DECEMBER 2016 WEATHER SUMMARY
FOR THE CENTRAL CALIFORNIA INTERIOR

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The meteorological winter of 2016-2017 began on the 1st. This day was typically cool, and dense fog was reported in a few locations in the San Joaquin Valley, as well as on the 2nd. The next few days were generally around average in terms of daytime highs, but below average during the morning hours as temperatures fell to below freezing in parts of the Central Valley. Fog was more suppressed as the airmass was sufficiently drier during the night of the 2nd and into the morning of the 3rd, as well as on the next couple of nights and mornings.

High pressure became better established along the coast of southern and central California by the 5th and into the morning of the 6th. The high pressure ridge was strong enough to produce conditions favorable for development of dense fog and milder overnight lows in much of the San Joaquin Valley on the morning of the 6th. The fog dissipated by the late morning hours, although a deck of stratus clouds quickly developed and persisted into the afternoon after the fog lifted. Breezy conditions occurred in the mountain and desert areas by the afternoon of the 6th, and low clouds even developed in the Tehachapi Mountains to allow for a chilly day; wind flow aloft was from the northwest while some upper-level impulses moved inland from the Pacific Ocean and brought periods of clouds. Some gusts to around 40-45 mph were observed in some locales in the Kern County desert, such as Ridgecrest, and below the passes and canyons. A few reports of around 55-60 mph occurred on the exposed ridgetops in the mountain areas of eastern Kern County during the afternoon and evening of the 6th.

On the morning of the 7th, many locations in the San Joaquin Valley had the coldest low temperatures since the previous January as a cold airmass remained in place. Fresno reported a low temperature of 32 degrees for the first time since January 1st, and some few locations even fell into the upper 20s (for example, the low was 29 degrees in Hanford and Merced). However, Bakersfield only had a low of 41 degrees that morning, as low clouds developed during the previous evening and had remained over the valley-facing slopes of the Tehachapi Mountains.

A low pressure system arrived by the night of the 7th, and a return to an unsettled weather pattern thus began. This pattern continued for the next several days. An atmospheric river, or a subtropical fetch of relatively warm, moist air, set up over much of northern California by the night of the 8th and continued through the 11th. Due to the presence of the atmospheric river, the airmass became quite warm and moist over much of central California. Where precipitation did not occur, temperatures rose well into the 60s in the San Joaquin Valley. Much of the region

experienced well above average temperatures and persistent cloud cover. Significant precipitation occurred in the Sierra Nevada and adjacent foothills, especially around Oakhurst and in Yosemite where around 2 to 3 inches fell during this period, except for a brief quiet period on the 9th in this area. As the airmass warmed, the snow levels rose quite dramatically, or to around 9,000 feet by the night of the 8th. On the 9th, precipitation did fall on quite a few locations in the Kern County mountain areas, where around a quarter to half an inch of rain accumulated due to the southward movement of the initial band of moisture (that had brought precipitation to locations in Fresno County and northward on the previous day). Similar snow levels and mild temperatures continued through the 10th. Other locations that did not receive much rainfall also experienced very mild temperatures, on the order of around 10-15 degrees above average in terms of both daily highs and lows. The San Joaquin Valley experienced a reprieve from dense fog for the month thus far; however, dense fog returned by the morning of the 11th.

On the night of the 11th and into the 12th, the atmospheric river that had impacted the region on the 10th, shifted north and allowed cloud cover to clear out, so that nighttime low temperatures cooled closer to around average for this time of year. Some low clouds were banked over the east side of the San Joaquin Valley on the morning of the 12th. However, daytime high temperatures remained mild and well above average through the 14th as high pressure rebuilt over the region. Any dense fog that developed was patchy, or confined to mainly rural areas away from main highways and the large population communities. However, the quiet weather was short-lived, as another low pressure system that brought copious amounts of precipitation was soon to follow.

A significant storm system with additional subtropical moisture arrived to the region on the 15th. This storm continued until the morning of the 16th. Every location received at least some rain in our forecast area, and the high elevations of the Sierra Nevada, mainly above 8000 feet, received significant snow. The most precipitation fell in Yosemite National Park, where five to six inches of rain (and locally higher amounts) fell in a 24 hour period. Some rivers did rapidly rise due to the heavy rain but remained below flood stage, although the Merced River in Yosemite National Park was one that almost reached flood stage, including at Pohono Bridge in Yosemite Valley. Some cities in the San Joaquin Valley picked up a half inch to over an inch of rain. Fresno received a total of 1.62 inches of rain during the 15th and 16th. However, Bakersfield received around a third of an inch with this system, mainly due to terrain influence, including rain shadowing. Heavy rain did occur in the mountains to the northeast of Bakersfield, including near Wofford Heights where some mudslides and debris flow were reported by local residents. Rainfall rates mainly were around a half inch (and sometimes as much as three quarters of an inch) per hour in the mountain areas, including in the Sierra Nevada; however, these rates can cause debris flows in areas that experienced recent wildfires. Other impacts included ponding on roadways in the San Joaquin Valley and fallen rocks on roads due to runoff from heavy rain, especially in the Sierra Nevada and into the foothills.

By the night of the 16th, cold air had flowed into the area behind the previous day's storm, so temperatures fell back to below average, especially during the mornings. Freezing temperatures occurred in many San Joaquin Valley locations during the mornings of the 17th through the 20th. Patchy fog also developed in some locales in the San Joaquin Valley, including on the 19th through the 22nd, as the airmass over the region gradually warmed while some surface moisture settled into the area. Larger cities, including Fresno, reported dense fog in the mornings during this period. Temperatures warmed back to around average during the 21st and 22nd before another system arrived on the 23rd.

The next storm system brought rain and mountain snow to central California starting on the morning of the 23rd; the bulk of the precipitation fell during the evening. The heaviest amounts occurred in Kern County. Bakersfield received 0.91 inch of rain on the evening of the 23rd and 0.19 inch early in the morning of the 24th; therefore, the 24-hour total rainfall for this location was 1.10 inches. Other locations in the mountain areas of Kern County observed local amounts exceeding 1.50 inches of rain, mainly below 4,000 feet. Flooding was reported in downtown Bakersfield due to poor drainage combined with heavy rain rates. A few roadways were flooded in nearby areas, especially in the southern end of the San Joaquin Valley and through the Kern River Canyon on Highway 178 (where some large boulders fell onto the roadway). Locales above 4,000 feet in the mountain areas received several inches of snow during the night of the 23rd-24th; including in Tehachapi and the Grapevine. The snow at the top of the Grapevine was enough to cause a shutdown of Interstate 5 for several hours.

On Christmas Day, the weather was mainly quiet, although temperatures were below average. More freezing temperatures occurred in much of the San Joaquin Valley. During the following day, daytime temperatures warmed to around seasonal averages, although the mornings were still below average. Due to a low pressure system about three hundred miles off the coast of southern California and northern Baja California allowed a southeast flow to set up over the region and was enough to cause locally gusty southerly winds through the passes leading into the San Joaquin Valley, including along Interstate 5 and Highway 58. Visibility was exceptionally clear in the San Joaquin Valley due to this particular weather pattern.

The year ended with active weather on the 30th-31st after several days of quiet weather. Prior to this active period, temperatures fell below average in much of the region, especially during the nights and mornings. There was little fog development until the 30th and 31st after a storm impacted the southern part of the forecast area, including Kern, Kings, and Tulare Counties on the 30th. On the morning of the 31st, dense fog had developed along Interstate 5 through the Grapevine, including in Lebec and downhill locations to the north. The visibility was low enough to cause a 30-vehicle pileup on Interstate 5 near the split with Highway 99. Another storm brought precipitation to much of the region, mainly during the afternoon and evening of the 31st, the heaviest amounts fell in Kern County where amounts reached around a half inch and just

above. During that afternoon and evening, several inches of snow fell in the Tehachapi Mountains and hampered travel through the mountain passes, especially the Grapevine. Several inches of snow also fell in Tehachapi and likely slowed down travel on Highway 58. Other passes on the west side of the San Joaquin Valley also had snowfall down to around an elevation of 2,500 feet. The precipitation generally ended just before midnight of New Year's Eve.

Overall, the month ended mainly above average in terms of both temperature and precipitation. There were a few locations that did receive below average rainfall towards the west side of the San Joaquin Valley (Fig 1). Temperatures were relatively warm during the first half of the month so that the month resulted as warmer than average overall (Fig 2), except for a couple of pockets in the mountain areas. Due to significant rainfall over much of Kern County and southern California during late in the month, Bakersfield had its third wettest December on record.

Table 1 - December 2016 Summary Statistics for ASOS locations				
Location	**Monthly Average Temp (deg F)**	**Departure From Average (deg F)**	**Total Monthly Precipitation (inches)**	**Departure From Normal (inches)**
Bakersfield	49.9	+2.1	2.41	+1.39
Fresno	47.1	+0.6	2.51	+0.74
Hanford	46.2	+1.7	1.87	+0.24
Madera	46.9	+1.3	1.87	+0.17
Merced	45.1	+0.5	1.91	+0.39

Number of Days with Minimum Temperature of 32 Degrees or Lower

Bakersfield – 3 (Average: 6 days)
Fresno – 8 (Average: 6 days)

Temperature/Precipitation Rankings for December

Bakersfield – 33rd warmest December on record; 3rd wettest December on record
Fresno – 49th warmest December on record; 28th wettest December on record

Top 10 Wettest Decembers for Bakersfield:

Year	Amount
2010	5.82
1931	2.98
2016	2.41
1936	2.10
1995	2.03
2014	2.02
1921	1.88
1992	1.81
1977	1.80
1952	1.80

Fig 1 - Percent of normal precipitation for December 2016:

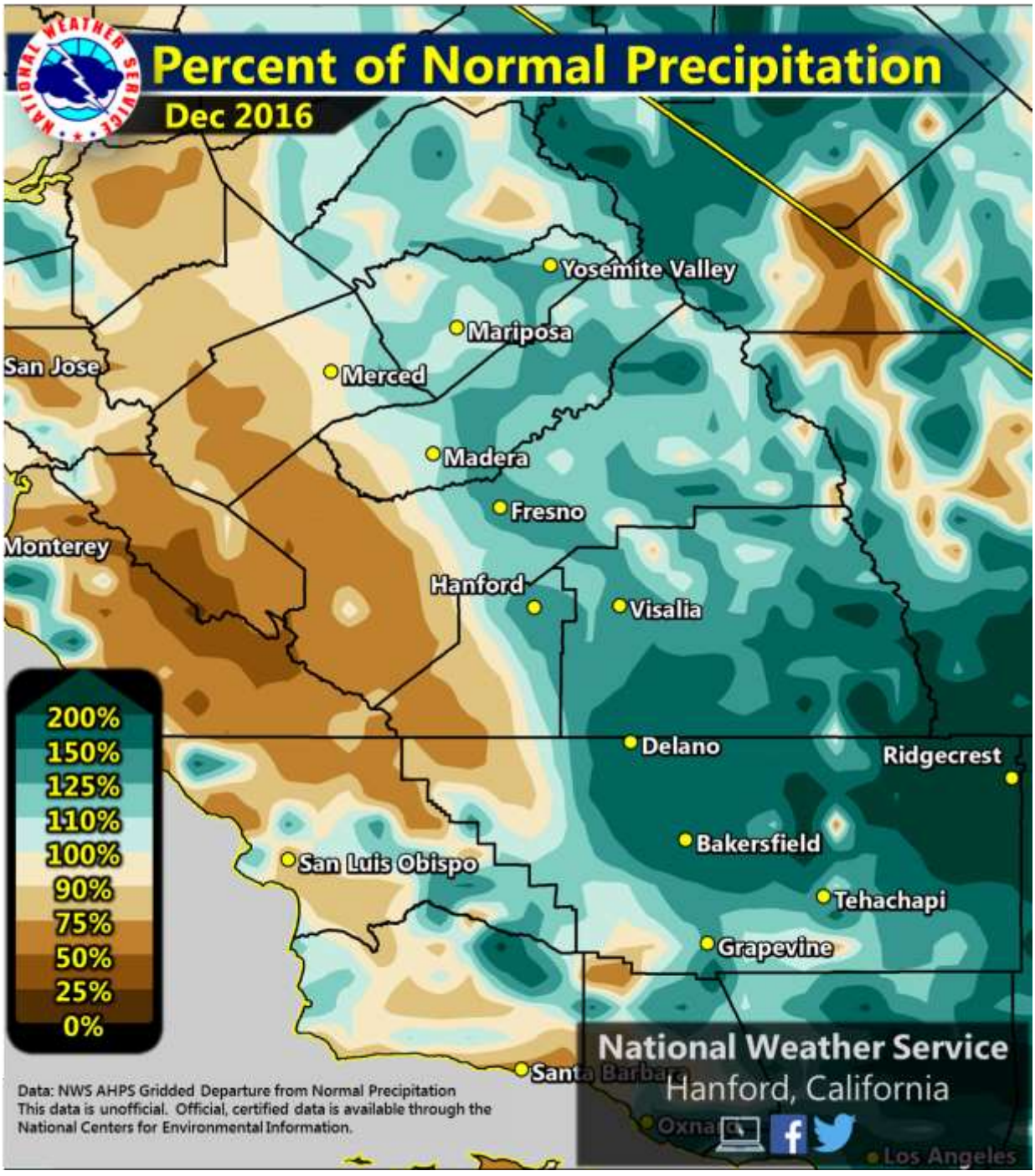

Fig 2 - Departure from average temperature for December 2016: