2009
Fire Weather Annual Summary

San Joaquin Valley Fire Weather District
Hanford, CA

Table of Contents

I.	Summation of 2009 Fire Weather Season	pg. 3
II.	Spot Forecasts	pg. 9
III.	ATMU Dispatches	pg. 10
IV.	Teaching Assignments	pg. 11
V.	Training	pg. 11
VI.	Red Flag Warning Verification	pg. 12

I. Summation of the 2009 San Joaquin Valley/Hanford Fire Weather Season

The National Weather Service in Hanford began its fire season activities on May 4th. Before this date, one narrative forecast was issued each afternoon. Warnings, watches, and spot forecasts were issued on an as needed basis. After May 4th, Hanford Fire Weather began its full fire season activities, preparing two narrative forecasts and zone trend forecasts seven days a week. This continued through November 30th.

January

January 2009 was much drier and warmer than normal. Weak weather systems passing through central California the first 9 days of the month produced minimal precipitation. Most of the month's precipitation fell between the 21st and the 25th, with as much as 2-4 feet of snow over the higher elevations of the southern Sierra Nevada and around a foot of snow in the Kern County mountains. The middle part of the month was dominated by a strong ridge of high pressure which kept temperatures well above normal from the 12th through the 21st. Throughout this period, a dry offshore flow prevailed, keeping low relative humidity over the higher elevations. By the end of the month, the water level in the major reservoirs was only 22 percent of normal.

February

In contrast to January, February 2009 was wetter than normal. Although the first few days of the month were warm and dry, the weather pattern became unsettled with a series of weather systems moving through from the 5th through the 22nd. These systems brought several feet of snow to the high Sierra, and occasionally brought a few inches of snow to elevations as low as 2500 feet. Two particularly cold storms, one on the 8th and another on the 13th-14th produced small accumulations of snow along interstate 5 through the Tejon Pass and also on highway 58 through the Tehachapi Pass. The storm on the 8th also brought thunderstorms to the San Joaquin Valley on the 9th, with one thunderstorm producing a weak tornado near Merced.

A storm system that moved through on the 15th and 16th brought hurricane force winds to parts of the Kern County Mountains near the Grapevine with sustained winds of 74 mph and gusts to 103 mph reported on the Grapevine RAWs station. Gusty winds also spread over the San Joaquin Valley and parts of the Sierra Nevada.

The last week of the month returned to a more tranquil weather pattern as the jet stream retreated north into the Pacific Northwest. Precipitation amounts for the month ranged from near normal to as much as 140 percent of normal throughout the central California interior. This brought the seasonal precipitation totals to about 80 percent of normal.

March

Precipitation in March 2009 was once again well below normal with only two storm systems bringing measurable precipitation. A low pressure system moved into the region on the 2nd through the 4th of March, dropping 1-2 feet of snow in the high Sierra and 1-2 inches of rain in the foothills. In the San Joaquin Valley, rainfall amounts were considerably less, ranging from about 2 tenths of an inch at the south end to three-quarters of an inch in Merced county. The second system moved through on the 21st and 22nd and brought scattered showers and isolated

thunderstorms to the San Joaquin Valley and foothills, with up to two feet of snow in the higher elevations of the Sierra. Up to an inch of rain fell in the foothills, while rainfall in the San Joaquin Valley was much lighter with less than two tenths of an inch.

A ridge of high pressure remained over the eastern Pacific for much of the rest of the month. Upper level disturbances moving around the ridge brought periods of gusty winds from the 25th through the 31st, especially to the Kern County Mountains and Desert and the west side of the San Joaquin Valley.

Temperatures averaged slightly above normal for the month. Precipitation amounts averaged about 50 percent of normal for the southern Sierra Nevada with the snowpack averaging about 80 percent of normal. In the San Joaquin Valley and the Kern county Mountains, precipitation amounts ranged from11 to 25 percent of normal.

April

April 2009 also saw below normal precipitation. A late season winter storm moved into central California on the 7th and 8th bringing rain to areas north of Kern county and as much as 19 inches of snow above 7000 feet. The foothills received up to two inches of rain, but the precipitation in the San Joaquin Valley was much spottier due to more scattered showers and isolated thunderstorms. Fresno recorded nearly three-quarters of an inch of rain while areas to the north and south of Fresno only recorded a few hundredths of an inch. Although Kern county was mostly left high and dry from this storm, an upper level low that dropped down the coast and moved inland over southern California on the 10th made up for it, bringing up to half an inch of rain across the valley and mountains of Kern County. The weather remained showery and unsettled in the Sierra Nevada during this time.

Otherwise, April brought several dry cold frontal passages which were accompanied and followed by gusty winds. A particularly strong cold front on the 14th produced winds of 40-45 mph in the San Joaquin Valley with areas of blowing dust and near zero visibility on the west side. These gusty winds continued to occur each day through the 16th.

A ridge of high pressure anchored itself along the west coast from the 19th through the 22nd bringing near record heat to the central California interior. Temperatures in the San Joaquin Valley warmed into the mid 90s to near 100 degrees. The prematurely warm weather caused excessive snow melt over the Sierra. A weak closed low moved through the ridge and stalled near Point Conception bringing some mid level moisture into the area and resulting in isolated thunderstorms over the mountains during this time. A strong but dry cold front brought an abrupt end to the heat on the 23rd with temperatures remaining several degrees below normal for the remainder of the month. By the end of April, snowpack in the southern Sierra Nevada was reduced to about 65 percent of normal.

May

May began with a strong upper level trough bringing heavy showers to the region. The trough tapped into a deep fetch of subtropical moisture, resulting in snow levels above 9000 feet, where up to 16 inches of snow fell. Many locations in the San Joaquin Valley received more than their normal monthly rainfall, while in the Sierra Nevada, Yosemite Valley received over 2 inches of rain and over 1.8 inches of rain fell as far south as Sequoia National Park. The rain tapered off on

the 2nd, with just a few showers lingering on the 3rd. A weaker trough brought a few more showers on the 5th. A dry westerly flow continued over the region from the 6th through the 14th with temperatures near normal to as much as 10 degrees above normal. Weak disturbances in the flow brought gusty winds at times to the Kern County Mountains and Desert as well as on the west side of the San Joaquin Valley. High pressure strengthened over the region bringing a strong warming trend from the 15th through the 19th. Temperatures in the San Joaquin Valley climbed over 100 degrees with temperatures of 105 to 110 degrees recorded on the 17th. During this time, an upper low off the coast of Baja also brought an influx of subtropical moisture which sparked thunderstorms in the mountains and desert.

A westerly flow aloft returned from the 20th through the 25th, cooling temperatures back down to normal. The westerly flow aloft brought enough lift for isolated thunderstorms over the Sierra crest each afternoon.

A strong upper level ridge of high pressure built over northern and central California on the 27th and 28th, with a low pressure system off the coast of northern Baja. A southeasterly flow of mid level moisture brought afternoon thunderstorms over the higher elevations from Tehachapi Mountains northward through Yosemite National Park which drifted into the foothills in the evenings. The southeasterly flow was strong enough to bring the thunderstorms out into the east side of the San Joaquin Valley on the evening of the 28th. A few of these thunderstorms became severe with large hail and damaging winds. The wind shifted to southwesterly on the 29th, thunderstorm activity was confined more to the Kern county desert and the Sierra crest.

May ended up being one of the warmest on record, with temperatures averaging about 6 degrees warmer than normal. Precipitation averaged 100 to 145 percent of normal, except near Yosemite where it was 150 to 200 percent of normal.

June

In contrast to May, June 2009 averaged cooler than normal. An unusually deep upper level trough anchored itself along the west coast during the first two weeks of the month and produced onshore flow across central California. The San Joaquin Valley temperatures were tempered by influxes of marine air through the 16th. On a few occasions, the upper level trough tapped into subtropical moisture and produced isolated showers and thunderstorms across the region.

From the 17th through the 19th, an upper level ridge of high pressure build into central California and brought significantly warmer temperatures. The warm up was short-lived, however, as another trough of low pressure developed along the west coast and produced cooler onshore flow by the 20th. From the 23rd through the end of the month, a strong upper level ridge of high pressure originating over Texas expanded westward into California. In addition to bringing warmer temperatures, the ridge brought a southeasterly flow of monsoonal moisture which fueled afternoon and evening thunderstorms over the Sierra Nevada and foothills on the 29th and 30th.

June was slightly drier than normal and for the 2008-2009 rain season ending June 30th, precipitation was only about 70 percent of normal.

July

A ridge of high pressure brought hot temperatures to the region for the first few days of July before a trough of low pressure stalled off the California coast. The trough brought dry weather with an onshore flow and near normal temperatures through the 13th. The ridge of high pressure over Texas shifted westward over California for another spell of hot temperatures for the middle of the month. An upper level disturbance off the west coast of Baja spun a fetch of subtropical moisture into California on the 16th through the 19th, with isolated thunderstorms over the Sierra Nevada, the Kern county mountains and the desert. One thunderstorm near the Frazier Park-Pine Mountain Club area dumped about an inch of rain on the 19th.

From the 21st through the 26th, the upper ridge lost some footing over California as upper level troughs moved through the Pacific Northwest. During this period, shallow intrusions of marine air cooled the San Joaquin Valley while temperatures changed very little over the higher terrain. The battle waged on between the ridge over Texas and an upper trough along the Pacific Northwest coast for the remainder of the month. Another flux of monsoonal moisture between the 26th and the 29th produced isolated strong thunderstorms over the Sierra Nevada.

August

August was typically dry with temperatures averaging slightly above normal. A southwesterly flow aloft prevailed over the region for much of the month as central California remained situated between an upper level ridge of high pressure over the Four Corners region and a nearly stationary trough of low pressure over the eastern Pacific. On a few occasions, the trough deepened and brought pushes of marine air into the San Joaquin Valley. But for a majority of the month, the ridge dominated the pattern with warmer than normal temperatures. This also brought dry conditions to the region with humidities dropping into the single digits for 10 hours or more in the Kern County Mountains on the 26th through the 28th prompting red flag warnings.

A brief influx of subtropical moisture occurred from the 21st through the 23rd and was brought northward into the mountains and desert by an upper level low off the coast of Baja. Scattered thunderstorms that developed as a result produced local rain amounts of up to 1.5 inches over the higher elevations of the Sierra.

September

September 2009 was much warmer than normal throughout the central California interior. In fact it was the 4th warmest September on record in Fresno and the 6th warmest in Bakersfield, with climatological records dating back to the late 1800's. Although an upper level ridge of high pressure anchored over the Four Corners region dominated the weather pattern for most of the month, there were a few occasions when upper level troughs moved through the region with cooler than normal temperatures and locally gusty winds. The first of these troughs moved through with little fanfare on the 6th and 7th. The second trough picked up some subtropical moisture when it moved through eastward across central California on the 13th and brought measurable rain to parts of the San Joaquin Valley with numerous showers over the mountains. An unseasonably cool airmass moved in behind this system on the 14th. This cool spell was very short lived as a ridge of high pressure quickly rebuilt over the region with temperatures climbing above normal again by the 16th. In fact, the ridge of high pressure brought above normal temperatures through the 28th.

The upper level ridge also brought a very dry airmass over the region. While the Sierra Nevada saw relative humidities mainly in the teens, the Kern County Mountains were extremely dry. There were 6 consecutive days with extended periods of relative humidities in the single digits with above normal temperatures, prompting red flag warnings for the Kern County Mountains from the 22nd through the 27th.

A trough of low pressure moved into the region on the 29th with little or no precipitation. However, strong and gusty northwest winds brought another exceptionally cool airmass to the region for the last few days of the month. The cooler temperatures and higher humidities were a dramatic change from the unseasonably warm weather that had preceded it.

October

A deep, slow moving trough of low pressure kept temperatures below normal for the first week of October, bringing some showers to the Sierra Nevada north of Kings Canyon on the 3rd and 4th. As much as a third of an inch of rain fell with a inch or two of snow above 6000 feet. The next storm system moved in on the 13th and was much stronger. The trough dropped out of the Gulf of Alaska and brought copious precipitation north of Kern County. Strong winds that accompanied this storm produced blowing dust and areas of near zero visibility on the west side of the San Joaquin Valley. Because this system tapped into an abundance of tropical moisture from the remnants of Typhoon Melor, it not only produced heavy precipitation, but snow levels remained above 9000 feet. Rainfall totals from this system ranged from 1-2 inches in the San Joaquin Valley north of Kern County to 4 to 7 inches in the foothills and higher elevations. In the southern Sierra Nevada, as much as 13 inches of rain fell at Dinkey Creek with about 10 inches at Wishon Dam.

A weak ridge of high pressure brought dry weather and warmer temperatures on the 15th through the 18th before the next trough moved in on the 19th. This system brought only light amounts of precipitation with only a few hundredths in the San Joaquin Valley to as much as two tenths of an inch in the Sierra Nevada. High pressure then brought another dry period with a warming trend from the 21st through the 26th. This was followed by another dry cold front with strong gusty winds through the San Joaquin Valley, the Kern County Mountains, and the desert.

November

Precipitation for November was below normal while temperatures averaged slightly above normal. An upper level ridge of high pressure dominated the pattern during the first four days of the month and brought unseasonably warm temperatures to the district. A cooling trend occurred on the 5th through the 10th as the westerlies settled southward over the state. A slow, southward moving cold front brought generally light precipitation on the 12th and 13th. The storm track retreated northward on the 14th and positioned itself over the Pacific Northwest through the 17th. Another cold front moved south across the region on the 18th and produced little more than isolated showers over the higher elevations of the Sierra. A somewhat deeper and colder trough moved through on the 20th, but only produced rainfall amounts of six hundredths of an inch or less in the San Joaquin Valley. In the mountains, amounts ranged from about a tenth of an inch in the Kern County Mountains to around a quarter of an inch in the Sierra Nevada.

The next storm system moved southeast along the California coast from the 27th through the 28th.

This system brought colder air to the entire district, but the focus of precipitation was mainly over Kern County. In the Sierra Nevada, up to a half inch of rain fell, with 2 inches of snow being reported at Lodgepole. In the Kern County Mountains, local rainfall amounts were around an inch, while the cold air brought snow levels down to 4500 feet with 4 inches of snow at Frazier Park. A strong northeast jet moved over the Southern Sierra Nevada along the back side of the trough. At the surface, high pressure dropped into northern Nevada, creating a northeast near-surface flow over the Sierra crest. This pattern had the potential for Mono winds over the western slopes of the Sierra Nevada in Mariposa, Madera, and Fresno counties. However, the jet dropped south faster than expected resulting in winds gusts mainly 35 to 45 mph. One report of 70 mph wind gusts was received through the Willow Creek Drainage near Peckinpah in Madera County on the evening of the 28th. The Hanford National Weather Service office reverted to an offseason forecast schedule effective November 30th.

At the end of November, the season-to-date precipitation amounts were only at 78.8 percent of normal at Fresno and 17 percent of normal at Bakersfield.

December

An upper level trough of low pressure brought a push of arctic air to the region on December 7th. A quarter to a half inch of rain fell on the San Joaquin Valley floor. A few flurries mixed in with the rain but did not stick to the ground. Due to the very cold nature of the airmass behind this cold front, snow levels plummeted. A few inches of snow was reported at elevations down to 2000 feet. Yosemite Valley received 8 inches of snow, while 6 to 12 inches of snow fell in the mountains of Kern County.

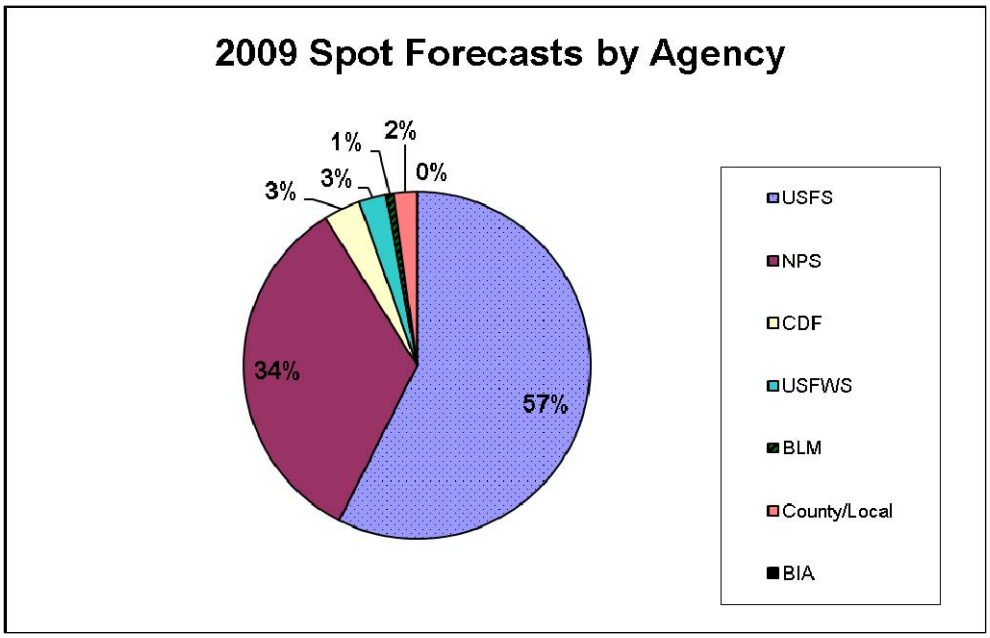
A series of storms moved through the region bringing heavy snow on the 11th through the 13th. Greatest snow amounts were above 7000 feet where snow amounts averaged 3 feet with as much at 5 feet at a few locations. A ridge of high pressure returned on the 14th bringing a period of Tule fog in the San Joaquin Valley. The next storm system arrived on the 21st bringing rain with snow above 9000 feet. By the morning of the 22nd, the cold air behind this system brought gusty winds and lowered snow levels to 2500 feet. Storm systems followed on the 26th and the 30th, with the latter storm bringing up to a foot of snow in the higher elevations of the Sierra Nevada.

The precipitation during December was enough to bring season-to-date rainfall to near normal levels. At the climate stations, Bakersfield was at 98.4 percent of normal while Fresno was at 119 percent of normal.

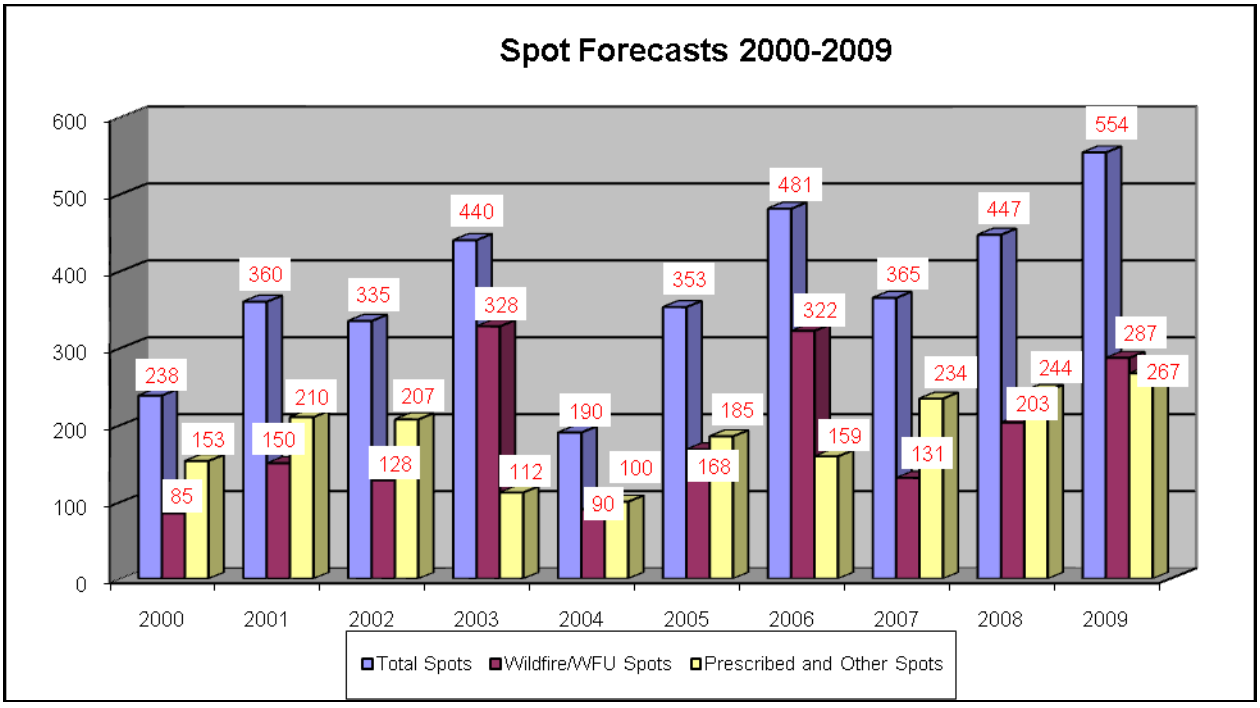
II. Spot Forecasts

The following Spot Forecasts were prepared by the National Weather Service San Joaquin Valley Office in 2009:

Total Spots: 554
  RX spots: 267
  Wildfire spots: 175
  WFU spots: 112
  Hazmat/Other spots: 7
Monthly average: 46.16



Average yearly spot forecasts from 2000 to 2009: 376.3



III. ATMU Dispatches

The San Joaquin Valley Office responded to the following Incident Meteorologist (IMET) requests during 2009:

Incident Name	IMET	Dispatch Dates	Fire Weather District
Big Meadow Yosemite NP	Cindy Bean	8/29/09 - 9/7/09	Hanford, CA

Total IMET days out of the office: 10

IV. Teaching Assignments

The San Joaquin Valley Office participated as instructors at the following Courses in 2009:

Course Name	Location	Agency Served	Instructor
S-290	Hanford, CA February 9-10	Kings County Fire	Cindy Bean
S-290	Porterville, CA April 13-15	Sequoia National Forest	Cindy Bean
S-290	Merced, CA April 27-28	Merced County/CalFire	Cindy Bean
S-290	Fresno, CA May 18-19	Fresno City Fire	Cindy Bean
S-290	Visalia, CA November 30-December 2	Tulare/Kings County Fire	Dan Harty

V. Training

The following training was completed by the San Joaquin Valley office in 2009:

IMET Workshop, Boise, ID, March 2009 - Cindy Bean
Dan Harty

VI. 2009 Red Flag Warning Verification

Note: warnings are issued for individual forecast zones.
e.g., a Red Flag Warning issued for 3 zones will count as 3 warnings.

Total Events

Number of Red Flag Warnings issued: 13
Number of Red Flag Warnings verified: 13
Number of missed events: 0

Warnings preceded by a Fire Weather Watch: 0
Watches not followed by a Warning: 0

Probability of Detection (POD): 100%
False Alarm Ratio (FAR): 0%
Critical Success Index (CSI): 100%
Average Lead Time for Warnings: 16.5 hrs
Watches: 0 hrs

The Red Flag events can be further broken down into events issued for Dry Thunderstorms and events issued for winds and low relative humidity.

Dry Thunderstorm Events

Number of Red Flag Warnings issued: 0
Number of Red Flag Warnings verified: 0
Number of missed events: 0

Probability of Detection (POD): NA
False Alarm Ratio (FAR): NA
Critical Success Index (CSI): NA

Wind and Low Humidity Events

Number of Red Flag Warnings issued: 13
Number of Red Flag Warnings verified: 13
Number of missed events: 0

Probability of Detection (POD): 100%
False Alarm Ratio (FAR): 0%
Critical Success Index (CSI): 100%
Average Lead Time: 16.5 hrs