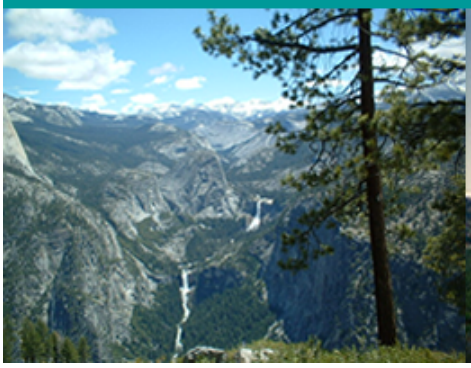
In The Clear

The Weather Newsletter For Interior Central California



Spring 2007 Edition National Weather Service – San Joaquin Valley/Hanford Office

Editor's Corner

We Are Back!

After a short hiatus, I am pleased to announce on behalf of the staff here at the National Weather Service in Hanford the return of our spotter newsletter, In The Clear. We published our first online edition of this newsletter in the fall of 1997 and have typically had editions each year published during the winter, spring, summer and fall. I hope you find this newsletter to be an important and valuable source of information about all aspects of the local weather in the Central California interior no matter what the season. Please feel free to provide us with any comments or suggestions for future editions!

Sincerely,

Chris Stachelski
Newsletter Editor/Focal Point

In this Issue…

Wildfire Worries…2 Flashback to the Flood…2 Temperature Sensors…3 Catastrophic Cold… 5 Hazardous Heat…6 Send us your weather pics…9 Summer Thunderstorms…10 UV Index…12 Weather Words…13 Monthly Memoirs…14 Dry Days…20 Running the Numbers…21

Meet Our New WCM!

Hello! I would like to introduce myself as the new Warning Coordination Meteorologist (WCM) for the San Joaquin Valley National Weather Service Forecast Office. My name is James Brotherton and I recently arrived in Hanford from the Sterling, VA NWS office.

I was stationed at the Sterling office for about two and a half years. While at the Sterling office, I was involved in several local office programs which involved working directly with our local customers, especially in the

(Continued on Page 9)

Wildfire Worries

By Chris Stachelski
Meteorologist Intern

The year 2006 was a historic year for wildfires in the United States with over 9.8 million acres burned, setting an all-time record for since records were first kept in 1960 by the National Interagency Fire Center in Boise, Idaho. In the state of California alone last year, over 8,100 wildfires occurred burning over 678,000 acres of land. This year has already seen wildfires make national headlines with the state of Georgia seeing its largest wildfire (in terms of burned acreage) on record.

Many people think of wildfires as only being a threat during the summer months. In central and especially southern California, the warm climate of much of the area allows for a wildfire threat throughout the year that typically peaks in the middle to latter portion of the summer. The drier than normal conditions experienced throughout interior central California and the rest of the state this water season also heighten the concern for the threat of wildfires this summer.

While the Sierra Nevada are an inviting place to visit anytime of the year, thousands of people can be found taking in the sights of the region during the summer months. Many people make day trips, but a number also choose to spend the nights camping in the wilderness.

While camping can be a fun adventure, there are many risks that campers face and should be aware of, including wildfires. While most of the wildfires in the Hanford County Warning and Forecast Area last year were lightning induced, a few were started by humans. There are a number of preventive measures people can take to reduce the risk of starting a fire that puts themselves and others at risk:

Flashback to the Flood…

January 2007 marked the 10th Anniversary of the historic flooding that affected Yosemite Valley. Nearly 178 million dollars in damage occurred in Yosemite National Park due to the flooding. An all-time high crest was set on the Merced River at Pohono Bridge of 23.45 feet during this event. Today, signs in the park provide visitors the ability to see how high the water levels reached during the January 1997 flood.

- Be careful with cigarettes in the outdoors. They should be carefully extinguished and disposed of.
- Avoid parking cars or trucks on dry grass.
- Never burning trash in an unlawful manner.
- Keep stoves, lanterns and heaters away from things that can catch on fire, such as a tent. Store containers with flammable liquids in a safe place.
- Never take any burning sticks out of a fire.
- Inspect your campsite when you leave to ensure your camp fire is out.

(Continued on page 8).

Even though the times have changed and more modernized equipment has become available, methods that determine the best location to place your equipment were established decades ago. (Above photo of a cotton region instrument shelter courtesy of the NOAA online Photo Library).

Temperature Sensors: Location…Location…Location

By Jim Dudley, Lead Forecaster

Without a doubt, the outside temperature is the most important of all weather elements. Many people own thermometers ranging from mercury filled plastic models, to round coil types to digital wired or even wireless varieties. They all work quite well and are reasonably accurate - if you know where to place the thermometer or sensor. Just what is a thermometer measuring? The answer seems rather obvious, the air temperature. A thermometer can accurately measure air temperature if it is out of direct sunlight, in a well ventilated location, and at the correct height from the ground. Here are a few guidelines and tips.

Placing a thermometer out of direct sunlight can be tricky since sunlit areas around your home vary considerably based on time of the year. A shady area in the winter can be in full sun in the summer and vice versa. One solution to this problem is purchasing a “radiation shield”. This device keeps your thermometer in the “shade” at all times and if properly constructed it will provide good ventilation.

Ventilation is just as important as sunlight exposure since reflected heat will warm the air around the thermometer and give false readings. The rule of thumb for ventilation is

Out and About…

Once again this past January, the National Weather Service in Hanford was an exhibitor at the annual Ag Expo near Tulare. Meteorologists Kevin Durfee (left in the above photo) and Carlos Molina (right) were among the staff who answered questions and provided information to the public about the National Weather Service.

Temperature Sensors…

(Continued from Page 3)

"the farther the better" meaning place the sensor as far away from walls and eves as possible.

Lastly is the height of the thermometer. The official World Meteorological Organization (WMO) guideline for the height of a thermometer is 1.5 meters (approximately 4 ½ feet) above the ground.

In many cases, it might not be possible to have a "perfectly" sited thermometer. That's okay; just do your best and understand that on a sunny and hot summer afternoon, that 130 degrees you're seeing on your thermometer is not accurate…thank goodness.

Questions? E-mail me at james.dudley@noaa.gov

Catastrophic Cold

By Chris Stachelski
Meteorologist Intern

Following a historic hot spell last summer, the marquee weather event of this past winter across interior Central California was also a temperature tale – persistent cold that resulted in a devastating freeze in the central and southern San Joaquin Valley. The California Department of Food and Agriculture as of April 25, 2007 reported at least 1.4 billion dollars in damages occurred to crops statewide – with 715 million dollars – or more than half of the total damage in the state of California - occurring the Hanford National Weather Service Office's area of responsibility.

Economically the damage from the freeze is staggering when put in perspective. According to the National Climatic Data Center in Asheville, North Carolina, since 1980 there have been a total of 70 weather-related events nationally in the United States to have seen at least 1 billion dollars in damage resulting from them. The freeze of January 2007 in California would bring this total to 71 nationally and makes it only the fifth weather-related event to have caused a billion dollars or more worth of damage in the state of California since 1980. From a freeze perspective, only two other freezes nationally have ever racked up damages of a billion dollars or more since 1980 – the legendary 1983 and 1985 freezes in Florida. Thus it can be said that the freeze of January 2007 is the most costly freeze to ever occur in the state of California. The economic impacts from the freeze have and will be continued to be felt in the central and southern San Joaquin Valley for some time to come.

In meteorological terms, the freeze was notable for the length of time it persisted in addition to the extremity of the cold. Freezing temperatures were first recorded in the Valley during the closing hours of January 5th and did not abate until January 27th in some areas. In both Fresno and Bakersfield, the freeze of January 2007 featured the second longest streak of low temperatures at or below 32 degrees ever on record. Fresno saw 19 such days from January 6 through the 24th, just 2 days shy of the all-time record set during January 1947 when lows of 32 degrees or lower were registered each day from January 3rd through the 23rd. In Bakersfield, low temperatures of 32 degrees or lower were logged each day from January 11th through the 24th. This stretch was just 2 days short of the longest record of days with lows of 32 degrees or lower in Bakersfield set from January 5th through January 20th of 1947.

From a number's perspective meteorologically, the frigid air this past January also was the coldest to be experienced in the central and southern San Joaquin Valley in about 8 years in some parts of the valley. Fresno's low of 23 degrees on January 13, 2007 was its lowest reading overall since a low temperature of 21 degrees on December 23, 1998. However, one would have to go back to 1976 to find a low temperature below 25 degrees in the month of January in Fresno. In Bakersfield, the coldest low during the January 2007 freeze was 23 degrees on January 14th. While quite frigid, this was not nearly as cold as the 19 degrees recorded on December 23, 1998. Lows in more rural locations during the January 2007 freeze were in the teens on several instances.

The continuous cold was the result of several factors. The dry air mass associated with the cold allowed temperatures to drop off rather quickly at night across the valley. Further, the

(Continued on page 20)

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution Extreme Caution Danger Extreme Danger

The heat index chart above is used to compute what it feels like outside by factoring in the relative humidity to the actual air temperature.

Hazardous Heat

By Chris Stachelski
Meteorologist Intern

The blistering, intense heat and the duration of it experienced in the Central California interior during last summer emphasizes the importance of understanding heat related terminology, how to recognize heat-related illnesses and also how spotters can assist the National Weather Service in fulfilling its mission to protect life and property.

A total of 46 people perished in the Hanford County Forecast and Warning area during the extreme heat of July 2006 and another 18 individuals were injured. Many of those who died or were injured were victims simply because they did not take precautions to protect themselves to dangers of hot weather. Here are a few simple safety tips to review and remember during the summer season when it comes to dealing with the heat:

- Slow down. Strenuous activities should be reduced, eliminated, or rescheduled to the coolest time of the day or avoided altogether, if possible. Find a cool place to stay, but remember in some cases that may not necessarily indoors.

- Dress properly for summer. Wear lightweight, light-colored clothing that reflects heat and sunlight, and helps your body maintain normal temperatures.

- Find A Cool Place To Stay. Air conditioned-buildings are a good place to start if you seeking relief from the heat. If you are not fortunate to live in a building with air conditioning, try to spend some time each day (especially during the hottest portion of the day) in an air conditioned building.

- Avoid getting too much sun. Sunburn makes the job of heat dissipation that much more difficult

- Watch what and how much you eat. One way to start is by eating smaller meals less often. Foods that are high in protein increase metabolic heat production which results in an increased water loss.

- **Stay hydrated by drinking plenty of water or other non-alcoholic beverages**. Your body needs water to keep cool. Drink plenty of fluids even if you don't feel thirsty.

- Do not take salt tablets unless specified by a physician.

During the summer months, you will often read or hear about certain terms associated with heat. Your National Weather Service Office in Hanford will issue, if warranted, watches, advisories and warnings for periods when excessively high temperatures are forecasted and could impact the health of people. Here are some terms that talk about temperatures when they're too hot to handle:

- Heat Index. This is also sometimes referred to as the "apparent temperature". The heat index is a measurement, given in degrees Fahrenheit (F), that tells how hot it feels when the relative humidity is added to the actual air temperature. Even with heat indices as low as 80 degrees, fatigue can be possible if a prolonged exposure and/or physical activity is experienced. Heat indices of 130 degrees or higher will very likely result in heatstroke or sunstroke with continued exposure.

- Heat Advisory. Your National Weather Service in Hanford will issue a Heat Advisory up to 36 hours in advance of when the Heat Index is expected to be at least 105 degrees for 2 or more hours.

-Excessive Heat Watch. Your National Weather Service in Hanford will issue a Excessive Heat Watch between 12 and 48 hours in advance of the time when a Heat Index of at least 115 degrees for 3 or more hours with nighttime lows dropping to only to near 80 degrees is a possibility.

-Excessive Heat Warning. This is essentially an upgrade of an Excessive Heat Watch. It means that the a Heat Index of 115 degrees or more for at least 3 or more hours with nighttime lows dropping to only or near 80 degrees is expected.

Heat Highlights:

The all-time record high temperature for Fresno is 115 degrees set on July 8, 1905. Bakersfield's all-time record high temperature is 118 degrees set on July 28, 1908.

What to watch for with heat-related illnesses:

- Heat stroke. Look for hot, red skin; changes in consciousness; rapid, weak pulse; and rapid, shallow breathing. A person's body temperature may be as high as 105 degrees Fahrenheit. Skin will be dry though may be wet if the person was working excessively and had sweat on their body.

- Heat exhaustion. Look for cool, moist, pale, or flushed skin as well as heavy sweating; headache; nausea or vomiting; dizziness; and exhaustion. Body temperature will be near normal.

How Can Spotters Play a Role in Helping the National Weather Service in Hanford during times of excessive heat?
As with all severe and extreme weather events, we welcome your reports! You can provide us with data of temperature and humidity by installing a home weather station and joining our online Mesonet. Reports of any heat-related damage, such as to crops, are also useful in helping us determine the economic impact of weather events. We use such data in verifying the immediate impact of extreme heat and in compiling our post-event reports.

Attention!

Do you have a home weather station? The National Weather Service in Hanford has a Mesonet in which you can share your weather information with us easily and continuously. Contact our Mesonet Focal Point, Jim Dudley by e-mail at:
james.dudley@noaa.gov
with any questions you may have about joining our Mesonet.

Wildfire Worries…

(Continued from Page 2)

Learning about the risks of wildfires while camping though starts long before you enter the wilderness, however. If you plan to go camping, there are a few things you can consider ahead of time that can put you less at risk to deal with the threat of a wildfire as well as make you aware of conditions conducive to one:

- Follow the weather. Be alert for thunderstorms. Also watch of for camping on days with low humidity and breezy conditions. The later two are ideal conditions for wildfires to spread rapidly.
- Be aware of any restrictions placed on campfires and burning.
-Be alert for Red Flag Warnings. These are issued by the National Weather Service when conditions are ideal for high fire danger in a given area.
- Know your surroundings. Camp in an area that is safe and can be evacuated safely and quickly in the event you need to should a fire start. Know your routes to safety.

Meet Our New WCM
(Continued from Page 1)

management community. I taught numerous SKYWARN classes and helped organize other outreach events as well. Before my stint in Virginia, I was stationed for just over 3 years at the Louisville, KY NWS office, where I was a journeyman forecaster. Similarly, I enjoyed working with the local emergency community and the general public while at Louisville. I participated in many outreach events including SKYWARN, StormReady, and several state fair booths. I even participated in a PBS production about the NWS, which was shown in public schools across the state. Before Louisville, I was stationed at the Charleston, SC office as a meteorologist-intern, where I was fortunate to learn the ropes of operational duties within the NWS. My career in the organization began at the National Centers for Environmental Prediction – Joint Agricultural Weather Facility in Washington, DC, where I was stationed for 2 semesters near the end of my college years. While studying meteorology at Purdue University, I also volunteered during the summer months at the local TV station in my home town Terre Haute, Indiana.

The primary duty of the local National Weather Service office is to provide timely critical warnings and other weather and hydrologic information for the protection of life and property within the borders of the USA. Within that dictation is the WCM, who acts as the primary individual to remain in close contact with our customers, including emergency management officials, numerous other government agencies, and of course the general public. As WCM, I will frequently be involved in public outreach events, such as SKYWARN presentations for amateur radio groups and the general public, seminars on hazardous weather education, and meetings with public officials on emergency response when it comes to the many hazardous weather or other natural elements that can affect the Central California interior. I will also work closely with our NWS San Joaquin Valley operational staff, and Meteorologist-in-Charge Steve Mendenhall, to ensure proper training for critical weather situations and updates to local policies, within the confines of national and regional regulations.

I look forward to learning more about the weather needs of our citizens as well as learning from my fellow staff at the forecast office. It will be a pleasure to serve the citizens of the San Joaquin Valley, and the nearby foothills, mountains and Kern County desert as your WCM. I would like to invite any of our partners to call and discuss improvements to our warning operations, or any other related topics. You can reach me directly at 559-584-0583, ext. 223, or via email at james.brotherton@noaa.gov. Thank you for your time!

A Call for any and all Weather-Related Pictures!

If you have any weather-related pictures or videos that you are proud of, we would love to obtain a copy of them. We will be improving our website with new photos in our photo album section in the near future. Please send your photos either through email, or you can mail in a CD, DVD, or the prints themselves. Our email address is w-hnx.webmaster@noaa.gov, and our mailing address is 900 Foggy Bottom Road, Hanford, CA, 93230.

James Brotherton
Warning Coordination Meteorologist

While thunderstorms in the San Joaquin Valley are rare during the summer months (June-August), they are quite common across the mountain regions, and when monsoonal moisture makes a push into the southern parts of California and Nevada, thunderstorms may also occur over the desert.

Vivid lightning displays over the high mountains are commonly seen from the San Joaquin Valley. When valley visibility conditions allow, we can sometimes see the long-distance signals of a stronger thunderstorm, such as the large billowing anvil cloud. In rare cases you may even see an overshooting top indicating a very strong updraft in the thunderstorm (see photo above, courtesy NWS).

These thunderstorms are enhanced by the influences of topography. The first influence is the predominant rising of the air mass as it encounters the terrain. This is commonly referred to as “orographic lifting”. Another substantial influence in the high country is from the smaller scale wind movements that are caused by differential heating of the mountain slopes and the surrounding air. These winds occur during the summer when the large-scale wind pattern is very light. These small scale winds help focus the thunderstorm activity along the ridge tops. An increase in easterly winds above the ridge tops occasionally cause the thunderstorms to drift west over the Sierra Nevada foothills and even reach cities in the eastern valley, such as Fresno and Visalia.

Conversely, desert thunderstorms are supported by the moist push of subtropical monsoonal moisture from Mexico and Baja California. These monsoonal thunderstorms usually occur during the summer in the Kern County Desert.

Summertime thunderstorms infrequently reach severe levels (with winds over 58 mph or large hail of penny size or larger) in the San Joaquin Valley and the nearby mountain and desert areas. The more typical threats with these thunderstorms are from frequent lightning and heavy rainfall-producing flash flooding.
All thunderstorms produce lightning. The amount of lightning in a thunderstorm does not dictate whether or not it is classified as a severe thunderstorm. Some thunderstorms produce only a few lightning strikes, while some others can produce prolific amounts of

lightning. Usually, the amount of ice particles in a thunderstorm dictates how much lightning occurs. When the atmosphere is very hot, a thunderstorm needs to grow very high into the atmosphere to be able to produce a significant amount of ice. It is also these storms that can become strong or severe since they must contain very strong updrafts and downdrafts.

Here are a few safety tips to remember when it comes to lightning:

- When a thunderstorm is approaching, lightning can strike as far as 10 miles from areas where it is raining. That's about the distance you can hear thunder. If you can hear thunder, you are within striking distance. Seek safe shelter immediately.

- During outdoor activities, minimize the risk of being struck. Most lightning deaths and injuries occur in the summer. Where organized outdoor sports activities take place, coaches, camp counselors and other adults must stop activities at the first roar of thunder to ensure everyone time to get to a large building or enclosed vehicle. Leaders of outdoors events should have a written plan that all staff are aware of and enforce.

- For more information on lightning safety, see our website at www.lightningsafety.noaa.gov

Flash flooding is a serious threat in the United States. Flash flooding is the number one thunderstorm-related killer annually. In the mountains that surround the San Joaquin Valley (especially the foothills and high country of the Sierra Nevada) flash flooding can be a serious concern during summer thunderstorms. The terrain causes water runoff to accelerate. Canyons and steep valley areas can force the water into a smaller area, also increasing the velocity, which can lead to a flash flood. In the desert, heavy rain can produce flash flooding as well. The mechanics of a flash flood in the desert are much different than in the mountains. The desert contains hard soil poor drainage, which causes most of the rain water to runoff. In addition, there is very little vegetation present to slow runoff. Therefore, desert flash floods can occur nearly as quickly as in mountainous areas.

Here are a few safety tips to keep in mind when it comes to flash flooding:

- Monitor NOAA Weather Radio or a local news source for vital weather related information.

- If planning to do any hiking or other outdoor activities, check with a park ranger or other public official on the current conditions and any necessary precautions you should take in the wilderness.

- If flooding occurs, get to higher ground. Get out of areas subject to flooding. This includes dips, low spots, canyons, washes, etc.

-Avoid areas already flooded, especially if the water is flowing fast. Do not attempt to cross flowing streams. Road beds may be washed out under flood waters.

-Do not camp or park your vehicle along streams and washes, particularly during threatening conditions.

-Be especially cautious at night when it is harder to recognize flood dangers. Flood deaths affect all age groups.

-For more information about flood and flash flood safety, check out this website: www.srh.noaa.gov/tadd

(Above photo: NWS archives)

Your Weather Reports Can Help Us:

During thunderstorm events, if you observe any of the following criteria, please contact the National Weather Service in Hanford at 559-584-3752. Your reports help us to issue and verify warnings. Feel free to report any of the following to us:

-Any flooding.
-Any branches or trees down.
-Any damage to structures or vehicles.
-Any wind over 40 mph.
-Any size hail.

Weather Fact:

Only one calendar day in July in Fresno has had a high temperature that has not reached or surpassed 110 degrees. July 12th has the distinction of having Fresno's "coolest" record high temperature of 109 degrees!

Be Aware of the UV Index This Summer

James Brotherton
Warning Coordination Meteorologist

The ozone layer forms a thin shield in the upper atmosphere, protecting life on Earth from the sun's ultraviolet (UV) rays. In the 1980s, scientists began accumulating evidence that the ozone layer was being depleted, primarily by human manufactured substances. Depletion of the ozone layer results in increased UV radiation reaching the Earth's surface. Overexposure to UV radiation can lead to serious health effects, such as skin cancer, cataracts, and immune suppression.

Did you know that the National Weather Service in Hanford measures stratosphere-level ozone three times a day? We are one of only a handful of stations in North America to have a "Dobson unit", which is the name of the system used to measure stratospheric ozone. Our data contributes to the daily UV index forecast in the United States.

The National Weather Service, in partnership with the Environmental Protection Agency, produces the daily UV Index forecast. For more information about the UV Index, how you can protect yourself from the sun's harmful rays, and to find out the daily UV Index for your city, please check out the EPA's SunWise website at www.epa.gov/sunwise.

Weather Words

By Kevin Durfee

(see page 20 for solution)

Y	O	T	R	O	P	I	B	M	D	A	R	K	A	T	O	R	N
T	R	H	F	O	G	I	O	E	O	N	N	D	O	D	M	O	H
I	O	S	A	E	S	N	C	N	C	O	I	P	O	R	O	A	R
L	L	R	A	I	O	T	U	A	T	O	S	W	K	S	N	O	Y
I	A	N	V	I	F	D	P	C	N	N	N	P	N	N	S	F	T
B	M	M	I	A	R	A	D	I	A	B	A	T	I	C	O	N	I
I	R	I	R	R	O	N	R	R	U	T	O	G	A	G	O	W	L
S	E	D	U	E	S	R	A	R	T	R	O	T	A	A	N	I	I
I	P	H	U	R	H	O	S	U	N	D	T	O	N	D	O	N	B
U	A	F	R	O	N	T	K	H	V	E	R	R	V	N	S	D	I
R	T	N	V	I	L	N	I	A	R	O	H	N	I	U	A	E	S
C	T	U	S	R	O	C	O	N	T	R	A	I	L	S	E	T	I
L	E	H	E	U	O	G	A	S	R	O	K	D	U	D	O	A	V
I	R	E	A	N	N	P	O	R	T	E	T	O	P	N	R	M	O
A	V	I	S	I	O	D	A	N	R	O	T	S	K	I	A	I	R
H	E	T	R	N	K	M	O	N	O	O	N	T	N	W	N	L	O
V	E	E	R	I	O	N	O	G	P	U	R	O	A	O	K	C	G
B	E	L	T	O	M	R	O	T	S	O	R	F	S	P	W	N	R
V	R	E	O	O	P	R	E	C	P	I	T	A	T	A	N	O	A
W	I	P	R	E	C	I	P	I	T	A	T	E	O	O	E	T	P
I	N	L	N	I	A	H	C	L	I	M	A	T	R	O	T	S	H
N	G	D	A	H	N	A	D	A	N	V	I	O	N	N	R	O	I
Y	G	G	O	F	L	I	C	E	R	P	I	T	A	T	E	F	C

adiabatic
anvil
climate
cloud
contrails
downburst
foggy
front
frost
hail
hurricane
knots
monsoon
orographic
pattern
precipitate
rain
season
snow
storm
sundogs
thermal
tornado
tropical
updraft
veering
visibility
winds

Monthly Memoirs

By Gary Sanger
Climate Services Focal Point

JANUARY 2007 WEATHER SUMMARY

High pressure built over California at the beginning of January, in the wake of a trough that moved through the region in late December. The ridge brought a stable air mass to the central California interior, with areas of dense fog developing in the central and southern San Joaquin Valley the night of the 1st.

A Pacific storm reached California the night of January 3rd-4th, bringing as much as two feet of new snow to the high country of the Southern Sierra Nevada. The storm also brought strong winds to the Kern county mountains and deserts, with gusts to 72 mph over the crest of the El Paso Mountains early in the morning of the 5th.

The storm brought cold air to the San Joaquin Valley, and behind it, an upper-level ridge built over California. As skies cleared, low temperatures fell below freezing. This cold pool lingered over the central and southern San Joaquin Valley for several days, as the ridge kept a table pattern in place with no mechanism to scour out the cold air.

The upper-air pattern changed as an upper-level trough dropped into the Great Basin on the 10th and 11th, deepening southwestward into southern California. This set up a northeast flow aloft over central California, and brought an Arctic air mass into the state for unseasonably cold weather. A deep freeze developed over the central and southern San Joaquin Valley, with low temperatures on the morning of January 12th falling into the mid to upper teens in the rural areas of the west side of the San Joaquin Valley, and into the lower 20s even in the urban areas.

The coldest temperatures were on the mornings of January 12th-16th, but sub-freezing temperatures continued through the morning of the 22nd. Fresno had 19 consecutive days with lows of 32 degrees or colder (January 6th-24th), just 2 days shy of the record of 21 days, set from January 3rd-23rd, 1947. Bakersfield had a string of 14 consecutive days with lows of 32 degrees or colder (January 11th-24th), also just two days shy of its record of 16 consecutive freezing days (January 5th-20th), also in 1947.

The northeast flow aloft worked down to the mountains at times, bringing periods of gusty winds to the higher elevations of the Southern Sierra Nevada and Tehachapi Mountains at times, as well as to the peaks in the Kern county deserts. Northeast winds gusted to 45 mph over the El Paso Mountains and into east-facing canyons of the Southern Sierra Nevada on January 21st, but did not lower to the desert floor.

An upper-level low dropped out of the Gulf of Alaska during late January, and became nearly stationary off the central California coast. The cyclonic flow around the low brought south winds to central California on the 25th, with downslope winds warming Bakersfield to a high of 71, the first time temperatures climbed into the 70's at Meadows Field since December 9th.

The low also brought a narrow fetch of mid-level moisture into the region. Snow developed over the Tehachapi Mountains and the Southern Sierra Nevada late on January 27th

and continued through the morning of the 28th. Although the snow was sporadic, a few locations received up to 8 inches of new snow. Moderate rain spread into the central and southern San Joaquin Valley, with both Fresno and the Hanford airport receiving 0.50 inch of rain on January 27th-28th, although Bakersfield reported only 0.09 inch of rain from the storm.

The low pressure system moved southeast on the 30th, coming inland over northern Baja California. An elongated upper-level ridge built along the coast, with a wide trough over much of the United States and Canada. This set up a northerly flow aloft over California, bringing a drier air mass to the region. As a result, fog in the central and southern San Joaquin Valley was patchy in nature for the last few nights of the month.

Because of the dry, cold air mass over California much of January, Bakersfield had its 12th driest January on record, while Fresno had its 26th driest January. Bakersfield tied for its 17th coldest January on record (with January 1999), while Fresno tied for its 26th coldest January (with January 1897).

FEBRUARY 2007 WEATHER SUMMARY

After a colder and drier than normal January, February 2007 was remarkable for being unremarkable. Fresno's average temperature for the month matched the 30-year average, and the rainfall at the Fresno Air Terminal was 0.17 inch above the normal for February.

February began with a weak short-wave trough moving out of California. In its wake, low clouds filled much of the central and southern San Joaquin Valley, and pushed into the Sierra Nevada foothills, where the clouds caused patchy drizzle and fog.

Behind the trough, an upper-level ridge built into California. This high pressure brought warming to the central California interior, and warmed Bakersfield to a high of 77 degrees on February 5th, just one degree sky of its record for that date (78 degrees, set in 1963). The warming was short-lived, as the first of 3 major upper-level Pacific storms approached the state.

The first storm consisted of a pair of upper-level troughs. The first trough moved into central California on the 6th, producing mostly virga initially. Measurable rain ultimately spread as far south as Fresno County before the trough moved east, with the second trough close behind. As with its predecessor, precipitation was mainly over the northern half of the Hanford warning/forecast area. Then, an upper-level vorticity rounded the trough during the late afternoon of February 13th, bringing moderate showers to the south end of the San Joaquin Valley and the adjacent mountains. The storms brought locally heavy snow to the high country of the Southern Sierra Nevada, with snowfall estimates of 1-½ to 2 feet, based on SNOTEL reports and observed snow/water ratios.

Strong high pressure aloft brought warm, dry weather to the region behind the troughs, and some patchy late night and morning fog to the central and southern San Joaquin Valley, High temperatures in the central and south Valley warmed into the mid 70s on the 17th, giving Fresno its first 70-degree day of the year. A blocking pattern kept the high pressure along the coast through the middle part of the month. The pattern broke down quickly as an upper-level trough moved into California. The main energy from this system moved through Kern County on the 18th-19th, with 0.29 inch of rain

falling at Meadows Field, Bakersfield. Runoff from the Tehachapi Mountains caused some road flooding in the far south end of the San Joaquin Valley.

The second major storm reached central California on the 22nd-23rd, and brought the first severe weather of the season to the central and southern San Joaquin Valley. This was a very cold system, and snow fell as low as the Sierra Nevada foothills, with up to 6 inches of snow falling in the Mariposa County foothills. Snow amounts in the foothills tapered off sharply to the south, with less than 2 inches being reported in the Tulare County foothills.

This funnel cloud in Fowler was one of several that formed across the Central San Joaquin Valley on February 22nd. (Photo courtesy of KSEE-TV in Fresno.)

Strong thunderstorms developed over the central and southern San Joaquin Valley during the afternoon of the 22nd, and persisted into the early evening hours. At least two funnel clouds were observed over southern Madera County; luckily, neither touched down. Further south, a thunderstorm that developed southwest of Hanford intensified rapidly as it moved east, becoming severe as it reached the Kings/ Tulare County line. A spotter reported hail in excess of ¾-inch in diameter from the storm.

Behind the storm, high pressure again moved over California, bringing clear skies to the central California interior. At the same time, cold air remained pooled over the San Joaquin Valley floor. This allowed low temperatures to cool into the upper 20s in the normally coldest, wind-sheltered Valley locations during the morning of February 24th.

The final storm of the month reached central California on the 25th. This storm brought more cold air into the region, and again snow fell into the Sierra Nevada foothills, down to as low as 1600 feet at Coarsegold. There was a break in the precipitation on the 26th, but showers resumed on the 27th and continued into the last day of the month. The first short-wave trough brought around a foot of new snow to the Southern Sierra Nevada, and triggered wind gusts of 55-65 mph over the Kern County mountains and deserts. The second short-wave trough had a stronger moisture tap, and dropped 2-3 feet of new snow above 6000 feet, and a foot of snow as low as Ponderosa Basin (at 3500 feet in Mariposa County). Over 4 inches of snow fell in the Kern County mountains above 5000 feet, and icy conditions closed Interstate 5 over the Grapevine.

MARCH 2007 WEATHER SUMMARY

In the wake of the storm that hit central California at the end of February, cold air filled the San Joaquin Valley. Temperatures in the Valley on the first two days of the month were only in the mid 50s to around 60. Bakersfield had a low of 32 degrees on the 1st. This was not only the last freezing night of the 2006-07 frost season, but also tied the record low for that date at Meadows Field (set in 1930). This cold air mixed out on the 3rd as high pressure built into the region; highs on March 3rd were as much as 14 degrees warmer than the previous day, and continued to warm the next few days as the upper-level ridge amplified ahead of a weak Pacific storm.

In the wake of the storm that hit central California at the end of February, cold air filled the San Joaquin Valley. Temperatures in the Valley on the first two days of the month were only in the mid 50s to around 60. Bakersfield had a low of 32 degrees on the 1st. This was not only the last freezing night of the 2006-07 frost season, but also tied the record low for that date at Meadows Field (set in 1930). This cold air mixed out on the 3rd as high pressure built into the region; highs on March 3rd were as much as 14 degrees warmer than the previous day, and continued to warm the next few days as the upper-level ridge amplified ahead of a weak Pacific storm.

This storm brought a push of colder air into central California, with temperatures on March 8th cooler by 8-10 degrees from the 7th. Despite this cooling, high temperatures remained slightly above normal. Sporadic light showers accompanied the storm, but neither Bakersfield nor Fresno saw any rain. Only a few inches of snow fell in the high country of the Southern Sierra Nevada.

Strong high pressure built into California built in the wake of the storm. Temperatures warmed rapidly, with Fresno breaking 80 degrees for the first time this year, with a high of 82 degrees on March 12th; the high at Fresno on the 9th had been only 68.

Bakersfield set record high temperatures on March 12th and 13th, while Fresno saw record highs on the 13th and 14th. Bakersfield also set a record high minimum temperature on the 14th. This string of warm days, which saw Fresno hit 87 on March 16th, and Bakersfield reaching 88 degrees (also on the 13th), was a major factor in both Bakersfield and Fresno having their 8th warmest March on record.

After a mostly warm and dry first half of March, two strong Pacific storms moved through the central California interior. The first storm arrived on March 20th, and brought between a quarter and a half inch of rain to the central and southern San Joaquin Valley, with the heaviest rain over the south end of the Valley. Likewise, the heaviest snow fell in the Tulare County mountains, where Lodgepole recorded over 4 inches of new snow, while Grant Grove reported 2 inches. Three-quarters of an inch of snow fell as far south as Bear Valley Springs in the Tehachapi Mountains.

A short-lived upper-level ridge moved into California behind the storm, with temperatures warming back into the 80s on the 24th, albeit for only one day. Two days later, a strong and cold storm dropped out of the Gulf of Alaska into California.

The storm brought a strong surge of cold air into the region, with temperatures cooling around 15 degrees from the 26th to the 27th. The snow level was very low, with snow falling into the Sierra Nevada foothills down to the 2500-foot level at times. Strong winds developed over the Kern County mountains and deserts, with frequent gusts to 60 mph. Mojave saw a few gusts to 75 mph as winds funneled through the Tehachapi Pass.

The high country of the Southern Sierra Nevada received up to 14 inches of new snow, while further south, up to 8 inches fell in the Tulare County mountains. A half foot of snow fell at Fish Camp, at an elevation of 5000 feet near Yosemite National Park. In the Kern County mountains, 9 inches of fresh snow fell on Alpine Valley (at 6000 feet) the night of March 26th-27th, and Bear Valley Springs in the Tehachapi Mountains reported 5 inches of snow. A mix of rain and snow was observed at Mountain Mesa, on the south shore of Lake Isabella at an elevation of 2800 feet.

In the San Joaquin Valley, the storm triggered several thunderstorms during the evening of March 26th. Outflow winds from collapsing cells generated gusts to 40 mph in Fresno, and downed power lines in Reedley. Although the

the 27th was relatively quieter, the combination of strong subsidence aloft and tight surface pressure gradients brought another round of gusty winds to the region. Gusts to 40 mph were recorded at Hanford Municipal Airport and at Meadows Field in Bakersfield. 38 mph gusts were observed in Fresno, toppling several trees. (The soil was already moist from the 0.65 inch of rain that fell in Fresno the previous day.) Gusts to 38 mph also were recorded in Visalia.

March ended on a warm and dry note, as high pressure returned to California and warmed temperatures in the central and southern San Joaquin Valley into the 80s.

APRIL 2007 WEATHER SUMMARY

The lack of precipitation this past winter is evident in this photo of Half Dome at Yosemite National Park. Only a very light coating of snow was covering the highest portions of this geological formation when this photo was taken on April 12th.

High pressure dominated the weather for the central California interior at the start of April, but an upper-level low west of the southern California coast pulled a fetch of subtropical moisture into the southern half of the state on the 4th. This resulted in high clouds spreading across the Hanford warning/forecast area, with some mid-level clouds at times. The air mass over the Southern Sierra Nevada became unstable during the afternoon of April 5th, resulting in isolated late afternoon thunderstorms over the high country of the Southern Sierra Nevada. Warm, moist and unstable air continued to move into the region from the south through the evening of the 5th, triggering a few thunderstorms in the Tehachapi Mountains near Frazier Park. Thunderstorms also were reported near Gorman, moving north into the Grapevine area. NOAA Doppler Weather Radar detected a few showers over the south end of the San Joaquin Valley, but these produced almost exclusively virga.

Another Pacific storm approached California on April 7th, but subsequently split, with the northern part moving into the Pacific Northwest, and the southern part into northern Baja California. This left the central California interior dry, but winds over the mountains and deserts did pick up in the wake of the remnant trough; gusts between 45 and 60 mph were observed at several sites in the Kern County mountains and deserts, and a gust to 86 mph was recorded at the Mojave airport.

The next upper-level trough reached California on April 11th-12th. This system brought measurable rain to the northern part of the Hanford warning/forecast area, with 0.08 inch of rain falling at the Merced Municipal Airport on the 11th. Neither Bakersfield nor Fresno saw measurable rain from this system, but Bear Valley Springs in the Tehachapi Mountains received an inch of new snow, and snow fell at Hume Lake. Gusty northwest winds developed over the region due a tight surface pressure gradient behind the trough, and widespread gusts of 35 to 40 mph were reported in the central and southern San Joaquin Valley on the 12th; NAS Lemoore had a peak gust of 46 mph. Stronger gusts occurred in the Kern County mountains and deserts, with one automated desert station recording a gust to 74 mph.

There was a one-day break in the unsettled weather before another upper-level system dropped out of the Gulf of Alaska into California on April 14th-15th. This system finally brought measurable precipitation to the region, with Bakersfield setting a record for rainfall on the 15th of 0.22 inch, nearly double the old record of 0.12 inch, set 40 years ago in 1967. Bakersfield had a 2-day total of 0.47 inch, more than Meadows Field saw in all of March 2007. Heavy rain and snow fell in the Kern County mountains, with 9 inches of new snow falling at Bear Valley Springs and up to 8 inches at Alpine Forest (near Tehachapi); Glennville had just over an inch of rain from the storm. A thunderstorm developed near Buttonwillow, with one lightning strike reported.

In addition to the precipitation, the storm also brought another round of gusty winds to the region, with gusts to 50 mph at Edwards AFB, to 47 mph at NAS Lemoore, and to 35 mph at the Merced Municipal Airport and China Lake NWTC.

Unsettled weather continued across the central California interior, with Pacific storms reaching the area every 2-3 days. The next storm, which was mostly dry, moved through central California during the latter part of April 16th through the 17th. The main effect of the storm was wind, as the central and southern San Joaquin Valley saw gusts of 35-45 mph, while the Kern County mountains and deserts had some gusts up to 60 mph; one isolated remote mountain station recorded a gust to 74 mph.

Next in line, an upper-level low dropped out of the Gulf of Alaska toward the northern California coast on April 19th. Light rain moved into central California that evening, and continued through the 20th as the low moved south along the coast. The push of cold air brought several degrees of cooling to the region. Bakersfield had a high temperature of only 59 degrees on the 20th, breaking the old record low maximum temperature for the date of 60 degrees, set in 1985.

A stronger system followed two days later, giving Fresno 0.41 inch of rain over a 2-day period (nearly all of which fell on the 23rd). Bakersfield recorded only 0.03 inch from this storm. A ridge of high pressure built into California behind the storm, with both Fresno and Bakersfield warming 10 degrees from April 23rd to the 24th. A weak low-pressure system moved into the Pacific Northwest on the 25th, deepening the marine layer along the coast and resulting in a push of marine air through the Sacramento Delta into the San Joaquin Valley. This surge of cool air negated much of the warming experienced the previous day, with high temperatures in the southern San Joaquin Valley on April 25th as much as 7 degrees cooler than the 24th.

High pressure aloft rebuilt into California on the 26th, and pushed central and southern San Joaquin Valley highs into the lower to mid 90s on April 27th. Both Bakersfield and Fresno had their first 90-degree day of the year with temperatures running 12-15 degrees above normal. The high pressure was the strongest on the 28th, with high temperatures reaching record levels at Bakersfield, Fresno and Edwards Air Force Base; and Coalinga reported a high of 100.

An upper-level trough approached the Pacific coast on the 29th and 30th, bringing areas of high clouds to the central California interior, and 8-12 degrees cooling to the central and southern San Joaquin Valley. Even so, temperatures on April 30th were still 6-10 degrees above normal.

A sign of the drier than normal conditions in Yosemite National Park this April is evident in this stream bed near Lower Yosemite Falls where water is seen trickling through.

Dry Days

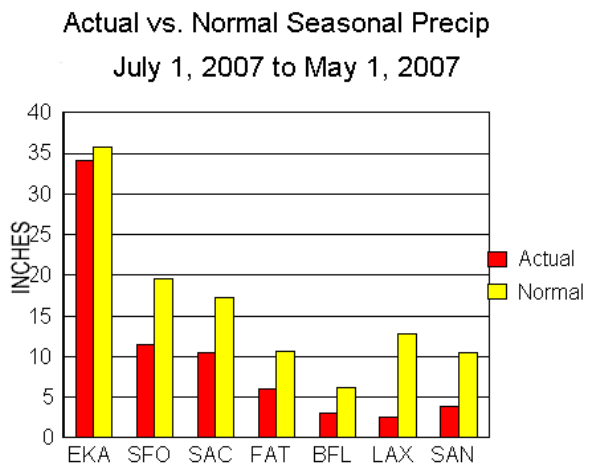
By Chris Stachelski, Meteorologist Intern

Unlike many areas in the eastern and central portions of the country which compile statistics for precipitation based on the calendar year, California and many other western states compute statistics for precipitation based on the water year. The "water year" runs from July 1st until June 30th of the following year. Thus, the 2006-2007 water season began on July 1, 2006 and ends on June 30, 2007. The main reason for using a water year instead of a calendar year to compile precipitation totals is due to the defined wet and dry seasons that California's climate has.

Precipitation trends across the Hanford County Warning and Forecast Area this Water season mirrored that of the state of California. Both Bakersfield and Fresno had one of their driest water seasons on record. Although additional rainfall is possible in either city before the final water numbers become available, late season storms tend to be weaker and often bring scant amounts of precipitation to interior Central California at best.

The Driest Water Year On Record

Fresno…4.43" in 1933-1934
Bakersfield…2.21" in 1933-1934



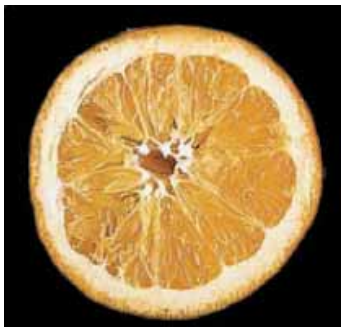
A sign of the times – the graph above shows how dry it has been at several locations in California for the water season so far. (Graph complied by Kevin Durfee.)

Runnin' the Numbers		Fresno				Bakersfield			
		JANUARY	FEBRUARY	MARCH	APRIL	JANUARY	FEBRUARY	MARCH	APRIL
TEMPERATURE (^{o}F)	Average Maximum	55.6	60.8	73.4	75.5	56.1	63.8	74.9	75.6
	Average Monthly	43.7	51.4	60.2	62.9	44.4	52.7	61.5	64.0
	Departure from Normal	-2.3	0	4.7	1.7	-3.4	-0.6	4.2	1.7
	Average Minimum	31.8	42.0	47.1	50.4	32.6	41.6	48.0	49.6
	Maximum	69	74	87	98	71	77	88	97
	Date(s)	25th	17th	16th	28th	25th	5th, 17th	13th, 16th	28th
	Minimum	23	33	33	39	23	33	32	42
	Date(s)	13th	24th	1st	19th	14th	24th	1st	18th
	Number of Days Max ∃90	0	0	0	3	0	0	0	3
	Number of days Min #32	19	0	0	0	17	0	1	0
PRECIPITATION (In.)	Total	0.59	2.29	0.97	0.49	0.21	0.99	0.44	0.51
	Departure from Normal	-1.57	0.17	-1.23	-0.27	-0.97	-0.22	-0.97	0.06
	Greatest in 24 hrs	0.50	0.84	0.65	0.42	0.12	0.35	0.32	0.47
	Date(s)	27th-28th	22nd-23rd	26th	21st-22nd	4th	12th-13th	20th	14th-15th
	Number days w/precip.	3	13	4	5	5	11	4	5
	Seasonal Total	2.23	4.52	5.49	5.98	1.12	2.11	2.55	3.06
	Departure from Normal	-3.30	-3.13	-4.36	-4.63	-1.94	-2.16	-3.13	-3.07
	Compared to Normal	40.3%	59.1%	55.7%	56.4%	36.6%	49.4%	44.9%	49.9%
WIND (mph)	Peak Speed	28	38	40	39	35	37	40	40
	Direction	NW	NW	NW	NW	NW	W	N	NW
	Date(s)	5th	26th	26th	12th	4th	22nd	27th	12th
PRESS (in.)	Highest	30.61	30.50	30.24	30.24	30.59	30.50	30.24	30.23
	Date	7th	15th	28th	24th	7th	15th	28th	24th
	Lowest	29.89	29.78	29.87	29.78	29.86	29.75	29.86	29.76
	Date	10th	18th	23rd	20th	10th	18th	23rd	20th

Catastrophic Cold…

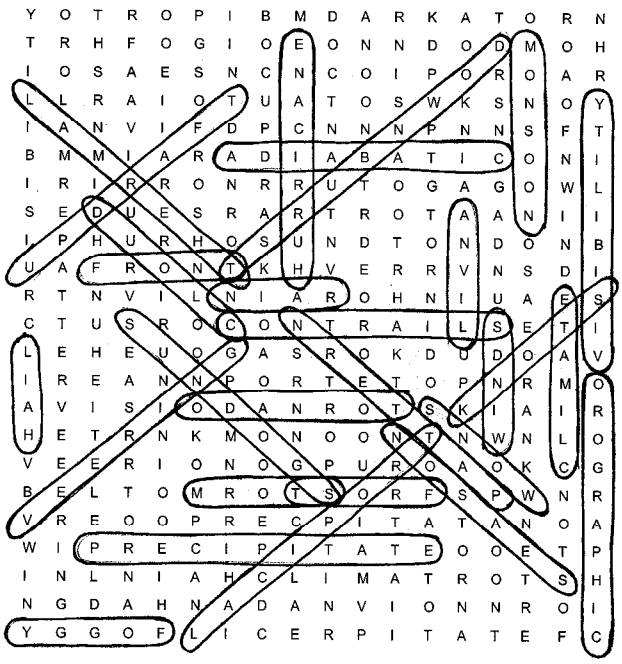
(Continued From Page 5)

lack of any significant storm systems during the early part of the cool season resulted in dry soil conditions across the valley. This resulted in ideal conditions for temperatures to drop off at night. In addition, the lack of soil moisture led to a lack of fog this past winter, which is the valley's natural protection from frost and freezes by helping to keep temperatures up at night. Lastly, once the cold air was ushered into the valley there was no real mechanism to force it out – allowing it be trapped and sit around in the Valley where it "chilled" (the other definition literally as well) for several days.



The inside of an orange damaged by a freeze. (Photo from the University of California).

Weather Words Solution



E-mail your Questions or Comments on this newsletter to <u>Chris Stachelski at:</u>

christopher.stachelski@noaa.gov

In The Clear is a newsletter issued by the:

San Joaquin Valley/Hanford Office
900 Foggy Bottom Road
Hanford, CA 93230-5236

A special thanks is extended to all of the staff members who contributed articles for this newsletter as well as to David Spector and Cindy Bean for advice with graphics, layout and formatting issues. Lastly, a special thanks is also extended to Steve Mendenhall, Meteorologist In Charge, for his overview of this newsletter. All photos not credited within this issue were provided by the HNX staff.