough moved through Southern California, packing winds and generally light rain. The mountains picked up around one half inch, while lower elevations received one tenth to about one third inch.

A high pressure ridge amplified along the west coast in the days that followed, leading to temperatures well above normal. They set several daily high temperature records particularly near the coast and in the mountains. Anaheim's 91 degrees on the 24th was remarkable.

A deep low pressure trough broke down that ridge and brought

This incredible fog bow (not making up that name) was captured on camera at Del Mar Beach on 24 March. Photo by lifeguard Tyler Grant.

stormy weather back to Southern California on the 28th and 29th. Rain and mountain snow was pretty generous, and some thunderstorms even entered the mix. Many mountains locations recorded over 2 inches of precipitation, including 1 to 4 inches of snow, and up to 6 inches at ski resorts. Roughly 0.25 inch to 1.50 inch of precipitation fell at the lower elevations. Thunderstorms in southern San Diego County produced a greater share.

For the last two days of the month, the calendar said spring and the marine layer took that cue. Low cloudiness covered the coastal basin, especially on the 31st, which dropped some drizzle and light showers.

April

Fair and seasonal weather got the month started under a weak low pressure trough over the West.

On the 5th and 6th strong high pressure aloft developed over the Pacific and nosed into California. This squashed the marine layer while temperatures climbed to record levels from the 6th through the 9th. Santa Ana conditions made the 8th was the most impressive day, with Anaheim reaching 106 degrees, Santa Ana 103 and Escondido 102. Other high temperature records, both max and min temperatures, were recorded during this time.

A large trough of low pressure gradually built into the West, bringing much cooler weather and strong winds to the coast, mountains and deserts. Low temperatures produced patchy frost in some inland valleys on the 13th. Mountain-desert gusts exceeded 50 mph across the wind prone areas on the 11th. Coastal winds of 25-35 mph were observed on the 12th. Light precipitation was also noted, from a few hundredths over some coastal areas to one-third inch in the foothills.

Snow Summit lived up to its name on 22 April. Three to four inches of new snow was reported (image Snow Summit webcam).

Weaker low pressure with weak shortwaves continue for the following week through the 21st. This allowed the marine layer to reestablish itself and provide more typical spring weather.

A much deeper trough swung through the region on the 22nd, bringing widespread precipitation, including snow in the mountains, and strong winds in the mountains and deserts. Rainfall amounted to

less than one-tenth inch near the coast, but increased up to one inch in the mountains. A few inches of snow were reported at Big Bear ski resorts. A batch of short-lived thunderstorms hit the front range of the San Bernardino Mountains. Strong winds in the Coachella Valley led to blowing dust which reduced visibility as low as two miles.

The jet stream remained active, allowing several more shortwaves to move through the region to finish out the month. Each wave enhanced winds in the mountains and deserts and the marine layer near the coast.

May

The seasonal weather continued through at least the first week of May. Numerous shortwaves passed through the West Coast and interior West to enhance onshore winds in the mountains and deserts. Strong winds in mountains and deserts exceeded 60 mph at several locations on the 8th.

A deeper trough bore down on the region on the 10th and 11th. This brought strong winds once again gusting over 45 mph.

The stronger than usual sea breeze combined with very dry vegetation to help a wildfire spread in the western edge of Laguna Niguel. The Coastal Fire raged uphill from the canyon source and took out at least 20 homes while burning 200 acres. Humidity was between 40 and 50% at the time of spread, which is a testament to the how dry the vegetation was.

High pressure built from the 12th through the 14th, boosting temperatures up into record territory. On the 14th, Chino reported a high of 101 degrees while Anaheim soared to 96. On the 15th, Ocotillo Wells managed 112 degrees and Palm Springs 108. Several small wildfires broke out in the high desert and Inland Empire, but without strong winds they were contained while still rather small.

The Coastal Fire burned an entire hillside on the western side of Laguna Niguel on 11 May. Photo Alex Tardy, NWS.

Weak troughs both small and large rotated through the West over the ensuing week through the 23rd. Temperatures averaged just below normal. May Gray started to assert its dominance.

A modest high pressure ridge built again, bringing temperatures above normal from the 24th to the 27th.

A broad trough of low pressure finished out the month on a cool note, with a deep and healthy marine layer. Some of the coast failed to see the sun for several days.

June

Right on schedule, the marine layer transitioned from May Gray to June Gloom with extensive cloud cover each night and morning west of the mountains. The marine layer shallowed starting on the 5th as high pressure aloft slowly and gradually strengthened. Coastal clouds remained tenacious at the immediate coast even during some afternoons as the warmer air aloft strengthened the marine inversion.

High pressure gradually built and temperatures gradually increased inland from the 6th through the 12th, peaking and achieving record levels in the mountains and deserts on the 10th and 11th. For example, Idyllwild tied a record on the 9th at 91 degrees, and set new records on the 10th and 11th, with readings of 92 and 91, respectively.

After some legitimate summer heat, spring returned as a low pressure trough moved through the West. Significant cooling resulted and some strong winds hit the mountains and deserts. Strong onshore winds developed on the 12th and continued through the 13th.

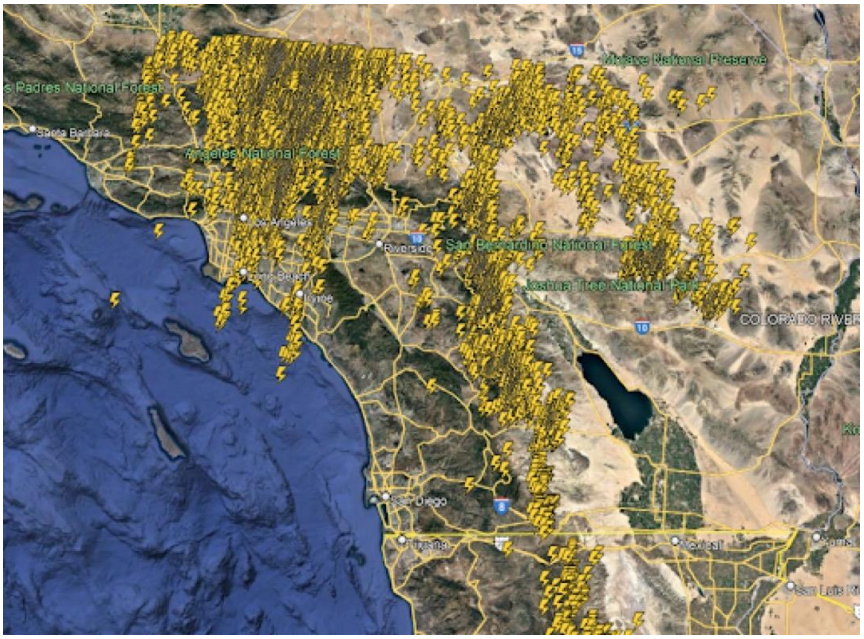
The Sheep fire (above) erupted during the heat of 11 June and spread during the winds of succeeding days. Photo CalFire.

Top gusts exceeded 50 mph through the Whitewater corridor. Several fires, some that had started during the heat wave, were boosted by these onshore winds. This largest was the Sheep fire near Wrightwood, which scorched 865 and was contained by the 19th.

A second, deeper trough of low pressure followed the previous wind maker, moving through the region on the 17th and 18th. It brought wind of its own, with top gusts in the mountains and deserts of San Bernardino County exceeding 40 mph.

These troughs keep the marine layer robust enough for typically cloudy weather at the coast.

High pressure rebuilt on the 20th, bringing a quick warmup, which brought above normal temperatures to finish out the month. Temperatures above 100 were observed in the inland valleys for several days.



The lightning plot from the night of 21 June through 22 June shows how widespread lightning was and rare June lightning near the coast. Image NWS.

On the 22nd, a low pressure trough off the coast drew in monsoon moisture to produce a rare June rainfall event, even near the coast.

Over one inch of rain was measured in a few gauges in the mountains of L.A. County. Mt. San Jacinto gauge received almost one inch. In San Bernardino County, a lot of places recorded up to one-third inch. Rare June rain near the coast approached 0.25 inch in Orange County, but most of the lower elevations recorded less than 0.10 inch. The bigger story may have been the frequent lightning coming from these thunderstorms, which sparked a few small wildfires in the Angeles National Forest.

June 2022 was among the warmest Junes on record for inland areas, with average temperatures 4 to 5 degrees above normal. The coast ended up near or even a little below normal.

July

A trough along the West Coast in conjunction with a high pressure ridge over the South-west contributed to a fairly seasonal first half of July across the region.

High pressure expanded westward from Texas, allowing temperatures to soar above 115 in the lower desert to as high as 119 in Ocotillo Wells.

As the high pressure ridge migrated north-ward, monsoon moisture was allowed to flow into the region from the southeast. This led to isolated thunderstorms on the 14th and 16th mainly over the San Bernardino Mountains and high deserts. A few spots in the San Bernardino Mountains received one half to 1 inch on the 14th. Eventually, the increased monsoon flow led to numerous showers and thunder-storms on the 17th and 18th across the mountains and deserts. Some of these even migrated off the coast of San Diego early in the morning of the 17th.

The heat stuck around on the 21st and 22nd before a weak trough brought some res-pite for a few days. Highs on both days were 113 at Palm Springs and 117 at Ocotillo Wells.

On the 24th and 25th, monsoon flow moved back into the region, sparking thunder-storms across the mountains and high desert. Nearly one inch fell in Johnson Valley and Landers.

After a few days, the monsoon flow deepened and produced many heavy thunderstorms across the mountains and deserts on the 30th and 31st. Isolated storms on the 30th around Big Bear area and Oak Glen produced a few flash floods. Numerous heavier storms struck on

Oak Glen (above, left, Twitter) got flash floods on Potato Canyon Road on July 30. On the next day, several debris flows (below, left) blocked and closed Highway 38 near Angelus Oaks for days. (Alex Tardy).

the 31st, particularly on the El Dorado burn scar, producing significant flash floods and debris flows that closed parts of highway 38 near Angelus Oaks for days. Some of the rainfall intensities exceeded 1 inch in 1 hour and a couple approached 2 inches per hour. Some weakening thunderstorms managed to drift across southern Orange County to the coast. Numerous storms in the high desert led to several flash floods.

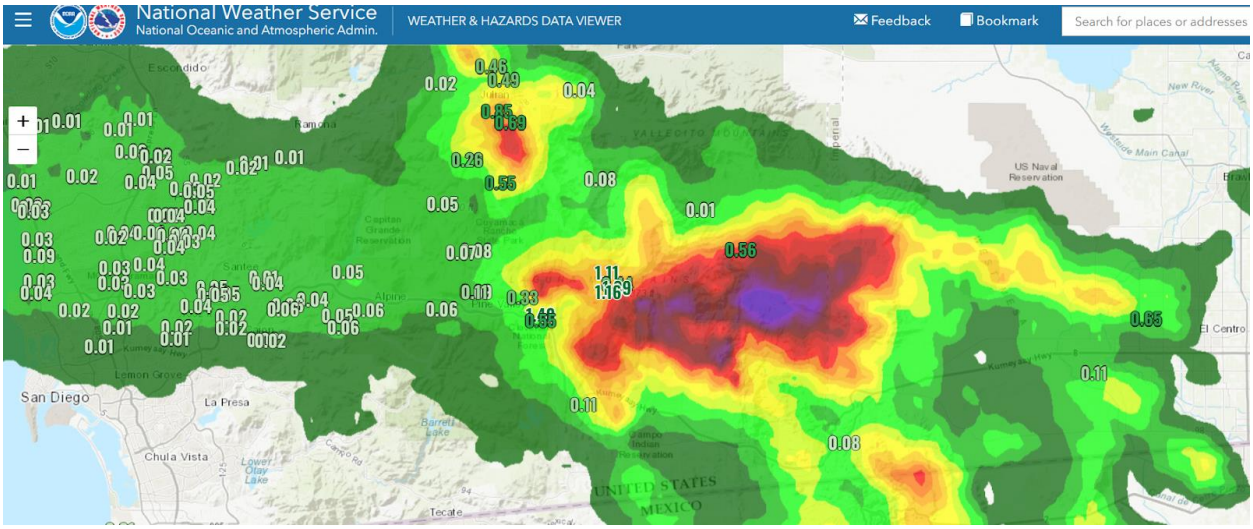
August

The first day of the month continued the theme of the last days of July, with thunderstorms producing heavy rainfall in the Big Bear area. Big Bear City received 1.20 inches.

August fell into a stagnant pattern of slightly above normal temperatures during a rather active monsoon season. August 4th through 16th was particularly active, with some thunderstorms observed on the 4th, 5th, 8th, 13th and 16th. Rainfall on these days often occurred in less than one hour, sometimes producing localized flooding.

August 8 featured some heavy storms in the mountains, with Mt. San Jacinto topping the list with 1.98 inches. This produced a flash flood that closed the Palm Springs Tram and stranded

visitors for a time. Another flash flood took out part of Highway S2 in the Anza Borrego Desert. That giant thunderstorm complex spread an anvil plume with light rain all the way to the coast across much of the San Diego metro area (see radar map below).



Another round of thunderstorms was especially impactful on the 13th. 2.28 inches at Yucaipa Ridge in a short time triggered debris flows and flash floods into Forest Falls. Aug. 16th brought another active thunderstorm day across the mountains and deserts, especially in San

Picturesque cumulonimbus (above) was captured on camera by forecaster Liz Schenk from Rancho Bernardo looking to the desert. Highway S2 (right) near Ocotillo suffered this serious washout from heavy storms on Aug. 8. (photo Craig Fischer). Several debris flows hit Forest Falls on Aug. 13, like this one (left). Photo by Warwick via Facebook.

Bernardino and Riverside Counties. Several of these storms produced wind gusts of nearly 50 mph.

Numerous thunderstorms developed each day from the 22nd to the 26th. The 24th featured notably stronger storms, with heavy rain rates of around 1 inch per hour over Toro Peak and strong wind gusts over 50 mph in the mountains of Riverside County.

The month finished a little drier, but with a warming trend. Exceptional heat started on the 31st, with Anaheim, Idyllwild and Campo recording record temperatures.

September

The last day of August was very hot, but served as only an appetizer for a very long-duration heat wave in early September. Veteran forecasters could not recall a major heat wave in our region that lasted so long.

The heat wave that gripped California from the end of August through the first couple weeks of September was one for the ages. Some weather experts and the California governor have called it the hottest and longest heat wave on record for September. Weather historian Maximilian Herrera declared that it was the "greatest September heat wave ever west of the Rockies hands down."

The Washington Post counted nearly 1,000 heat records that were broken across the West during the wave. Sep. 6 was especially record-setting. All-time highs were broken that day in Sacramento (116), King City (116), Santa Rosa (115), Napa (114) and San Jose (109). All-time highs were tied in Ukiah (117), Stockton (115) and Redwood City (110). On Sep. 5, Fairfield broke its all-time record at 117, while Livermore did the same with 116 degrees on Sep. 5 and 6.

Record highs for September were broken or matched on Sep. 6 at Bakersfield (115, tie), Vacaville (115, also Sep. 5), Marysville (115), Hanford (114), Fresno (114) and Modesto (111). (Chart below).

Record Highest Maximum Temp All-Time		**Record Highest Maximum Temp September**	
Fairfield	117 (9/5)	Vacaville	115 (9/5-6)
Ukiah (tie)	117 (9/6)	Bakersfield (tie)	115 (9/6)
Sacramento	116 (9/6)	Marysville	115 (9/6)
King City	116 (9/6)	Fresno	114 (9/6)
Livermore	116 (9/5-6)	Hanford	114 (9/6)
Santa Rosa	115 (9/6)	Modesto	111 (9/6)
Stockton (tie)	115 (9/6)		
Redwood City (tie)	110 (9/6)		

Salt Lake City tied its all-time high of 107 on Sep. 7. It broke its previous September record high five times in seven days.

Reno set a September record high of 106 on Sep. 6, beating the previous record of 104 set on Sep. 4, after tying the previous monthly mark of 102 on Sep. 2.

Utah and Montana each set the state record for highest temperature during September: 112 degrees in St. George, Utah, and 108 degrees at Big Horn, Montana.

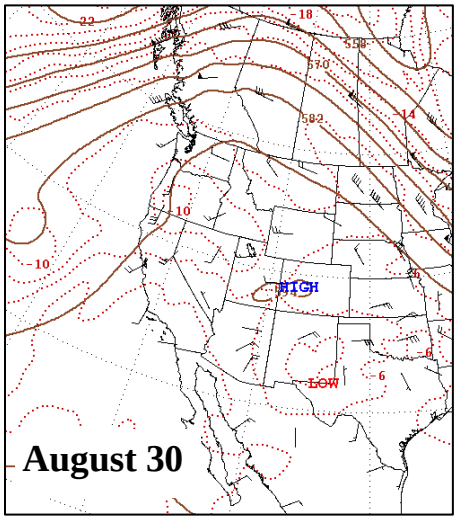
Death Valley hit 125 degrees on Sept. 6, falling just one degree shy of the September record for California and for the world. On Sep. 3, Death Valley's low temperature of 102 degrees tied the highest minimum temperature ever recorded worldwide during September. It reached 120 or more for nine days, a September record.

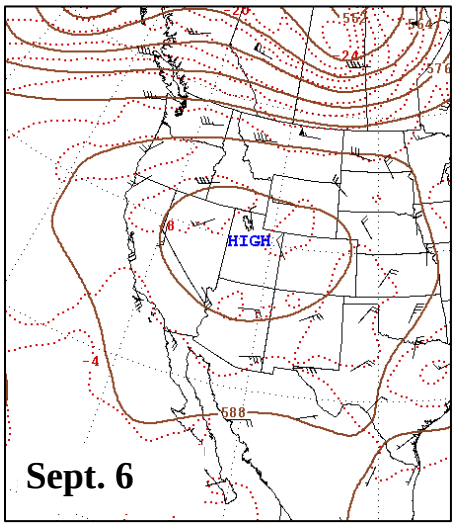
In Southern California, high minimum temperature records fell even more than maximum temperature records.

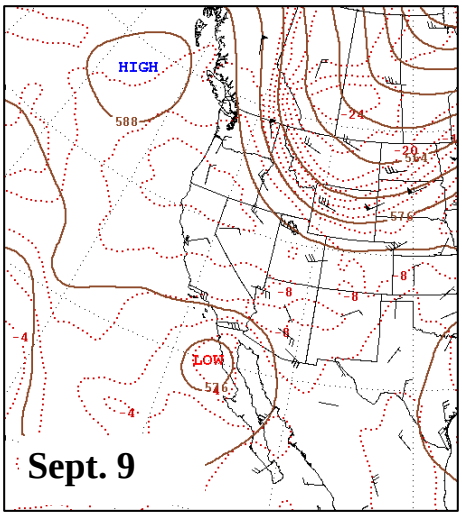
Burbank matched its all-time highest low temperature on Sep. 4, only dropping to 82 degrees. On Aug. 31, it set an August record high temperature of 112.

On the morning of Sep. 4, a burst of monsoonal heat hit the Southern California coast. This drove temperatures at sunrise into the upper 80s and lower 90s. In San Diego, it was 89 at 5 am and 91 at 7 am. The low in San Diego earlier that morning was 84, which would have shattered the all-time minimum temperature record of 78. But the calendar day of record stretched long enough to allow the temperature to drop to 78, achieved shortly before midnight that following evening, merely matching its all-time daily low record. Numerous other stations achieved

Record Highest Minimum Temperature All-Time		Record Highest Minimum Temperature September	
Riverside	80 (9/4)	Palm Springs	92 (9/5)
Chula Vista	78 (9/4)	Borrego Sps	89 (9/4)
San Diego (tie)	78 (9/4)	San Jacinto	79 (9/8)
		Anaheim	83 (9/9)
		Las Vegas	87 (9/4)



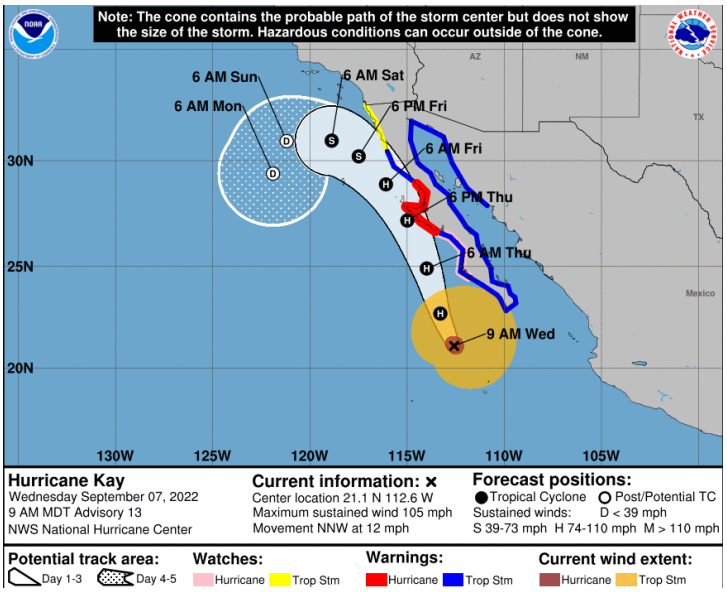




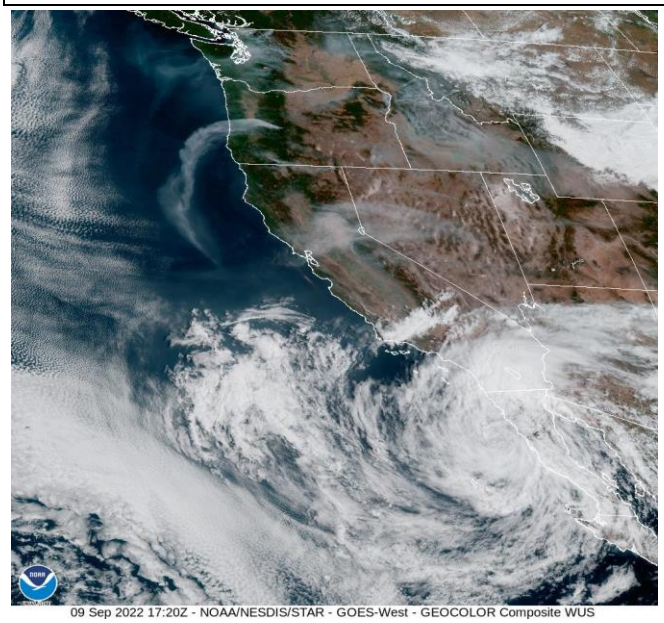
Strong high pressure developed over the West on Aug. 30 (above top, left), and peaked in strength at about 600 decameters over the Great Basin on Sep. 6 (above, lower left). Ultimately, it took post-tropical cyclone Kay to put a big enough dent into the high to bring in a new, albeit moist, air mass on Sep. 9 (above lower right).

their highest minimum temperatures on record all-time and for the month of September (see chart above).

What caused this long-duration heat wave? Strong high pressure developed at the end of August, peaked around Labor Day, then very slowly weakened as post-tropical cyclone Kay moved into the region on the 9th and 10th. The moist easterly (monsoonal) flow during this entire period kept humidity high and nights very warm.



The National Hurricane Center's (NHC) forecast track (above) for weakening Hurricane Kay on Sep. 7. Two days later, Kay was a dying tropical storm just off the northern Baja California coast (image NHC). Satellite imagery of Kay (below) on the morning of Sep. 9. (NOAA)



When the remnants of tropical cyclone Kay splashed into the region on Sep. 9, and brought a great deal of moisture and wind. The counter-clockwise circulation of the former hurricane was still spinning as the dying cyclone stumbled into Southern California. Suddenly, the focus of the forecast turned from extreme heat to strong, damaging winds and copious, flooding rainfall.

Highest Wind Gusts Sep. 9

Location	Speed (mph)
Cuyamaca Peak	109
Big Black Mountain	96
Sill Hill	91
Otay Mountain	81
Hauser Mountain	80
Mt. Laguna Obs.	80
Jamul	79
Toro Peak	77
Pine Cove Rocky Pt.	76
Boucher Hill	74
Fremont Canyon	73

Kay lived as a hurricane for about two days before it weakened into a tropical storm as she moved northwest toward California (see track on graphic at left). Outer bands of precipitation and strong, easterly winds would impact Southern California. The NHC correctly predicted that

Kay would weaken quickly, turn into a depression, and die in a few days. Strong, easterly winds arrived in Southern California before the rain did early in the morning of Sept. 9. These winds prompted a broad, area-wide high wind warning. Many observed wind gusts in the mountains and foothills ranged from 70 to 95 mph. One gust from Cuyamaca peak came in at 727 a.m. and registered 109 mph! Was this true? Nearby stations reporting gusts above 90 mph led to the credibility of this incredible report, which became the strongest measured wind gust observed in Southern California. Thankfully, wind gusts in the populated areas were not nearly as strong.

The moisture was deep and plentiful right on the heels of the strongest winds. Precipitable water as measured by the San Diego balloon sounding reached 2.35 inches on the afternoon of Sep. 9, a record level for September and the second wettest all-time in the sounding record back to 1956.

East winds forced a role-reversal for the usually leeward desert slopes of the mountains. The orographic flow was flipped, bringing the greatest rainfall of 2 to 6 inches from the Anza Borrego Desert to Mt. Laguna. The usual windward slopes became the rain shadow in this topsy-turvy world. Rainfall amounts of 2 to 4 inches were recorded, even in the desert. Mt. Laguna harvested the most with over 5 inches. Valleys and coastal areas in the rain shadow managed to receive only one tenth to about one half inch.

Two days of widespread, steady rainfall in the mountains and low desert were followed by two days of numerous thunderstorms across the mountains and valleys on Sept. 11 and 12. Unfortunately, a few of the more intense storms struck the El Dorado and Apple burn scars on Sept. 12, where Raywood Flats recorded a rain rate of 1.02 inch in 15 minutes and 2.44 inches in one hour! This triggered major debris flows into Forest Falls and Oak Glen, where 30 homes and businesses were damaged. Search and rescue operations found all missing persons but one, a woman who was killed in Forest Falls. 14 evacuees spent at least

Massive debris flows on Sep. 12 damaged dozens of homes and businesses, like this home (above) in Forest Falls (onscene.tv). Birch Creek in Oak Glen exceeded its banks and spread thick debris and boulders (below) across a long stretch of Potato Canyon Road (Alex Tardy).

one night at a Red Cross shelter. Several roads and highways in this area were blocked by debris and closed. Other massive debris flows, including large trees and boulders, flowed down Banning and Mias Canyons above Banning. Flash floods were also reported in Barona and Temescal Valley.

The Fairview Fire erupted on the 5th southeast of Hemet. The heat primed the dry fuels for rapid growth. Strong winds from Kay luckily came with wetting rains across the fire, which helped suppress the spread. The fire would eventually burn over 28,000 acres by containment mid-month. The Radford Fire near Big Bear Lake started on the same day and eventually burned over 1,000 acres.

The atmosphere gave Southern California a break for the next 10 days or so with a cooler air mass, the redevelopment of a marine layer and a return to more seasonal weather. A deep trough of low pressure brought Northern California rain from the 18th to the 21st, which was rather anomalous for September.

High pressure rebuilt across the Southwest on the 23rd, bringing more hot weather to the region from the 23rd to the 28th, but nothing like the heat at the beginning of the month. Temperatures went over 100 degrees in the Inland Empire and 90s were common elsewhere in the coastal basin.

The position of the high brought back the monsoon flow as well. A few thunderstorms started on the 23rd, but more significant storms fired up on the 25th, and then on the 27th through the 29th. Rainfall on the 25th measured as high as 0.50 inch in Warner Springs. On the 28th, a few rain gauges on Mt. San Jacinto received one half to nearly 1 inch. All measurements reflect heavy downpours of less than an hour. One cell on the 29th near Hot Springs Mountain was determined to be severe.

On Sep. 29, Jon Pederson captured a shot of a Ranchita thunderstorm and measured its hail (above). Lightning was caught on camera by spotter Will Wilkens at Oak Grove on Sep. 28 (right).

The month ended on a cool note, with the marine layer fighting back the monsoon flow.

October

Fair and benign weather was observed for the first few days of the month under weak high pressure aloft.

A weak upper low drifted south into Sonora, Mexico, allowing the easterly flow in Arizona to grab monsoon moisture and send it into Southern California. This produced several days of monsoon thunderstorms from the 6th through the 10th, quite late in the season.

On the 6th, a complex of severe thunderstorms over Imperial County produced a massive haboob (dust storm) that pushed into San Diego and Riverside Counties, even west of the mountains. Wind gusts of 55 mph were clocked in Imperial and over a few of the peaks of San Diego County. Visibility in dust was reduced to near zero across much of the desert floor.

The haboob on 6 October (above) swallowed up highway 78 near Ocotillo Wells (CHP). A landspout (right) was captured on camera in Menifee on 8 October (John Pederson).

On the 8th, thunderstorms produced a landspout in Menifee and another at the foot of Palomar Mountain.

An upper low swung down the coast on the 11th and 12th, producing more elevated thunderstorms that spread across the entire region, even over the coast and the ocean. 1,132 lightning strikes on the 11th were detected in San Diego County alone. On the 12th, hail blanketed an area around Lake Arrowhead. A heavy storm produced a debris flow on the Fairview burn scar south of Hemet, which closed Hwy. 74.

The upper low cut itself off of the jet stream but strengthened on the 15th and 16th. Widespread rain and thunderstorms were the result. This time the low deserts harvested much of the rain. One-half to over one-inch amounts were common in the mountains and deserts of Riverside and San Diego Counties.

High pressure over the interior West pushed offshore—Santa Ana winds across Southern California on the 18th and 19th. The winds weren't that strong, but they boosted coastal temperatures into the 90s, including 95 degrees at San Diego.

A deep trough moved through the West, producing strong westerly winds in the mountains and deserts on the 22nd, and top gusts exceeding 60 mph.

A stronger offshore Santa Ana wind event on the 24th produced some gusts of 40 to 60 mph in the foothills.

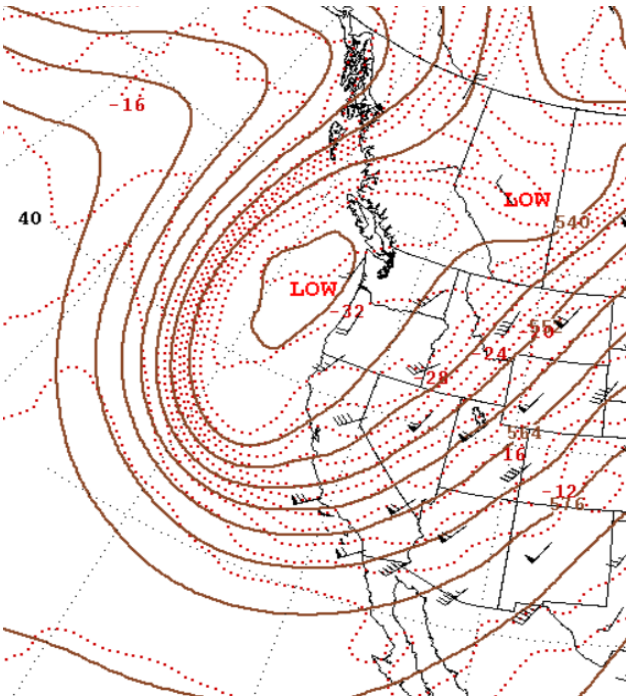
The longwave trough over the West didn't go away, so cooler than normal weather continued the last week of October. The shortwave troughs did lift and allowed the pattern to moderate somewhat, with fair weather and closer to normal temperatures.

November

Just as the calendar turned, it signaled the first Pacific storm to arrive on the 1st and 2nd. Generally less than one-quarter inch fell in lower elevations, but mountains harvested impressive amounts of 0.50 to 2 inches. This also brought the first light snowfall to the mountains.

Fair but cool weather returned for several days thereafter.

On November 8-9, a deep trough of low pressure with copious moisture brought heavy rain and mountain snow to the region. Winds gusted to over 70 mph in the mountains, downing trees and triggering minor power outages. An impressive gust of 101 mph was recorded at Burns Canyon (east side of San Bernardino Mountains). Heavy rain resulted in urban flooding, including three fatalities in a channel in Cucamonga creek. Total rainfall amounted to 1 to 2 inches coast and valleys, and 3 to 5 inches in the mountains. A peak of 9 inches was recorded in



The upper low (above) on 8 Nov was anomalously strong and deep for early November. Several inches of new snow were captured at Snow Summit (above, right). Photo James Hype.

Lytle Creek. Snow fell as low as 5,500 feet with 1 to 3 inches at 6,500 feet and as much as 6 inches at Bear Mountain.

The storm was followed by cool weather and a series of upper lows that served as inside sliders, pushing flow offshore in regular intervals. Offshore wind events occurred on November 15-16, 19-20, and 24-25 (Thanksgiving holiday).

Peak wind gusts on the 15th and 16th exceeded 80 mph for a few locations in the foothills of the San Bernardino, Santa Ana, and San Diego County Mountains. Many more spots exceeded 60 mph. Fuels (vegetation) was relatively damp from the recent storm, so fire activity was minimal.

On the 19th and 20th, another offshore push produced wind gusts 50 to 70 mph, mostly in the same foothills, but also partially into the northern Inland Empire. Fontana reached 59 mph and Rialto 58 mph.

Thanksgiving brought more offshore winds, with many gusts 60 to 77 mph in the foothills. Sill Hill was the extreme outlier, achieving 88 mph. These winds were propelled by an upper low diving south through the Southwest.

Warm weather followed from the 25th to the 27th, with temperatures in the 70s and low 80s.

A trough pattern finished the month on the cool side. At times this produced a deep marine layer and clouds west of the mountains, and very light precipitation on the 29th around San Diego.

December

The longwave pattern continued to maintain a trough of low pressure over the West Coast for the first half of the month.

A series of shortwave troughs moved within the longwave trough through the region during the first week. Each of these produced light precipitation (mostly less than 0.10 inch) from the coast to the mountains, but around one quarter inch was reported near the Cajon Summit area. An atmospheric river brought copious rainfall to northern and central California these days.

That atmospheric river was steered into Southern California by a deep trough, and brought rain, mountain snow and strong winds on the 11th and 12th. Rainfall ranged from 0.50 inch to 2 inches in the lowlands, generally 2 to 4 inches in the mountains (except outlier Lytle Creek topped the list with 5.03 inches), and 0.03 to about one-third inch in the deserts. Snowfall reached over one foot at Snow Valley, totaled 10 inches at Green Valley Lake, 9 inches at Forest Falls, and 8 inches at Mount Laguna. Several inches of snow accumulated across most of the mountains as the snow level dropped to 3,500 feet, where Descanso reported 1 inch.

Areas of urban flooding developed, and swift-water rescues were made in Ontario and Anaheim. Snow on highway 18 trapped scores of vehicles at 4,000 feet and also along the Arctic Circle, closing the highway.

Skies eventually cleared and a cool air mass settled in, which included several frosty nights for parts of the valleys from the 12th through the 15th.

Offshore winds on the 16th produced top gusts around 50 mph in the foothills, with some gusts around 35 mph in adjacent valleys.

A weak trough through the 19th continued the cool weather with occasional clouds, but dry weather.

The pattern gradually shifted from the 20th through the 22nd and a ridge pattern established itself along the West Coast. This pattern shift helped temperatures move above normal for the first time in weeks by the 22nd. The Christmas weekend was quite warm and sunny, with temperatures in the 80s at lower elevations.

Julian became a winter wonderland on 12 December with a few inches of new snow (above, photo visitjulian.com). The view east toward snowy Cuyamaca Peak on 13 December (below) was captured by Maura White of San Diego Country Estates.

The pattern reverted to a cooler, wetter regime as a storm brought a good soaking rain to the region on the 27th and 28th. The precipitation favored San Diego County slightly, with top measurements over one inch in the mountains. Lower elevations recorded from one-third inch to nearly one inch.

Cool and unsettled conditions prevailed through the 30th.

Rare dense fog developed in the Coachella and Imperial Valleys on the morning of the 31st.

A more potent storm moved in late on the 31st, and continued into New Year's Day. The heaviest band of rain straddled the region just as the clock struck midnight to ring in the new year on a decidedly wet note. Many mountain locations recorded over 4 inches of precipitation, mostly rain. Lytle Creek took top honors with 5.85 inches storm total. Lower elevations

generally got 1 to 2 inches, but Coto de Caza overachieved with 3.62 inches. Street and stream flooding was observed in many areas, and was particularly serious next to the Fairview burn scar south of Hemet. Snowfall up to 8 inches fell at Snow Valley, with 3 to 7 inches common around Big Bear Lake. The snow fell only during the later colder stages of the storm on New Year's Day. Strong winds accompanied this band with some gusts over 60 mph on ridgetops and adjacent desert slopes. The highest measured gust was 79 mph at Toro Peak. Gusts near the coast reached 35 to 40 mph and toppled several trees.

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Summaries were written by Miguel Miller, editor of the NWS San Diego's quarterly newsletter *Coast to Cactus Weather Examiner.*