Coast to Cactus Weather Examiner

Enhanced Decision Support in the Pandemic Era
by Casey Oswant, Dan Gregoria and Miguel Miller

The National Weather Service has adapted and evolved to a new kind of service, called impact-based decision support service (IDSS). Partners, such as those in emergency management who play a role in delivering the NWS mission to protect life and property, now receive greater support in the sometimes life-or-death decisions they make when hazardous weather approaches.

What does IDSS look like in our region? And how has the NWS San Diego (NWSSD) adapted in the pandemic era? NWSSD meteorologists Dan Gregoria and Casey Oswant explain.

Twice daily, the National Weather Service produces a routine forecast for the next seven days. Forecasters make predictions for weather elements like temperature, wind direction and speed, the chance of precipitation, rain and snow amounts, and much more. On top of routine forecast products, forecasters at NWSSD provide numerous briefings to help our core partners make key decisions whenever a storm threatens.

Core partners of the NWS include emergency managers, public health officials, city officials, police and fire departments, public safety departments, lifeguards, and swift-water rescue teams. We work in a collaborative manner with our partners to develop and tailor briefings to meet their needs. The forecast information that we provide in these briefings plays a critical role in helping them make decisions for situations including, but not limited to, community evacuations and resource deployment. This is

Inside this issue:

Flooding in Garden Grove (below left, Brett Trimper) and snowfall leading to icy roads in the San Jacinto Mountains (below right, Alex Tardy) are two of many impacts for which partners need to prepare.

Enhanced Decision Support in the Pandemic Era —continued

what impact-based decision support services (IDSS) is all about - **providing the forecast information that partners need to support their decisions**. These tailored weather briefings have expanded over the years, necessitating a dedicated meteorologist each day working to directly support our partners. This is in addition to the typical and traditional two forecasters on each shift. If at least some precipitation is forecast, many IDSS briefings are completed at least once a day leading up to and during a storm. Here are some of the most common briefings.

General Weather Briefing: The NWSSD produces a general weather briefing daily for all of our partners, covering the impactful weather that may be coming over the next week and sometimes beyond. This briefing serves as a "heads up" for long term potential weather impacts, while providing more detail as these impacts loom closer in time. However, some partners need additional, more specific forecast information for their decision-making.

Weather Decision Support Services
National Weather Service - San Diego
Issued: 1:00 PM January 8, 2021
Next Update: Midday Saturday
Point of Contact: NWS Operations (24/7/365) (858)

Burn Scar Briefings: To prepare for situations that damage property and are potentially life-threatening, emergency managers and other officials need more detailed information. For our region this is especially true near recent burn scars. The risk of life-threatening debris flows is greatly increased where areas have been burned in wildfire. As such, we produce very detailed briefings for recent burn scars for about two years, including projected rainfall amounts and, more importantly, the peak rainfall rates that are possible. Evacuation decisions are then made based off of these briefings. Due to an active 2020 fire season, we've been providing separate burn scar briefings for officials in Riverside and San Bernardino

NWS San Diego - El Dorado/Apple/Snow
Burn Scar Debris Flow Briefing
Decision Support Services 24/7: (858) _____ (restricted)
Issued 1300 Friday December 25, 2020

Monitoring website: https://www.wrh.noaa.gov/sgx/kml/applefire.php

Time period (6 or 12-hour) Day of week	1800-2400 Sun	0000-0600 Mon	0600-1200 Mon	1200-1800 Mon	1800-2400 Mon	0000-0600 Tue	Max Rate
El Dorado and Apple Burn Scar Rainfall (inches)							
Prob. Tstorm %	0	5	15	15	5	0	
Max 1-Hour Rate 8000 feet	0.05	0.25	0.35	0.40	0.10	0.05	0.40
Max 1-Hour Rate 4000 feet	0.05	0.25	0.35	0.40	0.10	0.05	0.40
Rate Confidence	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	
Total Rainfall 8000 feet	0.00-0.05	0.20-0.35	0.30-0.45	0.30-0.50	0.00-0.10	0.00-0.05	0.80-1.50

Confidence: Low <30%, Moderate = 30-70% and High >70%

Counties (El Dorado, Apple, and Snow), Orange County (Blue Ridge and Silverado), and San Diego County (Valley). We also provide verbal weather briefings on conference calls and informal calls with county emergency managers and other officials.

CalTrans Briefings: NWSSD provides rain and snowfall forecasts for the mountains in support of CalTrans operations. These briefings provide detail on how much precipitation is forecast in the mountains, including the projected snow level and snow amounts at various elevations. They help CalTrans operations prepare for upcoming winter storms, whether it be for resource deployment or safety measures, such as signage to alert motorists to poor road conditions.

NWS San Diego - Caltrans Mountain Weather Briefing
Decision Support Services 24/7: (858) _____ (restricted)
Issued 1500 PST Sunday December 27, 2020

Monitoring website: https://www.wrh.noaa.gov/sgx/kml/holyfire.php

Time period (12-hour)	1200-2400 Sun	0000-1200 Mon	1200-2400 Mon	0000-1200 Tue	1200-2400 Tue	Total or maximum*
San Bernardino County Mountains Rainfall and snowfall* (inches)						
Max 1-Hour Rate	0.05	0.40	0.40	0.05	0.00	0.40
Rate Confidence	Moderate	Moderate	Moderate	Moderate	Moderate	
Total Rainfall (inches)	0.05-0.10	0.60-1.10	0.60-1.00	0.05-0.10	0.00	1.30-2.30
Fog Level (MSL feet)	4000-8000	4000-8000	3000-8000	3000-8000	No Fog	
Snow Level (MSL feet)	5500-6000	4500-5000	4000-4500	3500-4000	3500-4500	
Snowfall 5000 feet	0	Trace-4	4-6	Trace	0	4-10
Snowfall 6500 feet	Trace	5-8	4-8	Trace	0	9-16

Enhanced Decision Support in the Pandemic Era —continued

NWS San Diego - Urban-Rural Rainfall Rates
Swiftwater Decision Support Services 24/7: (858) ▬▬▬ (restricted)
1230 PST Wednesday, December 23, 2020

Monitoring website: https://www.cnrfc.noaa.gov/ (forecasts)

https://www.weather.gov/sgx/Hydro (rainfall and rivers)

https://tidesandcurrents.noaa.gov/ (tides)

Time period (12-hour)	0000-1200 Mon	1200-2400 Mon	0000-1200 Tue	1200-2400 Tue	0000-1200 Wed	Max Rate/Total Precip
Orange County and Inland Empire Rainfall rate (inches)						
Max 1-Hour Rate	0.20	0.40	0.10	0.05	0.00	0.40
Rate Confidence	Moderate	Low	Low	Moderate	Moderate	
Total Rainfall	0.10-0.20	0.30-0.50	0.05-0.10	0.05-0.10	0.00	0.50-0.90

Swiftwater/Department of Public Work Briefings: Specific rainfall forecasts are made for the Department of Public Works and Swiftwater Rescue teams in the Inland Empire, San Diego County and Orange County. This briefing provides detailed information on rainfall amounts and intensity in 6- or 12-hour time frames. With this rainfall forecast, they can prepare for a storm, whether it be for water sampling activities, resource readiness or deployment for potential flash flood or swift-water rescues.

When demand for briefings increases, the Impact-based Decision Support Services (IDSS) forecaster shifts into high gear. In addition to completing partner briefings in writing, by phone and by video, they post on social media and do media interviews.

In the case of the December 28 storm, we started messaging the potential for impactful rainfall in our daily partner briefing as early as December 20. This included a general heads up of threats included in our 7-day Threat Matrix (sample below). In order to give partners ample time to prepare for the potential destructive impacts of the upcoming rainfall, briefings specifically addressing rainfall rates and our confidence in their occurrence started December 23. From that point until the rainfall event on December 28, the DSS forecaster completed six briefings a day. These briefings are sent to help decide when to test ocean water quality, if and where chain controls will be needed, if neighborhoods near burn scars will need to be evacuated, and if emergency/rescue departments need to increase staffing.

Threat Matrix
San Diego County, San Diego County Coastal Waters, Orange County, Western Riverside County, Southwest San Bernardino County

UPDATED: 01/20/2021 7:18 AM

Weather Threat	Wed 01/20	Thu 01/21	Fri 01/22	Sat 01/23	Sun 01/24	Mon 01/25	Tue 01/26	Wed 01/27
Urban Rain (Driving Impact)	Yellow	Green	Yellow	Orange	Yellow	Orange	Orange	Yellow
Flooding	Orange	Green	Green	Green	Yellow	Yellow	Yellow	Green
Thunderstorms	Green	Green	Green	Green	Green	Yellow	Yellow	Green
Snow	Yellow	Green	Green	Orange	Yellow	Red	Red	Yellow
Non-Thunderstorm Winds	Red	Green	Green	Green	Green	Orange	Yellow	Green
Fire Weather	Orange	Green	Green	Green	Green	Green	Green	Green
Extreme Temperatures	Green	Green	Green	Green	Green	Green	Green	Green
Fog	Green	Green	Green	Green	Green	Green	Green	Green
Coastal	Yellow	Green	Green	Green	Green	Green	Green	Green
Marine	Yellow	Green	Green	Green	Green	Yellow	Yellow	Yellow

Impact Scale	None	Minor	Moderate	Major	

Threat Matrix link: www.wrh.noaa.gov/sgx/event/dsstable.php

The trigger for beginning these briefings varies depending on the requesting agency. County Public Works departments usually need briefings when even a very small amount of rain is expected, while more moderate rainfall/snowfall needs to be expected to begin burn scar and department of transportation briefings. Once the precipitation forecast meets the partner's criteria, our office Warning Coordination Meteorologist signals to operations that these briefings need to begin. As we get close to the event, county emergency management officials may request daily, or even twice daily conference calls. The IDSS forecaster can verbally communicate the forecast to our partners and answer any specific questions. It also allows our office to stay situationally aware in regards to the actions that our partners are taking. In recent years, a meteorologist has been deployed to emergency operation centers (EOCs) during major storms to provide in-person support. During the pandemic, we've had to transition our partner support to all virtual, leveraging the conference calls, and making additional frequent calls to emergency operation officials to give them a heads up to any major forecast changes. We let them know when we make watch and warning decisions that could impact their decisions and operations.

Another Wildfire Means More Debris Flow Planning by Alex Tardy

In November and December 2020, a series of Santa Ana winds dried out an already dry Southern California region, producing high fire danger. Strong winds and low humidity contributed to new wildfire starts. CalFire was able to keep most fires under 500 acres, but another large wildfire erupted in a remote and rugged region of eastern Orange County.

The Bond Fire started in a home and then spread rapidly through vegetation, consuming 7,000 acres and connecting to the Silverado burn scar, which had burned in October. The Bond fire was relatively small, but the soil was severely and deeply burned on steep canyon walls.

CalFire formed a Watershed Emergency Response Team (WERT) to analyze the burn severity and for input into the USGS debris flow modeling. This region has a history of fatalities including several in 1969 and another from a rockslide. The USGS modeling resulted in a significant debris flow when rainfall above 25 mm/hour (~1 inch/hr) was used. A rate of 30 mm/hour (~1.18 inch/hr) corresponded to a return interval occurring once nearly every two years in history.


The WERT team also found dozens of year-round residences in White and Wildcat Canyons that were directly in the path of potential mud and debris flows (Values at Risk). There is only one road to get into and out of the canyons, a sensitive situation. Therefore, all

Significant landmarks on the Bond Fire burn scar (above). Colors show the USGS basin debris flow probability exceeding 15 minute rainfall. WERT survey using the USGS modeling (below).

partners agreed to use a lower threshold for flash flood watches and warnings for this burn scar, similar to those on the El Dorado fire in the San Bernardino Mountains.

Since the WERT briefing, there have been special planning calls and meetings with Orange County emergency management and the state office of emergency services (CalOES). Orange County hosted a virtual town hall to discuss threats to the area and how weather could result in evacuations and road closures. Citizens in this region were already challenged with power outages, road closures and evacuations during the early December wildfire.
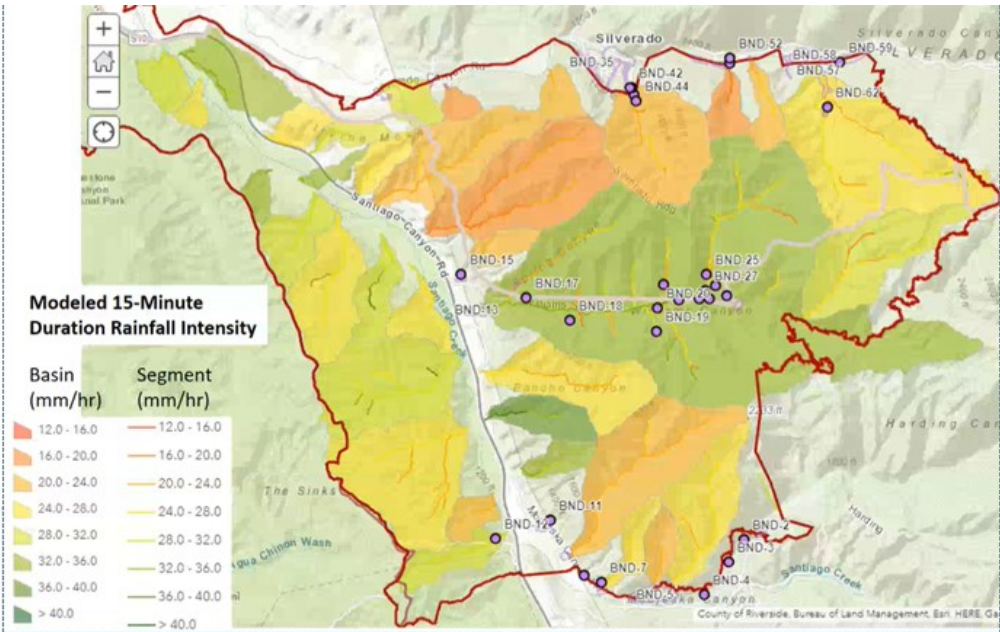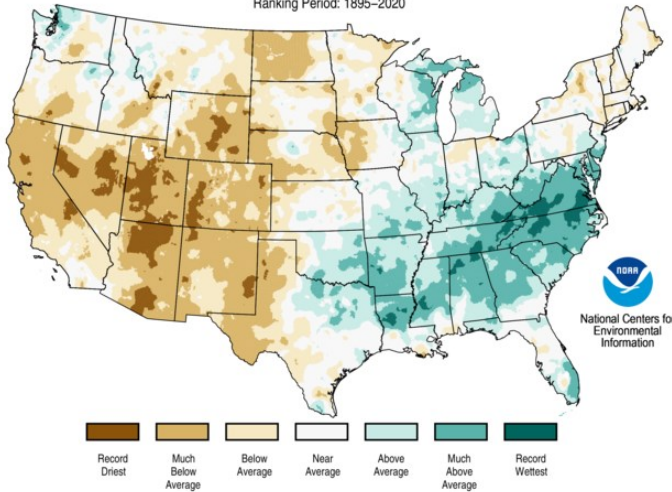
Findings from the U.S. Climate Assessment for 2020 - from NCEI

For 2020, the average contiguous U.S. was 54.4°F, 2.4°F above the 20th-century average, ranking fifth warmest in the 126-year period of record. The five warmest years on record have all occurred since 2012.

Most of the contiguous U.S. experienced above-average temperatures during 2020. Ten states across the Southwest, Southeast and East Coast had their second-warmest year on record. There were no areas of below-average annual temperatures observed across the Lower 48 during 2020.

The annual precipitation total for the contiguous U.S. was 30.28 inches, 0.34 inch above average, ranking in the middle third of the historical record.

Mean Temperature Percentiles
January–December 2020
Ranking Period: 1895–2020

National Centers for Environmental Information

Record Coldest | Much Below Average | Below Average | Near Average | Above Average | Much Above Average | Record Warmest

Created: Wed Jan 06 2021

Data Source: 5km Gridded Dataset (nClimGrid)

Total Precipitation Percentiles
January–December 2020
Ranking Period: 1895–2020

National Centers for Environmental Information

Record Driest | Much Below Average | Below Average | Near Average | Above Average | Much Above Average | Record Wettest

Created: Wed Jan 06 2021

Data Source: 5km Gridded Dataset (nClimGrid)

Above-average annual precipitation was observed from the Great Lakes and Plains to the Southeast and Mid-Atlantic regions. North Carolina had its second-wettest year on record during 2020 and Virginia was third wettest. Below-average precipitation fell across much of the West, northern Plains and parts of the Northeast. Nevada and Utah ranked driest on record for 2020 with two additional western states ranking second driest.

During 2020, several North Atlantic hurricane season records were broken. Thirty named storms formed, which breaks the previous record of 28 set in 2005. Twelve named U.S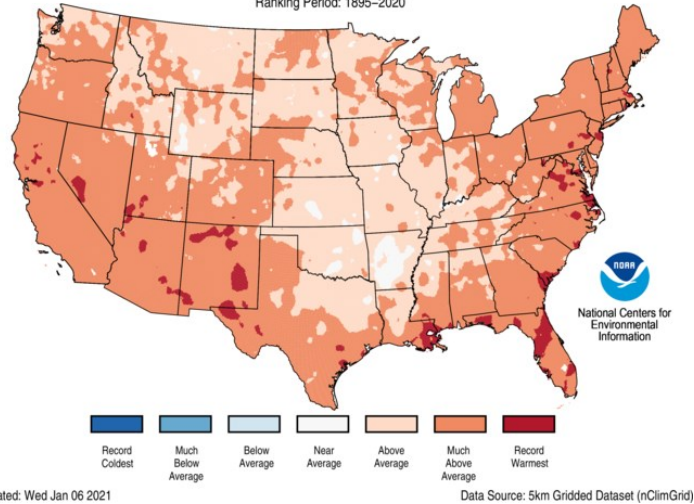. storm continental landfalls occurred during 2020. This breaks the previous annual record of nine landfalls set in 1916.

It was the most active wildfire year on record across the West. Five of the six largest fires in California history and the three largest fires on record in Colorado occurred during 2020.

22 separate billion-dollar disasters were identified during 2020, breaking the previous record of 16 set in 2011 and matched in 2017.

2020 billion dollar disasters: www.climate.gov/news-features/blogs/beyond-data/2020-us-billion-dollar-weather-and-climate-disasters-historical

U.S. Selected Significant Climate Anomalies and Events for 2020

Coldest winter (Dec–Feb) since 1999. Coldest year since 2012. The lowest known mean sea level pressure on record for AK was observed at Shemya on Dec 31 — 924.8 mb (27.31 in.).

CONUS drought coverage expanded throughout much of 2020 with a minimum extent of 9.6% occurring on Feb 18 and maximum coverage of about 50% on Dec 22. Drought conditions expanded or intensified across much of the western U.S. and southern to central High Plains throughout 2020. D3 and D4 drought coverage in Dec was the largest CONUS extent since Aug 2012.

It was the most-active wildfire year on record across the West. The 3 largest wildfires in CO history and 5 of the 6 largest wildfires in CA history occurred during 2020.

The Death Valley temperature observation of 130°F on Aug 16 was the hottest CONUS temperature in 2020 and 3rd-warmest temperature on record for any month across CONUS.

Warmest year on record for Kahului and Hilo.

Aug 10 severe weather, associated with a derecho, stretched from SD to OH with most damaging impacts across IA. This was one of the costliest weather disasters across the U.S. in 2020.

Overnight EF-3 and EF-4 tornadoes on Mar 2–3 caused more than $1 billion in damage and multiple fatalities across the greater-Nashville metro area.

More than 140 tornadoes were reported during the Apr 12–13 tornado outbreak from TX to MD. This multi-billion dollar disaster was associated with the most fatalities during a tornado outbreak since Apr 2014.

12 named U.S. landfalling tropical cyclones occurred during 2020, breaking the annual record of 9 landfalls set in 1916. It was the most-active North Atlantic hurricane season on record.

Drought was most notable across Puerto Rico in Jun and Jul, affecting over half the island.
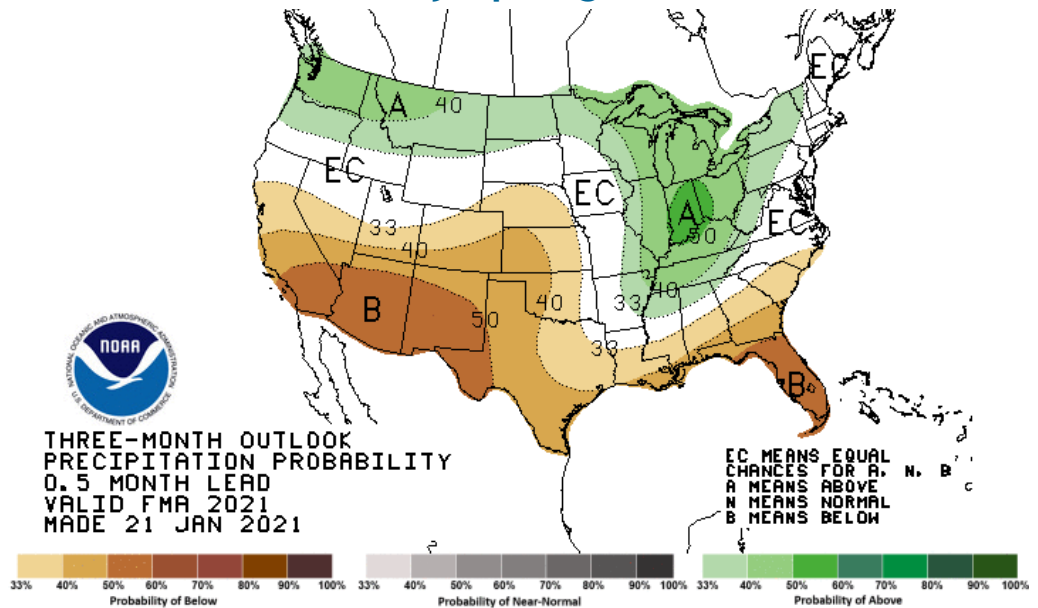
2020 was the 5th-warmest year on record; the average U.S. temperature was 54.4°F, 2.4°F above average. 2020 U.S. precipitation average was 30.28 in., 0.34 in. above average, ranking in the middle third of the historical record.

Please Note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: http://www.ncdc.noaa.gov/sotc

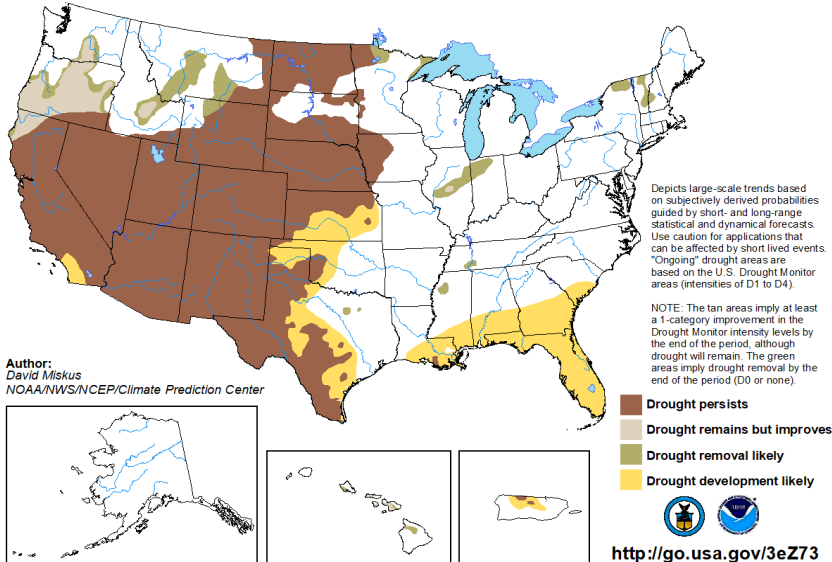# Outlook for the Rest of Winter and Early Spring 2021

The Climate Prediction Center (CPC) released their latest three monthly outlooks on 21 January. With La Niña the main player through the rest of winter, here is the prognosis through April.

The **three month precipitation outlook** (right) shows a decent tilt in the odds for a drier than average February, March and April across most of California, especially the Southwest, and in the far Southeast. Wetter than av-

THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
VALID FMA 2021
MADE 21 JAN 2021

EC MEANS EQUAL CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW

erage conditions are favored for the far north, the Great Lakes region and the Ohio Valley.

The **Seasonal Drought Outlook** for mid-January through April (left) shows drought development for far southwest California, joining the rest of the state and most of the West in drought conditions.

The **three month temperature outlook** (below) projects a tilt in odds toward above normal temperatures for most of the country, especially the Southwest. Only the Pacific Northwest is favored for cooler than average weather.

U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period

Valid for January 21 - April 30, 2021
Released January 21

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Author:
David Miskus
NOAA/NWS/NCEP/Climate Prediction Center

Drought persists
Drought remains but improves
Drought removal likely
Drought development likely

http://go.usa.gov/3eZ73

For more detailed information on these outlooks, including an interactive map where you can pinpoint a specific location's outlook, go to:

www.cpc.ncep.noaa.gov/ products/predictions/ long_range/interactive/ index.php

THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.5 MONTH LEAD
VALID FMA 2021
MADE 21 JAN 2021

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New Seasonal Precipitation Model Shows Promise adapted from CW3E

The Center for Western Weather and Water Extremes (CW3E) assembled a team of experts in weather and climate prediction to improve seasonal prediction of precipitation, atmospheric rivers (ARs), and ridging events over the western U.S. region. The team consists of Alexander Gershunov, Marty Ralph and many others.

As part of this overall effort to benefit water resource management across the western U.S., researchers at CW3E have implemented and tested an analysis model to develop an experimental seasonal precipitation prediction over the southwestern U.S. Precipitation forecasts are generated early each month starting in September, targeting subsequent three-month periods spanning the remaining active part of the water year ahead.

The initial experimental seasonal prediction effort is based on the tropical and north Pacific monthly sea surface temperature anomalies to predict total seasonal precipitation over the Southwest. This model will be further improved and expanded to predict things like temperature, snowpack and streamflow in upcoming years.

How did the model perform for the 2019-2020 winter?

Figure 1 (right) presents the forecast precipitation anomaly for January-March 2020 issued in early November 2019, along with the observed October SST predictor field, the expected skill, and subsequently observed precipitation anomaly. Although much of the seasonal prediction skill is predicated on ENSO phase, fall 2019 was ENSO-neutral, but it was marked by a distinctive PSST anomaly pattern featuring a warm anomaly around the Aleutian Islands (Figure 1a). The predicted precipitation anomaly was essentially a NNW-SSE-oriented dipole of dry-wet anomalies (Figure 1b). Expected skill was significant in the west and south parts of the southwestern domain (Figure 1d), and in these regions, the forecast performed rather well. The observed precipitation anomaly (Figure 1c) generally resembled the forecast (Figure 1b) everywhere except, most notably, in southeastern Colorado. In California, the general pattern of dry north-center and wet in the southern desert was well predicted.

In general, JFM is the most predictable season. But interestingly, the most accurate prediction was made with October 2019 PSST, at 3-month lead-time, beating the November and December predictions. December PSST failed to correctly predict the observed anomaly pattern, in

JANUARY–MARCH (JFM) 2020 PRECIPITATION PREDICTED FROM OCTOBER 2019 PSST

a) October PSST predictor (°C)

b) JFM '20 forecast Precip. anomaly (%)

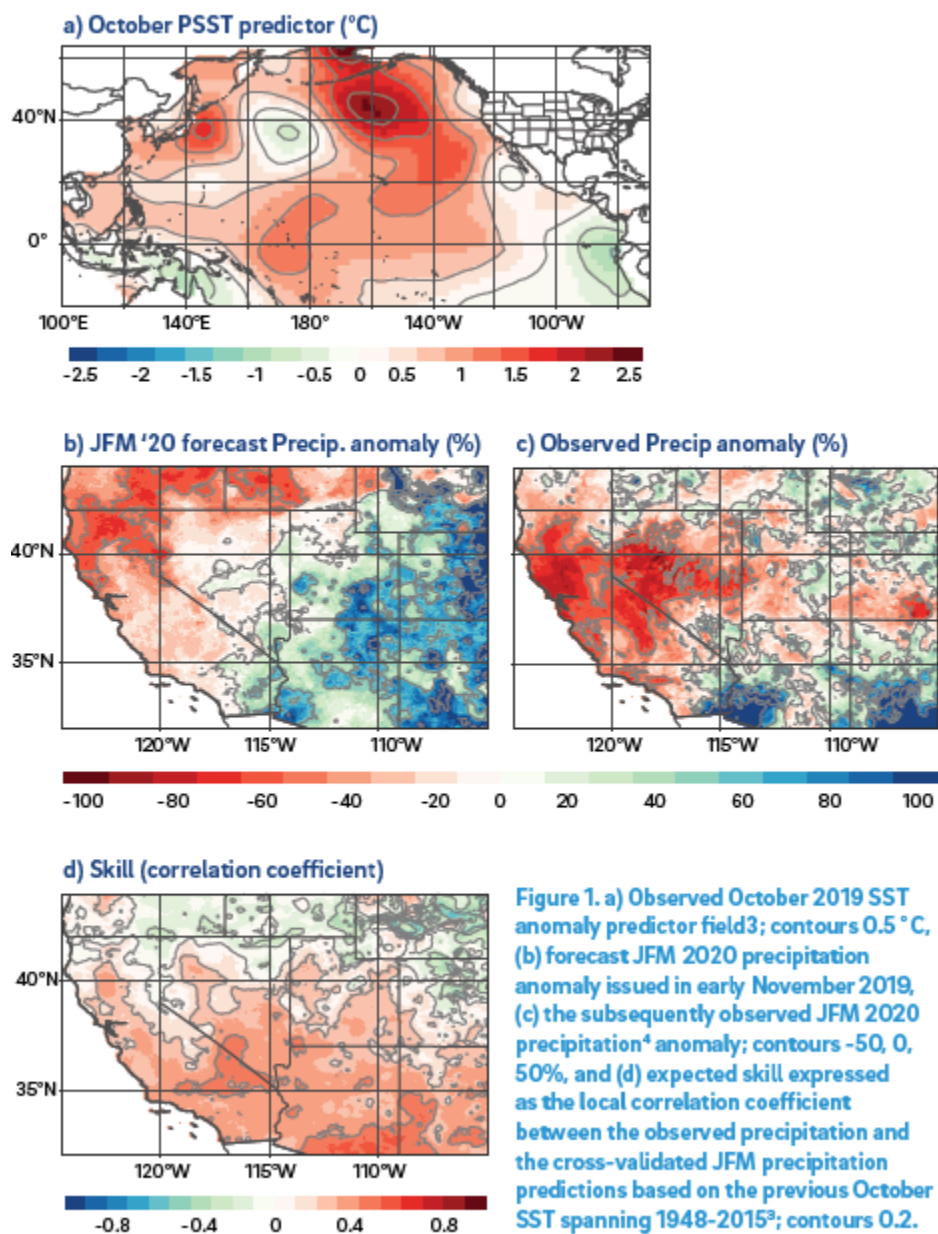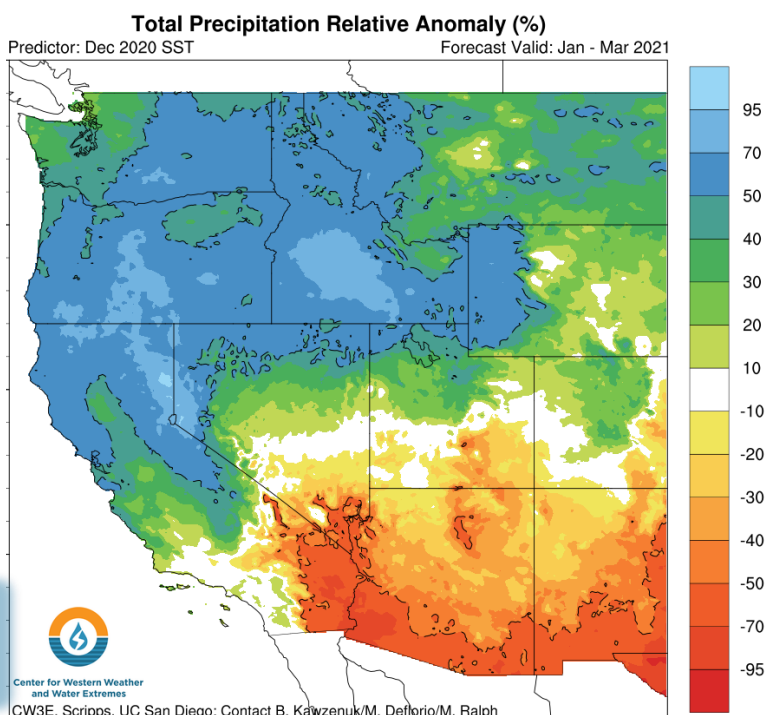c) Observed Precip anomaly (%)

d) Skill (correlation coefficient)

Figure 1. a) Observed October 2019 SST anomaly predictor field3; contours 0.5 °C, (b) forecast JFM 2020 precipitation anomaly issued in early November 2019, (c) the subsequently observed JFM 2020 precipitation[4] anomaly; contours -50, 0, 50%, and (d) expected skill expressed as the local correlation coefficient between the observed precipitation and the cross-validated JFM precipitation predictions based on the previous October SST spanning 1948-2015[3]; contours 0.2. Precipitation anomalies are calculated as % of JFM climatology relative to 1948-2015

New Seasonal Precipitation Model Shows Promise—continued

spite of the expectation for the shortest lead-time forecasts to be the most skillful. Skills can vary with lead-time from year to year rather differently compared to the expected skill averaged over all years. Performance varied across all active seasons in water year 2020 with fall and early winter (October – January) being most skillfully predicted at one-month lead-time. It is important to note that performance in one year and season does not guarantee similar performance in the following years, given the intrinsic variability within the climate system.

So what does the model predict for this January through March? The early December forecast (at right) calls for above average precipitation north and west, and below average south and east.

Updated forecasts: cw3e.ucsd.edu/s2s_forecasts/

Total Precipitation Relative Anomaly (%)
Predictor: Dec 2020 SST   Forecast Valid: Jan - Mar 2021

Center for Western Weather and Water Extremes
CW3E, Scripps, UC San Diego: Contact B. Kawzenuk/M. Deflorio/M. Ralph

Super Partner Phill Dupree Departs by Miguel Miller

Phill Dupree is moving on to the next stage of life, out of the high desert of Hesperia to the plains of North Dakota. For more than 20 years, Phill has supported the National Weather Service in San Diego in so many ways. On January 25, 2021, Phill will be presented with the prestigious John Campanius Holm Award for 20 years of superior volunteer observing, in a virtual ceremony including NWS and core partners.

As a weather spotter, he has reported significant weather as it happens. As a regional Skywarn coordinator for San Bernardino County, he has conducted numerous activations when the weather got crazy, collecting spotter reports and relaying them to the NWS. He also organized many spotter/Skywarn training sessions. As a cooperative climate observer, he has observed and documented the weather in Hesperia, reporting numbers every afternoon, earning the Holm Award. He has been instrumental in getting San Bernardino County to achieve and maintain Storm-Ready preparations, earning him the national distinction of Weather Ready Ambassador. He has assisted in the NWS' "Turn Around Don't Drown" promotion. He has volunteered his time in organizing and participating in numerous public safety events.

We thank him. We recognize him. And we'll certainly miss him.
We wish him the best!

In 2012, Phill Dupree (above right) meets with flood control officials and former Meteorologist in Charge—NWS San Diego, Roger Pierce (left) at the Mojave River bridge in Helendale. Photo NWS.
In 2015, NWS San Diego Observing Leader, Noel Isla (left) presents a 15-year Length of Service Award to Observer Phillip Dupree with help from Met Intern Tina Stall (right). Photo NWS Coop.

Quarterly Summary
October

The strong and immovable high pressure ridge over the West during August and September continued to bring dry and hot weather to Southern California the first week or so of October.

A weak low pressure trough over the Pacific Ocean promised rain roughly from the 9th to the 11th, but it came and went with no rain, only cooler, cloudier weather.

A West Coast ridge redeveloped and continued through the middle of the month, bringing more hot weather, particularly from the 12th to the 16th. The heat was helped by weak Santa Ana conditions.

Autumn began to assert itself as deeper troughs of low pressure began to rotate through the northern part of the country. That brought more persistently cooler weather to Southern California for the last two weeks of the month. Temperatures fell below average for the first time in a long time from the 21st to the 27th.

A vigorous trough of low pressure barreled down the coast on the 25th and 26th. This was energetic enough to wring out some rain showers, amounting mostly to less than one tenth inch in the lowlands, but 0.25-0.75 inch at some mountain stations.

San Diego - Lindbergh Field Data - October				
	Max	Min	Avg	Rain
Actual	79.8	63.1	71.5	0.12
Normal	72.8	62.6	66.7	0.57
Anomaly	7.0	0.5	4.8	-0.45
% of normal				21
Max	97	69		0.12
Min	72	51		

Large, mature trees were felled by the strong Santa Ana winds on 26 October, like these in Riverside. Photo Dan Coats.

While the showers were ending near San Diego early on the 26th, strong offshore winds, a "cool" Santa Ana, had already begun farther north with gusts over 50 mph observed in the northern Inland Empire. For most of the 26th, this wind event would prove quite strong, with gusts at several locations exceeding 70 mph (top gust 88 mph at Fremont Canyon). The winds toppled big rig trucks and downed mature trees in the northern Inland Empire. The dry winds also contributed to spreading two fire starts, the Blue Ridge and Silverado fires in eastern Orange County.

High pressure rebuilt along the West Coast once again to allow for a dry warming trend to finish out the month.

Total monthly precipitation ranged from zero in the desert, a trace to 0.17 inch along parts of the coast and valleys, and about 0.25 to 0.77 inch for the mountains. Those wetter areas ended up around 150% of normal for the month, while most areas fell below 25%.

Average temperatures across the region ranged from 4 to 7 degrees Fahrenheit above average for the month, good for one of the warmest Octobers on record for some locations.

November

November was a roller coaster ride for much of the month. It began on the warm side under high pressure, producing the kind of heat that set new daily record high maximum and minimum temperatures for inland areas on the 3rd through the 5th.

A deep and cold low-pressure trough from the Gulf of Alaska dove down the West Coast into Southern California, bringing the first significant precipitation of the season to the region from the 7th through the 9th. San Diego County harvested the most precipitation overall. Lake Cuyamaca nearly reached four inches, and other mountain locations ranged from two to 3.5 inches. Snowfall of one foot was common in the San Bernardino Mountains. Some higher ski slopes received around 18 inches. Two to eight inches were common below 6,000 feet elevation, and snow was observed as low as 4,000 feet. Rainfall across the lower elevations ranged from less than one-quarter inch for some spots in the northern Inland Empire and Orange County, while most received from one-third to two inches. Several thunderstorms erupted in the Inland Empire, packing strong damaging winds. One of these felled a few large trees and snapped large branches in Redlands. While briefly heavy rains struck the Apple and El Dorado burn scars, any flooding and debris flows were minimal.

Some record low minimum and maximum temperatures were set on the 9th and 10th, during and following the storm.

A weak troughing pattern across the West continued for several days, keeping the weather rather cool.

High pressure amplified on the 15th and combined with warm Santa Ana flow to produce record heat again west of the mountains on the 16th.

Seasonal weather followed as a trough of low pressure producing onshore flow passed by to the north on the 17th through the 19th, followed by higher pressure and offshore flow to warm and dry the region on the 20th through the 22nd. Coastal fog was a frequent visitor this week.

Dry, inside slider type troughs moved through California from the 23rd through the 27th, during the Thanksgiving holiday period. This brought fair but cool weather, and a strong offshore wind event from Thanksgiving into the next day. Top wind gusts in the inland valleys and foothills were 50-70 mph, with Fremont Canyon topping the list with a 79-mph gust.

High pressure rebuilt quickly, allowing the month to end with a warming trend from the 28th through the 30th.

Total monthly precipitation ranged from near zero in the deserts, up to two to four

San Diego - Lindbergh Field Data - November				
	Max	Min	Avg	Rain
Actual	72.3	53.0	62.7	0.26
Normal	69.0	53.6	61.3	1.01
Anomaly	3.3	-0.4	1.4	-0.75
% of normal				26
Max	90	63		0.14
Min	65	42		

The first significant snow of the season dropped over one foot across the higher San Bernardino Mountains on November 7-9 (Hwy 18 photo Alex Tardy).

inches in the valleys and mountains. That was good for single-digit percent of normal monthly rainfall for the deserts, while those wetter mountain areas ended up just over 100% of normal. The populated lowlands finished anywhere from 10 to 100% of normal monthly precipitation. But after a dry October, water year totals were all at a deficit.

Average monthly temperatures across the region ranged from roughly 0.5 degree Fahrenheit above average in San Diego, to 3.6 degrees above average in Palm Springs. Most stations reported 1.0 to 2.5 degrees above average.

December

High pressure and offshore flow got December started in a dry and warm way. Strong Santa Ana winds developed on the 2nd and 3rd, producing a fire hazard. Several wildfires broke out, including the Bond Fire in Silverado Canyon, which eventually burned 7,300 acres. The Airport Fire (Corona), the Willow and Cerritos Fires also erupted, but were contained quickly. This was a big wind storm. Isolated wind gusts in the foothills gusted to over 90 mph, while widespread winds in populated valleys gusted 30 to 50 mph.

The pattern of low pressure troughs dropping south over the Southwest produced strong offshore winds again on December 7-8 and many lighter offshore wind episodes through Christmas Eve.

San Diego - Lindbergh Field Data - December				
	Max	Min	Avg	Rain
Actual	69.0	46.8	57.9	0.60
Normal	64.7	48.4	56.5	1.53
Anomaly	4.3	-1.6	1.4	-0.93
% of normal				39
Max	80	56		0.56
Min	62	41		

Precipitation finally arrived early on the 28th. Heavy rain moved through the region early on the morning of December 28, and was followed by showers and isolated thunderstorms through the rest of the day. Showers lingered into the early morning of the 29th. Precipitation amounts ranged from about one-third inch around parts of San Diego, to just over 2.5 inches in Garden Grove and some mountain areas. Snowfall accumulated as much as 10 to 20 inches in the mountains, and fell as low as 3,000 feet elevation. 8-18 inches fell in the San Jacinto Mountains. Local flooding inundated a neighborhood in Garden Grove with a reported rain rate of one inch in 45 minutes (photo on page 1). Only minor mud flows were observed on burn scars. Tree damage was incurred in Crestline due to heavy snow. A thunderstorm produced damage to trees and a building in El Cajon and a tree in National City. December finished on a fair note with offshore flow and some winds to ring in the new year.

Total monthly precipitation came from essentially one storm, which amounted to 25 to 70 percent of the monthly average across the region.

Average monthly temperatures across the region ranged from roughly 1.5 to 3.5 degrees Fahrenheit above average. Fullerton managed 3.8 degrees above average, while Ramona was 1.2 degrees above average.

Heavy snow piled up on 28 December with 8-18 inches reported in the San Jacinto Mountains. Photo by John Hubbs.