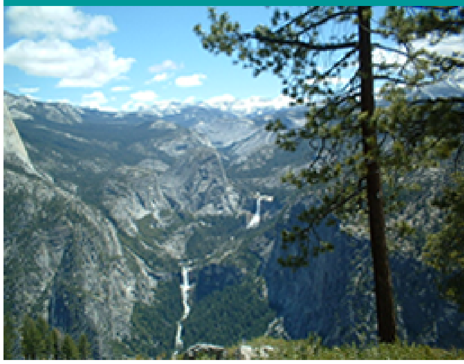
In The Clear

The Weather Newsletter For Interior Central California



Early Winter 2007 Edition National Weather Service/Hanford, CA

Editor's Corner

Well it took a while, but winter (or at least snow) has finally showed up in parts of interior Central California! As I write this article, the first noteworthy winter storm of the season has blanketed the higher elevations with snow finally. As we get ready to close out 2007, I think one word easily describes this fall and the year overall – ***dry***. This year has certainly had its share of interesting weather stories though – from the major Valley freeze last January, the Rosamond tornado in early September and more recently the severe weather in the central and southern San Joaquin Valley and the nearby Sierra on October 29th.

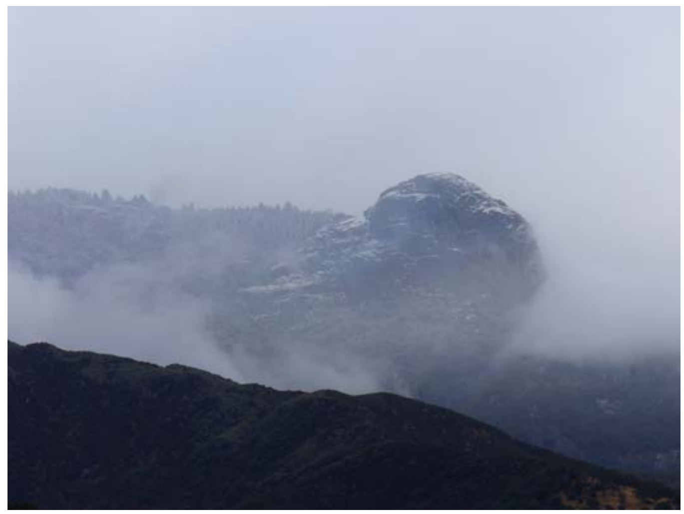
With winter almost upon us (in the astronomical school of thought), this issue focuses heavily on winter weather from how to prepare to a look back at winters of the past. Our popular series on home weather stations continues and this issue concludes with Gary Sanger's recap of the weather during the last three months. I hope you enjoy this issue!

Happy Holidays!

Sincerely,

Chris Stachelski
Newsletter Editor

A special thanks is extended to all of the staff members who contributed articles for this newsletter as well as to David Spector, the office webmaster. 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.



Moro Rock in Sequoia National Park in October 2007 sprinkled with a fresh coating of snow.

Inside This Issue…

New TAF for Visalia Airport

James Brotherton
Warning Coordination Meteorologist

On December 13, 2007, NWS Hanford will begin new Terminal Aerodrome Forecast (TAF) service for Visalia Municipal Airport. Terminal Aerodrome Forecasts are routinely issued every 6 hours, and more frequently when required. TAFs are valid for 24 hours from the time of issuance. The product provides a forecast of cloud heights and ceilings, wind direction and speed and associated wind shear, visibilities, and prevailing weather conditions. Other sites currently receiving TAF service in the Hanford area of responsibility include Fresno, Bakersfield, and Merced.

The Visalia Airport is one of the oldest in the Central Valley, and it is also the third busiest airport in the Central Valley by the number of daily operations. Currently the Visalia Airport provides four daily commercial flights to Las Vegas. New TAF service was requested by the airport manager and General Aviation community from Visalia. For more information about TAFs, please contact our Aviation Forecast Program Leader, Carlos Molina, at **carlos.molina@noaa.gov**.

New Recreational Forecast

On January 2, 2008 a new recreational forecast will be issued by the NWS Hanford for the National Parks located within our forecast and warning area. This product will feature a seven day forecast of temperature, sky cover, weather and significant winds for Yosemite National Park and a forecast for Kings Canyon and Sequoia National Parks. This product will be available online under “Recreational Forecast” under the WMO header of SXUS 45 KHNX. Look for this product on our webpage among other places! For additional information contact our Meteorologist-In-Charge, Steve Mendenhall, at **steven.mendenhall@noaa.gov**.

Additional Precipitation Data Now Available!

Through the work of the NWS Hanford Climate Services Team and our office webmaster, additional monthly and annual precipitation data is now available for Los Banos. Data now goes back to the beginning of records for this site, which began taking observations starting in 1906! This data is available on the climate section of our website under the tab marked “local data/records”.

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

christopher.stachelski@noaa.gov

Staying Safe This Winter

Winter Can Be A Season To Enjoy…but like any other time of the year there are hazards to be alert for!

Chris Stachelski
Meteorologist Intern

Winter scene at Bear Mountain, Fresno County.

Winter - from its bitter blasts to blinding blizzards, this can be a season of beauty but also a season of potentially dangerous weather. In interior Central California, the varied geography of our area makes for a variety of winter weather hazards – some more of an issue in parts of the area than others. However, even in areas where the typical signatures of winter like snow and ice are uncommon, winter can still be a season that can pack a punch. Cold temperatures can lead to injury or even death and unsuspected snowfall can lead to travel troubles.

Cold Care

Freezing temperatures in the mountains of interior Central California are accepted as coming with the territory by many. When cold air pours into the lower elevations of the San Joaquin Valley and the Kern County deserts, though, it can be a potentially hazardous situation. Many residents of the area are unaccustomed to subfreezing temperatures, even if experienced for a short duration. Cold temperatures in the lower elevations can not only be a threat to humans – but also property such as animals, plants and pipes in buildings.

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	29	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

One term frequently used in the winter months is *Wind Chill*. Wind Chill is not the actual air temperature, but rather what the air temperature feels like on exposed skin when the wind blows. The thing to keep in mind with wind chill is it is all in the wind - at a given air temperature, the stronger the wind, the lower the wind chill. The table above shows what the wind chill would be for a given air temperature at a specific wind speed.

When the wind blows and picks up in speed, heat is carried away from the body at an accelerated rate, resulting in your body temperature lowering. Exposure to the cold can lead to frostbite and hypothermia if protective measures are not taken. Frostbite is damage to body tissue caused by extreme cold and results in the loss of feeling and a white or pale appearance in parts of the body like fingers, ear lobes, nose tip and toes. Hypothermia results when the body temperature drops below 95°F and can result in death or serious bodily injury. People who are found with either condition should be treated immediately.

Here are some safety tips to remember to protect yourself (and others) from the cold:

- **Wear loose, lightweight, warm clothes in layers.**
- **Avoid perspiration. This can lead to subsequent chill.**
- **Outer garments warn should be tightly woven and water-resistant.**
- **Cover your head with a hat or hood.**
- **Wear gloves or mittens.**
- **Stay dry as best as possible.**

Not only are humans vulnerable to the cold, but so are animals. Remember to keep them in a warm place as well! Animals that must remain outdoors should be kept in areas that are protected from the wind, with thick bedding and non-frozen drinking water. Also, if you live near a lake, remember to keep an eye on your pets – they could easily wander into the chilly water or fall into a frozen lake. In addition, watch for signs of shivering or listen for sounds of discomfort and take action to quickly move your pet to a warm, comfortable location.

Cold weather can also cause damage to property. Many plants in the lower elevations are not tolerant of the cold, especially palms and citrus. Temperatures of 28°F or below for several hours can be particularly devastating to these types of plants. Bring smaller plants indoors. Plants left outdoors should be wrapped in cloth to protect them from the cold. Be alert for frozen pipes in buildings, especially in places with hoses, sprinkler lines and swimming pool lines. Pipes not used frequently in the winter should be drained. Consider insulating pipes. Allow water to trickle or flow in small amounts through pipes to prevent water from freezing in them. In addition, be alert if using space heaters, making sure proper ventilation is available. Keep a safe distance of several feet between a space heater and nearby objects. Turn off space heaters if you are unable to safely keep an eye on them. Do not use space heaters to warm clothing or bedding, cook food or dry pipes.

Snow Safety

Snow can be one of the most beautiful elements of nature, but also one with a hazardous twist to it. In interior Central California, snowfall is a particularly interesting weather element in that hundreds of inches of it falls annually across parts of the higher elevations, but in the lower elevations of the San Joaquin Valley and the Kern County deserts, several winters in a row can pass without even seeing a flake of snowfall.

In the Sierra Nevada, snow can occur across elevations above 12,000 feet in any month of the year. But even in elevations as low as 6,000 feet there has been snowfall recorded in all but the months of July and August. Typically the most significant snows of the winter – those which bring several feet of snow above 6,000 feet in elevation – usually occur in the period between late November and early April. However, even lighter snowfall amounts can be a hazard, especially during the transition into and out of the cold season. Transition season snowfalls, while not as heavy, can catch people unprepared for winter weather off guard. Many people often do not have their winter gear ready or feel that the snow season has long passed and that winter weather is no longer a threat. Over the years more outdoor enthusiasts have suffered death or injury in the fall months than in the winter months. Many venture out hiking or camping and then get caught off-guard when snow begins to fall. Simply checking the weather forecast and if needed, preparing a winter safety kit, can be a easy way to prevent problems later.

Winter storms can easily bring at least a foot of snow to the higher elevations, especially the Sierra Nevada, above 6,000 feet. These storms can quickly cause hazardous road conditions, halting travel altogether at that height. In addition, the weight of the snow, coupled with gusty winds, can easily down trees and power lines. When snow levels lower below 6,000 feet, these same effects can be felt, however, the impact on people is often greater since these areas are more populated. Those traveling through the passes of Kern County – Tehachapi Pass and the Grapevine - should be prepared for hazardous road conditions. To stay up-to-date, Caltrans has a special number that you can call to hear current road conditions, 1-800-427-ROAD.

Attention Motorists!

Need to know the latest road reports when you are traveling?
Caltrans has set up a special number you can call to find out the status of roads.
Dial 1-800-427-ROAD.

As mentioned before, one of the simplest and easiest ways to prepare for winter weather, either at home, work or in your vehicle, is by preparing a winter survival kit. Things to include in your kit are:

- **A flashlight and extra batteries.**
- **Keep a cell phone with you. Make sure it is charged.**
- **Have blankets and/or a sleeping bag. Make sure you have mittens gloves, scarves, a hat and water-resistant boots. Extra clothing is also a good idea to include in a motor vehicle safety kit.**
- **Medicine, a first air kit, canned food and a can opener and bottled water.**
- **A battery powered radio. Look for a radio with a frequency that can pick up NOAA Weather Radio.**

If you plan to travel when winter weather is expected or is imminent, remember that travel times can be significantly longer. Allow extra time to reach your destination. Keep your gas tank full. Find a safe location to pull over if you must exit your vehicle to clean it off. Last but not least, slow down, and be alert for sudden reductions in visibility. Additional items to include in a vehicle safety kit include:

- **Sand for traction. Many stores also sell containers with road traction chemical substances. Cat litter also can be used to provide traction.**
- **A shovel, window scraper and a window brush.**
- **Chains. You may not be permitted by law enforcement to drive in some areas without them.**
- **A car tool kit and tow rope.**
- **Road maps. A compass or GPS is also helpful.**

Winter Weather Terms

Special Weather Statement
Issued 3 to 7 days in advance for major storms or significant weather.

Winter Storm Watch
Issued 12 to 48 hours in advance to given notice of the possibility of winter storm warning conditions.

Winter Storm Warning
Issued up to 36 hours in advance for the combination of heavy snow coupled with gusty winds.

Snow Advisory
Issued up to 36 hours in advance for specified snow accumulations based on elevation.

Blizzard Warning
Issued up to 36 hours in advance for the combination of sustained winds or frequent gusts of at least 35 mph or more with visibility less than ¼ of a mile for a minimum of 3 hours while snow is falling or is being blown around.

Dense fog on a road in Hanford. (NWS Hanford Photo Archives).

When The Fog Gets Dense…Drive With Common Sense!

National Weather Service Hanford Staff

The massive 86 vehicle pile-up on Highway 99 on November 3rd brings to the forefront the importance of driving carefully in the fog. Although many people often are concerned about driving during wet weather such as heavy rain, thunderstorms, ice and snow, fog can be just as – if not more – serious. It can show up in one place and not another. And worst of all, it commonly occurs at night when visibility is naturally lower due to the absence of sunlight.

Simply defined, fog is a cloud on the ground. The term "dense fog" is applied to fog where the visibility is at or below one-quarter of a statute mile. Tule Fog is just a local term applied to the fog in the San Joaquin and Sacramento Valleys, named such because fog here typically was found by the tules (bulrush plants) that grow in marshy areas.
Visibility in fog can often vary greatly over a short distance. This is very critical to keep in mind while driving. Visibility can easily drop from a few miles to less than 500 feet in just a few minutes. While fog can occur at any time of the day, it typically forms at night and becomes the thickest around and in the subsequent hours just after daybreak. Depending on the time of year, fog can easily persist into the afternoon or not even go away altogether. As the days get shorter, fog is able to stick around longer since there is less sunlight. As the days get longer, the sun is out longer and stronger and thus the atmosphere is able to warm up better. This enables the air to dry out easier
(Continued on Page 8)

Fog Safety

Continued from Page 7

and thus rid itself of any moisture that can help fog to form.

Remember – **When the visibility gets dense, drive with common sense!** Follow these safety tips:

- When the visibility gets low its time to drive slow! Slow down! Allow extra - stopping distance in between you and the vehicle in front of you.
- Use low beams. High beams only reflect back off the fog and make visibility even worse.
- Avoid crossing traffic. If you need to, stop and listen for traffic. Role your windows down if needed.
- Use windshield wipers and defrosters to help maximize your vision.
- Unless needed, avoid stopping on any freeway or heavily traveled road. If you need to stop, find a safe area on the shoulder or as far away from traffic as possible to avoid injury.
- Be patient! Don't pass long lines of traffic in fog.
- If visibilities drop to the point you can no longer proceed, pull over and find a safe place to wait until conditions improve.
- Consider postponing your trip until visibility improves, especially if it is non-essential.

Sights of the Sky…

On the morning of December 7, 2007 a vivid sight filled the sky in Hanford. A double rainbow formed as seen in the photo on the left.

There are many was to record precipitation. Above is an 8 inch standard rain gauge.

Problematic Precipitation?

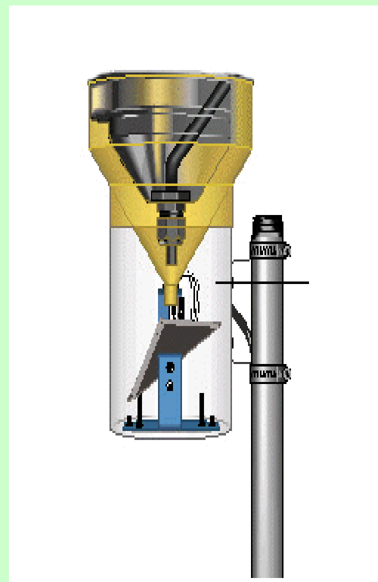
Not really a problem with a rain gauge!

Jim Dudley
Lead Forecaster

In this issue we will tackle the subject of rain gauges. A useful rain gauge can vary from a simple "soup can and a ruler" to a sophisticated electronic tipping bucket instrument. Although rain gauges can vary tremendously in complexity, the reality is they all measure precipitation pretty accurately. One thing that is not complex about rain gauges, no matter what the type of gauge that is used, is that you only need to place the gauge in an open environment, free from obstructions to get accurate readings. Just what are some of the obstructions you want to avoid? Here are a few: Roofs…place the gauge out in an open space away from rooflines. Trees…place the gauge out away from trees and any overhanging branches. Other obstructions include fences, vehicles and any other structures that may interfere with rain collecting. Again, keep the gauge free and clear from obstructions. The most simple type of rain gauge can be made from a tin can. The sides must be straight and you just let the rain collect and then insert a ruler to measure what has fallen. The only problem with this method is measuring very small amounts of rain as it is difficult to determine amounts less than ¼ of an inch. The next step up in the world of rain gauges is manufactured "tube" types. These consist of a clear plastic tube with measuring lines marked on it. Prices range from a couple of dollars at discount stores for the smaller types to $20-30 for the tallest, very well marked easier to read varieties. Many types and brands of "tipping bucket" gauges are also available and these usually come with an electronic weather station. The tipping bucket operates on the principle of a "see-saw". Rain drops are collected by the gauge's funnel and they fall into collection platform that when filled, tips the see-saw to one side. This action makes an electronic switch register 0.01" (one-hundredth) of an inch of rain. The see-saw collection platform is reset and the process repeats. Although increasingly rare, "weighing" rain gauges were used in the past to measure the calculated weight of falling rain. These simple devices used a bucket placed on as scale. The weight of the bucket was noted and after rain fell into the bucket, the difference in weight determined how much rain fell. As you can see, simple or not, measuring rain is not a problem…if you know how.

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





A collection of rain gauges can be seen in the photo to the left. At the top of the picture are two plastic "tube" type gauges (mounted on wall), while below is an 8 inch standard rain gauge. The middle photo shows a tipping bucket rain gauge (photo courtesy UC-Davis) while the illustration to the right shows the inside of a typical tipping bucket gauge with the "see-saw" part located at the bottom of the gauge (photo courtesy San Diego State University).

The National Weather Service in Hanford was sad to learn of the recent loss of Kevin Traeger from Clovis. Kevin was one of our most dedicated spotters, frequently calling us with his daily temperature and precipitation and reports of severe weather. We would like to thank Kevin for his valuable reports over the years and dedication to helping us serve our area better.

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.

There's more to measuring snow than just sticking a ruler in the ground.

It All Adds Up!

Properly measuring snow is as much of an art as it is a science…

Chris Stachelski
Meteorologist Intern

At first, measuring snowfall sounds simple – get a ruler, go outside, stick it in the ground and there you have it – a snowfall measurement! Not really. Unlike a lot of other meteorological phenomena that are measured or observed by high-tech equipment, proper snowfall measurements are taken with relatively simple equipment that has not changed all that much in over a century. Snowfall is one of the few meteorological variables that is somewhat more subjective than quantitative in nature. Two people could go to the very same area, with the very equipment and get two completely different (but somewhat close) snowfall amounts. Given the subjective aspect to snowfall measurements, there are some general 'best practice' guidelines that can help you to take a more accurate snowfall measurement.

Why are precise snowfall measurements important?

Accurate measurements of weather variables are always important, no matter what weather parameter is being reported. Despite an increasingly automated weather observing network, accurate ground measurements of snowfall confirm values from automated sensors such as the SNOTEL network and remotely sensed satellite images. Snowfall is also the primary source of water in this area and accurate snowfall measurements can help keep track of this precious commodity. Accurate snowfall measurements also provide verification for warnings and advisories, alert of potential road hazards, inform outdoor enthusiasts about how much snow has fallen and also assist in compiling climate records.

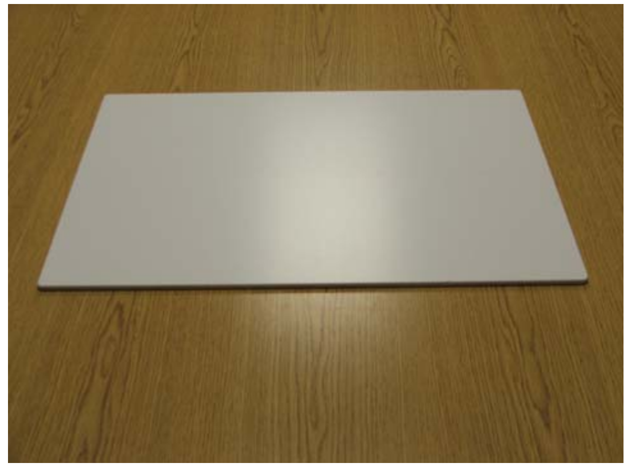
What sorts of instruments are needed to measure snowfall properly?

The first piece of equipment necessary for measuring snow accurately is a snowboard. A snowboard is a piece of plywood or flat plastic board painted white. This board should be white in order to minimize radiation and melting effects and where observations of snowfall should be taken. Ideally, a snowboard should be about 2 feet wide by 2 feet long and about a half of an inch thick. One alternative that can be used as a snowboard is a white, plastic cutting board. However, be sure to avoid measuring in any “moat” that such a board would have. Snowboards should be cleaned off after each observation of snowfall is taken and set flush with the existing snow surface.

Next, you’ll need a measuring tool. A ruler or yardstick is the most critical tool as without one, there’s no way to measure snow at all. A metal ruler or yardstick is best as you can push it into the snow easier. If you live in an area that gets snowfall totals over a foot frequently, a yardstick is a better way to go. Look for a ruler or yardstick that is thicker; a thin one will be rather flimsy and may bend when you try to insert it into the ground. At some official cooperative weather stations, observers will be equipped with a snowstick, essentially just a ruler used to measure snow with the above features in mind.

How do you measure snow?

Once you have the necessary equipment, and snow to measure, it’s time to take your



Basic snowboard.

measurement. It is important to remember when you report snowfall, that you only want to measure the amount of new snow that has fallen on the ground. This can be since a set time once a day or since the start time of an event. Since snow compacts with time, taking frequent measurements during an event will result in an over-measurement. At best take a measurement once every six hours. If you measure all the snow on the ground, including old snow, this NOT snowfall but rather snow depth.

Your measurements should be taken on a snowboard. If you don’t have a snowboard, use a wooden deck or grassy surface, however air pockets lurk in the grass and this can cause a slight over-measurement of snow. Do not measure snow on a paved surface, sidewalk or gravel surface as these are sources of heat and will cause snow to be under-measured. Snow should be measured in an area as far away from obstructions such as buildings, trees and fences, at least a minimum of 20 feet. These obstructions can cause funneling of wind or create localized wind patterns that cause blowing and drifting of snow. In addition, gusty winds can often blow snow off the roof of a building or tree tops and land it on the ground thus inflating how much snow fell. Be alert for recording snow in areas that are shaded versus in direct sunlight. Shaded areas will see higher totals. In this case, it may be best to average a total of the two if sunlight was an issue before you had a chance to measure snow. Watch for areas where snow has drifted. In events where drifting took place, snowfall should be measured in an area that looks to be a level average between the highest and lowest drifts. Areas where human or animal activity has disturbed snowpack are also not ideal spots to measure snow accurately. Also, never take just one measurement. Several measurements should be taken in your desired area and then averaged together to get your snowfall total.

Weather Fact

The greatest snowpack ever measured at Lodgepole was on February 26, 1969 when an incredible 197 inches was on the ground! The state record for California well surpasses that though. On March 11, 1911, 451 inches was measured at Tamarack.

Words of Winter

Snow terminology simplified:

Snowfall
The amount of new snow that has fallen since the last observation. This is measured to the nearest tenth of an inch (0.1 inches).

Snow Depth
The combined total of old and new snow (and ice) on the ground from a representative location. Usually taken only once a day around 7 AM. Measured to the nearest whole inch.

Snowpack
Same as snow depth. Just another word for it.

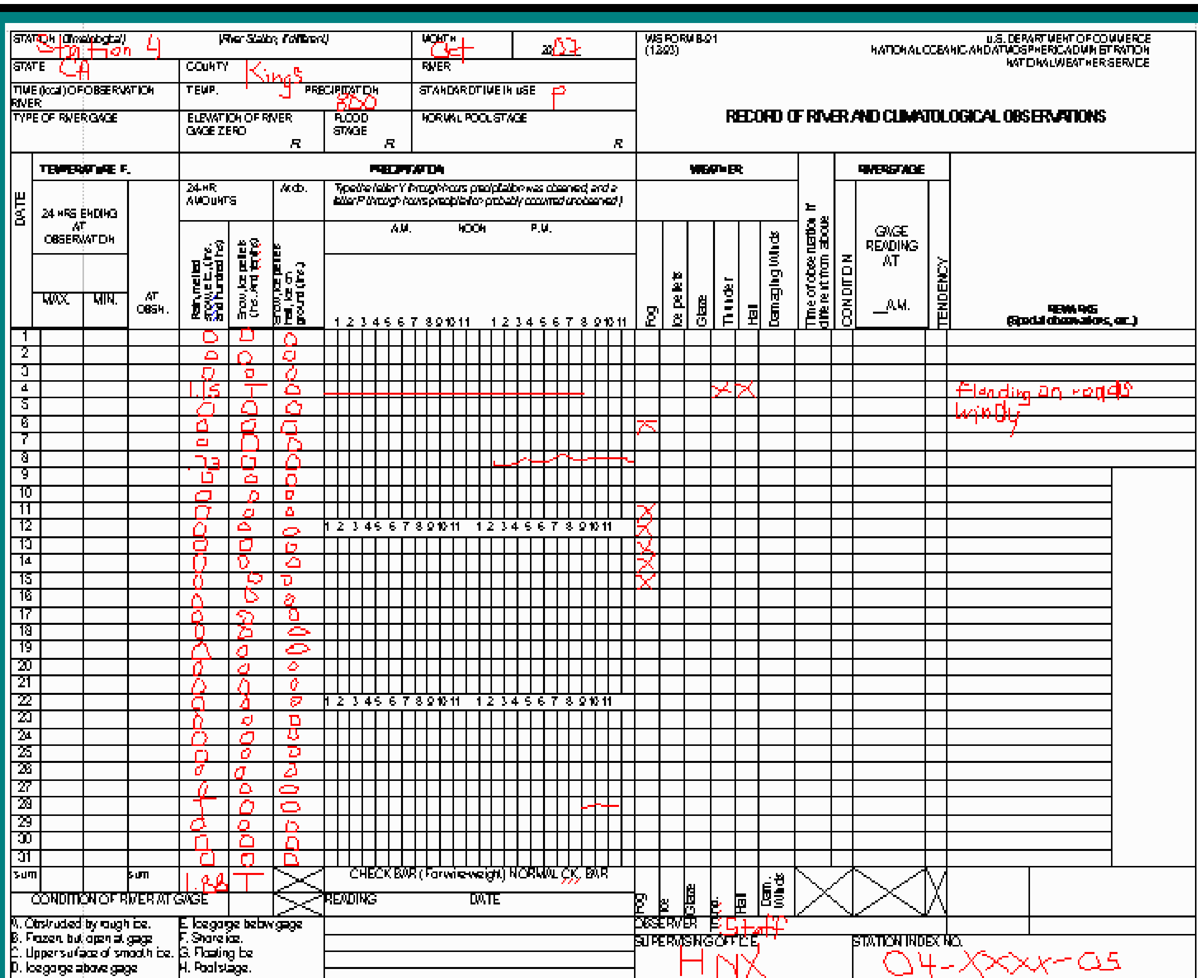
Out and About…

During the last few months several staff members from the National Weather Service in Hanford conducted a variety of outreach activities across the area. Forecaster David Spector discusses the weather with children at the Butterfield Stage Days in Porterville in October (above left). Lead Forecaster Gary Sanger spoke to children at the Lemoore Harvest of Knowledge in November about the National Weather Service (above right).

Cooperative Corner

Adding Detail To Your Observation Record Forms

Chris Stachelski
Cooperative Program Assistant



WS FORM B-91

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological) Station 4 (River Station, if different)
MONTH Oct
STATE CA
COUNTY Kings
RIVER
TIME (local) OF OBSERVATION RIVER
TEMP.
PRECIPITATION 800
STANDARD TIME IN USE P
TYPE OF RIVER GAGE
ELEVATION OF RIVER GAGE ZERO Ft.
FLOOD STAGE Ft.
NORMAL POOL STAGE Ft.

DATE | TEMPERATURE F. (24 HRS ENDING AT OBSERVATION: MAX., MIN.; AT OBSN.) | PRECIPITATION (24-HR AMOUNTS: Rain, melted snow, etc. (Ins. and hundredths); Snow, ice pellets (Ins. and tenths); Snow, ice pellets, hail, ice on ground (Ins.); Type of Precipitation A.M. NOON P.M.) | WEATHER (Fog, Ice pellets, Glaze, Thunder, Hail, Damaging Winds) | RIVER STAGE (GAGE READING AT A.M.; CONDITION; TENDENCY) | REMARKS (Special observations, etc.)

4: Flooding on roads
5: windy

SUM 1.88

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire weight) NORMAL CK. BAR
READING DATE
OBSERVER Staff
SUPERVISING OFFICE HNX
STATION INDEX NO. 04-XXXX-05

An excellent addition on any day when recording your weather observations is adding a remark as well as denoting any types of weather observed and when any precipitation fell. This information can be very valuable in letting people know just what the weather was like in your area as well as give valuable information to the unique microclimate of your area. The above form is for a sample cooperative weather station that only records precipitation.

All cooperative observers are used to filling out a form each day to record the weather observed at their location. This form, known as WS Form B-91 formally, or the "Record of River and Climatological Observation", is what most cooperative weather observers use to submit their data formally to the National Weather Service at the end of each month.

While an increasing number of observers now use an online computer entry system known as Weather Coder to enter their data on a routine basis, many observers still fill out a paper form to submit their data to us. However, the data still submitted by computer on Weather Coder still gets formatted by the program into a "Record of River and Climatological

Observation", or WS Form B-91.

Basic items typically filled out on a "Record of River and Climatological Observation" form are the high and low temperature and any precipitation. Some stations are only responsible for the collection of precipitation data. However, there are additional sections on a "Record of River and Climatological Observation" form that are a nice supplement to the routine weather data collected. These columns can provide a more detailed look at the weather in your location on a given day and give valuable insight as to just what really happened. Especially in areas like interior Central California, where many small-scale variations in climate take place, these features can help to distinguish what makes the weather at your particular location unique.

When filling out your precipitation for the day, directly to the right of the precipitation amount columns and frozen precipitation on the ground at observation time column is an area where you can indicate when precipitation occurred. This feature is something that is easily done at locations where paper forms are still mailed to us. During the time of day when precipitation fell at your location, you can draw a solid line indicating the length of time that precipitation fell and you are certain about it or a wavy line if precipitation fell but you are not 100% certain as to its exact time of occurrence. This section runs on the calendar day (midnight to midnight, local time) for the date on which you are writing in the data. In most cases, this will vary from the time your observations run from.

Immediately to the right of this section is a bunch of columns under the "Weather (Calendar Day)" section. Again, this covers the period between midnight and midnight, local time, and will likely vary from the time you record temperature and precipitation data at. There are a total of 6 columns of observed weather types. Place an "X" below any of these types of weather if you send in a paper form to us.

Lastly, one easy section to use on the "Record of River and Climatological Observation" form is the "Remarks" section. This is a field available to enter information into on both the paper version and on the computer with Weather Coder. Weather Coder will have a character limit though. This is a great place to add in details like flooding, heavy downpours, snow flurries, or strong winds blew down a large tree.

Why is this information so valuable? Not only does it give meteorologists at the National Weather Service another method of ground confirmation in determining what exactly happened, but also helps individuals doing climate studies to understand local variations in the weather. Another use of cooperative weather observations are for legal purposes. These observations are often the primary source of finding out what exactly happened with the weather in some communities on a given day. These observations assist in court cases, development projects and also provide data to business owners that heavily depend on the weather such as farmers.

The form at the beginning of this article shows an example of a "Record of River and Climatological Observation", or WS Form B-91, for a sample station in our area that records just precipitation. This observer has also indicated days where the weather in their area featured fog and also a day when a thunderstorm brought hail and caused flooding. As you can see, this provides a great deal of detail and makes this form more valuable.

The staff at the National Weather Service in Hanford greatly appreciates the services of our cooperative observers for the services they provide. Your data is valuable to us in understanding what goes on across our area!

Desert Snow

Chris Stachelski
Meteorologist Intern

Snow at China Lake Naval Air Station on January 7, 2005. Three inches of snow fell during this event here. (Photo from China Lake NAS).

Mention the word "desert" and snow is probably the last thing that would come to mind. However, as long-time residents of the Kern County desert know, snowfall is not all that unheard of. Although most winters pass without seeing a flake of snow on the desert floor, higher elevations nearby in the Tehachapi Mountains can typically receive accumulating snow. Snowfall in the Kern County desert takes just the right set up in the atmosphere to occur – a combination of sufficient moisture, cold air and a storm system or disturbance moving through the area.

The 'window' for snow events to occur in the desert is relatively short – typically from the later half of December into the early days of February. This coincides with the time of year when there is the best potential to get a sufficient depth of cold air into the desert and the sun angle is the lowest. However, accumulating snow has occurred on the desert floor in Kern County as early as November and as late as April, with January the leading month for having seen snow events occur.

November

Snow events in November are typically confined to snow flurries or non-accumulating snow and the rate of occurrence of them is rare. In the nearly 60 years that consistent records have been kept at China Lake Naval

Air Station, there are only three instances of snowfall being observed this month. Only once, on November 17, 1964, did snowfall actually accumulate here with 0.3 inch occurring. In Mojave, an inch of snow has fallen as early as November 15, 1952 while Randsburg received three inches of snow on November 10, 1985. However, the greatest snowfall on record in November in the Kern County desert occurred at Mojave where in 1906 a total of 6.5 inches of snow fell from the 27th into the 28th. This occurred during a significant early season cold snap that brought frost as far south as San Diego.

December

As the days grow shorter and the air typically gets colder, the frequency of snowfall events increases. This is especially true in December, where a marked increase in the occurrence of snowfall on the Kern County desert floor is evident in the later half of the month. Records kept at China Lake since 1948 show that there have been 14 Decembers to see at least a trace of snow with measurable snowfall having occurred in 8 Decembers.

The earliest occurrence of an inch or more of snow at China Lake Naval Air Station occurred on December 15, 1967 when exactly one inch of snow whitened the ground. This storm brought 5 inches of snow to Mojave. One of the greatest snowfalls ever on record in a given location on the Kern County desert floor in December though occurred in December 1909 at Mojave when 10.4" of snow fell from the 20th into the 21st. This storm was followed by another round of snow a little more than just 24 hours later that dropped an additional two inches at Mojave.

More recently, as much as a foot of heavy, wet snow fell on December 18th and 19th in the Antelope Valley with 4 inches at China Lake NAS and 3.5 inches at nearby Inyokern.

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Edwards Air Force Base was closed for the first time due to snow. Just three years later on December 16, 1987 another winter storm struck Kern County described as "the worst in ten years". A total of 11 inches of snow was measured at Randsburg while Mojave recorded a foot and a half of snow. On December 23, 1995, a system brought an inch of snow to China Lake NAS, an inch and a half to Edwards Air Force Base, four inches to Inyokern and six and a half inches to Randsburg.

January

By January winter is typically in full swing and it should come as no surprise this is the leading month for snow to occur on the desert floor in Kern County. At China Lake Naval Air Station, a total of 21 Januaries have had at least a trace of snow since 1948, nearly one-third of the total number of Januaries that records have been kept. A total of 11 Januaries have had measurable snow at China Lake, while at roughly 1300 feet higher, Randsburg has had measurable snow occur in 16 separate Januaries since 1939.

Of all the months where snow has fallen in the Kern County desert, January 1949 is particularly noteworthy. It featured not one – but two separate snow events. An upper level low moving through the region was responsible for the first event, which was the bigger of the two. Snow commenced on the 9th and continued falling through the 13th. Even once the snow was over with it remained on the ground for up to five days after the event was over with in some areas. Total accumulations included 12.8 inches at Randsburg, 8 inches at Mojave and 3.5 inches at China Lake NAS. On the 19th, another system brought snow once again with most areas below 3,000 feet seeing just trace amounts of snow. However, 3 inches fell at Randsburg.

Three notable snow events occurred in a span of just five winters apart in the 1970s. In January 1974, a storm system produced nearly identical snowfall amounts to the storm of January 9 - 13, 1949 but in less than 24 hours. From January 4th through the 5th, as much as 11 inches of snow fell at China Lake NAS and 8 inches fell at Inyokern. Snowfall was lower in this event at Mojave with just 5 inches recorded. This storm stands as the greatest single storm event ever on record at China Lake NAS. From January 5 – 6, 1977, a system deposited 8 inches of snow at China Lake NAS and Randsburg, with just 1.5 inches logged at Inyokern. Another significant snowfall would come in the closing days of January 1979 when snow fell from the 30th into the 31st. Total accumulations from this event included 9 inches at China Lake NAS and Mojave with 8 inches at Randsburg and 4.5 inches at Inyokern.

The most recent measurable snow in the Kern County desert to occur in any month in any year occurred in January 2005 when two to three inches fell on the 7th.

February

February is no stranger to seeing snow on the desert floor either. Nine Februaries have had at least a trace of snow at China Lake NAS since 1948. While a few measurable events have occurred since 1948, two of the largest measurable snow events in February date back before this. In 1911, Mojave received 11 inches of snow and in February 1938 Randsburg recorded 17 inches of snow.

More recently, notable measurable snowfalls in February occurred in 1989 and 2001. From February 8th through the 9th in 1989, 6 inches of snow fell at China Lake NAS. Other amounts included 4 inches at Inyokern and 3 inches at Randsburg and Mojave. In February 2001, a storm system brought as much as 5 inches to the Kern County desert floor causing massive travel problems.

March

With the days getting longer and often warmer, the frequency of snow on the desert floor rapidly decreases. Often when it does snow, it is difficult for it to accumulate. There have been six Marches at China Lake NAS to receive snow, and only twice has a measurable amount been achieved.

March 1952 was noteworthy at Randsburg for producing two separate measurable snow events. On March 7th, a total of 4 inches of snow fell, followed by a 2 inch snowfall on the 16th. One of the more widespread March snowfalls in the Kern County desert came in 1969. Snowfall totals of 1 inch were reported at China Lake NAS and Inyokern with 1.5 inches at Randsburg. However, the most impressive snow event ever recorded this month came in the final days of 1991. Beginning on the evening of March 26th and continuing into the 27th snow fell and accumulated to as much as 8.5 inches at Randsburg. Other amounts included 3.1 inches at Mojave with a trace at China Lake NAS.

April

Although the calendar officially says spring in April, snow has managed to fall and in rare instances accumulate on the desert floor during this month. Only twice are measurable amounts of snow known to have fallen in April on the desert floor. On April 21, 1963 a half of an inch of snow fell at Mojave while Randsburg saw a trace. Two years later in 1965, one inch of snow was on the ground on the morning of April 3rd at Randsburg.

Dusty Disaster

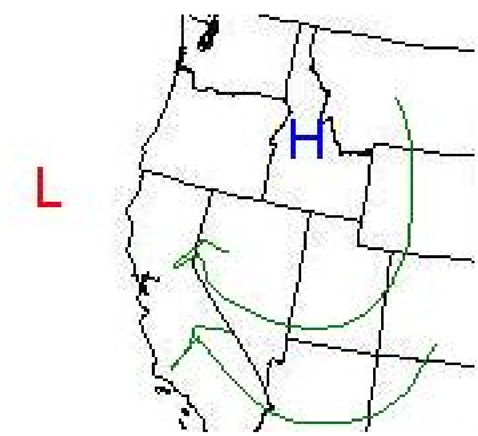
The South Valley Dust Storm of December 20, 1977

Chris Stachelski
Meteorologist Intern

A pilot captured this picture of dust being pushed at least 5,000 feet into the atmosphere above Arvin during the South Valley Dust Storm of December 20, 1977. (Photo courtesy Sam Chase).

Thirty years ago an event occurred in the southern San Joaquin Valley the likes of which had never been seen before – or since. On December 20, 1977 a severe dust storm, likely the most severe ever on record in the state of California, struck several communities in Kern County. Powerful winds roared across the valley floor causing damage and destruction to property and even changing the landscape forever in some areas.

On December 19, 1977 the surface weather map showed an area of high pressure centered over northern Idaho and an area of low pressure along a frontal boundary several hundred miles off the coast of California. By the early morning of December 20th, the surface high slid into southern Idaho and strengthened while the offshore low moved about 150 miles closer to shore and continued to deepen. Air flowing between these two pressure centers was “squeezed” and thus subsequently increased in strength as the pressure gradient tightened across the area. Winds continued to blow from the south to southeast during the day on the 20th before gradually subsiding on the morning of the 21st as the pressure gradient relaxed across the area in response to the surface low moving closer to the Oregon coast and the surface high over Idaho weakening some. The direction of the winds, coming from the south to southeast into the southern end of the San Joaquin Valley, allowed for the winds to be forced downhill and through various passes and canyons in the Tehachapi Mountains and southern Sierra Nevada which further resulted in air being funneled and thus resulted in strong winds, often of hurricane force.



Map showing location of surface high and low pressures on December 20, 1977.

While the strength of the wind was the significant part of the story of this storm, the dust that accompanied it was almost just as incredible. Bakersfield had below normal precipitation in back-to-back water seasons from 1975-1976 to 1976-1977 with departures from normal of over 2 inches in both seasons. The 1977-1978 water season was also off to a dry start (though ironically is the second wettest water season on record). The dry conditions in place, combined with fields that had been recently been plowed or cleared, left a large amount of loose dirt available that was

Selected Wind Gusts from the South Valley Dust Storm of December 1977:

Arvin	**88 mph***
Bakersfield (Meadows Field)	**63 mph**
Bakersfield (tower just north)	**94 mph**
Wheeler Ridge	**120 mph**

*** = Incomplete record, instrument failed.**

easily picked up by the strong winds. When the strong winds moved over the loose soils, they kicked up a cloud of dust that reached up to 5,000 feet high and resembled a tidal wave according to some personal accounts. The southerly trajectory of the winds carried the dust as far north as Sacramento and Reno where the sky sported a yellowish-brown tint and the sun at times was obscured.

Wind gusts were highest in areas just south and east of Bakersfield, where storm damage survey assessments placed gusts as high as 192 mph! Data collected from various anemometers though did show 60 second wind gust values clocked at up to 120 mph. Buildings suffered as roofs were ripped off, facades crumbled, siding was torn off and windows blew out. Final figures computed showed nearly 70 percent of the homes in Arvin, Edison and East Bakersfield had structural damage. Vehicles were stripped of paint as they were essentially sand-blasted. Other vehicles were buried in by sand. Travel was disrupted to the point where 2,000 motorists were stuck overnight on Interstate 5 and Highway 58. In all 30 percent of the vehicles in the area were damaged. Agriculture also suffered both short term and long term with substantial crop losses as crops were blown away and orchards had substantial damage to trees. In addition, some 25 million tons of soil was loosened from grazing lands. Five people died and damages totaled $34 million dollars. Power was lost by 120,000

Customers in Kern County. When the winds had subsided, dust over an inch thick covered the inside of some homes and outside dust piles reached over two feet next to whatever fences were still standing. In all five people died during this event and damages totaled $34 million.

Information from an independent study conducted by Southern California Edison Company, the Bakersfield Californian, and various archive publications from the NWS were used to compile this report.

2007 SKYWARN Recognition Day

James Brotherton
Warning Coordination Meteorologist

Amateur Radio Operators at NWS Hanford on December 1, 2007.

On December 1, 2007, the annual SKYWARN Recognition Day was held. This is a national event to celebrate the volunteer efforts of the NWS network of storm spotters and amateur radio operators. SKYWARN Recognition Day was developed in 1999 by the National Weather Service and the American Radio Relay League. During the day, SKYWARN operators visit NWS offices and contact other radio operators across the world. Information regarding SRD is available at http://hamradio.noaa.gov.

Every year, for a 24 hour time period, amateur radio operators around the country convene at local NWS offices to help recognize this important program. Contacts are made with other NWS offices and other radio volunteers. This year, as in years past, NWS Hanford participated with a 24 hour staff of volunteers at the office. Although atmospheric conditions were quite poor across much of the country for radio contacts, volunteers at NWS Hanford still made roughly 20 contacts. In addition, local NWS staff are currently working with our volunteer radio group to improve the equipment and organization of the local program, with the end result being better communications during extreme weather events and improved reporting of unusual weather phenomenon and property damages.

Thanks to the volunteers that came out to NWS Hanford to participate in 2007 SKYWARN Recognition Day! If you would like more information on our local SKYWARN program or would like to become a part of our local amateur radio group that supports the NWS during severe weather events, please contact james.brotherton@noaa.gov.

Weather Words

By Kevin Durfee

See Solution on page 26

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

anvil
aurora
downdraft
dry
flash flood
fog
forecast
front
frost
gage
hail
halo
humid
kelvin
lightning
mist
precipitation
radar
rain
snow
supercell
tornado
virga
water
weather

Monthly Memoirs

Gary Sanger
Lead Forecaster/Climate Services Focal Point

SEPTEMBER 2007 WEATHER SUMMARY

A strong ridge of high pressure aloft lingered over California and the Desert Southwest the first 3 days of the month, keeping the central and southern San Joaquin Valley under triple-digit heat. A monsoonal flow triggered thunderstorms over the mountains and the Kern county deserts, and one thunderstorm near Rosamond on September 1st spawned a tornado that moved through the town; a National Weather Service storm survey rated the tornado at EF0 on the new Enhanced Fujita scale. As the thunderstorm collapsed, it generated high winds that knocked down several power poles and created areas of blowing dust. On September 3rd, a thunderstorm dropped ½-inch hail on the town of Boron in the southeastern corner of Kern County, generated a wind gust measured at 83 mph at the Mojave Air and Spaceport, and caused flash flooding in the vicinity of Mojave and California City.

An upper-level low-pressure trough dropping out of the Gulf of Alaska weakened the ridge, dropping temperatures around 12 degrees on September 4th, as the surface flow turned onshore and a deep layer of marine air flooded the San Joaquin Valley. Temperatures remained near normal through September 12th, and no triple-digit temperatures were recorded at either Bakersfield or Fresno after the 3rd.

Another upper-level trough brought a push of cool, dry air to the region on September 13th. Relative humidities dropped into the single digits in the higher elevations of the Southern Sierra Nevada in Tulare and Kern Counties.

The first winter storm of the season moved into central California on September 20th. At least two inches of snow fell on Tioga Pass, and thunderstorms developed over the central and southern San Joaquin Valley, lingering into the late evening.

Immediately behind this storm was a second system. An upper-level low dropped down the coast on the 21st, and moved inland over southern California the next day. This low triggered another thunderstorm outbreak, with hail up to 0.88 inch in diameter falling in eastern Kings County during the afternoon of September 22nd, and 0.75-inch hail falling west of Squaw Valley in Fresno County near the foothills. Flash flooding occurred in eastern Kings County, central Fresno County, and north-central Tulare County, with scattered reports of road flooding and minor mud/debris flows elsewhere in the central and southern San Joaquin Valley.

An upper-level ridge of high pressure moved over central California behind the storm, with the central and southern San Joaquin Valley warming to around 90 on September 26th and 27th. A fast-moving, dry, cold trough reached California on the 28th, with San Joaquin Valley temperatures plunging into the lower to mid 70s. As this trough exited the region, temperatures warmed back to near normal at the close of the month.

OCTOBER 2007 WEATHER SUMMARY

An upper-level ridge over California at the beginning of October warmed temperatures to near normal on the 1st, and to above normal on the 3rd. A cold, mostly dry trough reached California on the 4th, with San Joaquin Valley temperatures plunging into the lower to mid 70s (a drop of 13-14 degrees from the previous day), and further cooling into the 60s the next two days. Light precipitation fell on the northern parts of the Hanford warning and forecast area, but stayed mainly north of Fresno. To the south, the main impact was wind, as gusts to 45-55 mph were recorded in the Kern County mountains and deserts on October 4th. Bakersfield set a record low maximum temperature on the 5th of 66 degrees, breaking the old record of 68 degrees in 1918. As this trough exited the region, temperatures warmed back to near normal by the 8th, and several degrees above normal on the 9th as the airmass warmed ahead of an approaching Pacific storm.

The storm that reached central California on the 10th ushered in a period of cold, unsettled, and occasionally windy conditions for the middle of the month. Light precipitation accompanied the first storm, with significant precipitation on the 12th as the next storm moved through the region. Nearly all of Fresno's measurable rainfall occurred with this storm (0.14 inch—month total was 0.15 inch), but Bakersfield only saw a trace of rain.

The third storm brought only light precipitation to the region on the 16th-17th, but also brought strong wind gusts to the Kern County mountains and deserts, where gusts as high as 67 mph were recorded. The fourth, and final, storm of the series hit central California on October 20th, again bringing gusty winds to the Kern County mountains and deserts—with gusts of 45-55 mph—but again only light precipitation, mainly north of Fresno.

A sharp change in the weather pattern occurred during October 21st-22nd, as strong high pressure aloft built into California. Temperatures warmed 12-15 degrees from the 21st to the 23rd, and a strong offshore surface-pressure gradient set up across the southern half of California. The dry, windy, and unseasonably warm conditions resulted in numerous wildfires across southern California, with some smoke drifting into the Hanford warning and forecast area. Fresno warmed to 91 degrees on October 24th, its warmest day of the month. Historically, the latest 90-degree day for Fresno is the 31st, with a record of 90 degrees, set in 1949. Record highs for Fresno fall into the 80's on October 26, which has a record high of 89 degrees, set in 2003. Bakersfield's latest 90-degree day is November 8th, with a record high of 95 degrees, set in 1918.

Hail fell in a number of places the central and southern San Joaquin Valley during the evening of October 29th.

An upper-level low developed off Point Conception by October 27th, and slowly drifted northeast toward the central California coast. The low pulled a moist, tropical airmass into the central California interior beginning on the 27th and continuing through the 29th. A dry air flow became entrained in the circulation around the low, clearing skies over the San Joaquin

Valley during the late morning, allowing for solar heating of an already unstable airmass. Then, in the late afternoon, an upper-level disturbance rotating around the low moved over the southern half of the Hanford warning and forecast area. This combination of events triggered the worst severe thunderstorm outbreak over the central California interior in memory, with fifteen Severe Thunderstorm Warnings, two Urban and Small Stream Flood Advisories, and a Flash Flood Warning issued between 4 PM and 8 PM. Another Severe Thunderstorm Warning had been issued earlier in the day, at 1:16 PM, for the Sierra foothills in Madera and Mariposa counties. Hail up to an inch in diameter was reported, and flooding occurred in parts of the San Joaquin Valley, including sections of northwest Fresno and downtown Visalia.

Thunderstorm activity continued into the early morning hours of October 30th, as a cold front moved through central California. A strong push of cold air into the region dropped the high temperature at Fresno from 80 on the 29th to 68 on the 30th. Bakersfield saw even stronger cooling, from 84 on October 29th to 63 the next day, a 21-degree cooling. Temperatures warmed to near normal on the 31st as an east-Pacific upper-level ridge began building into California.

NOVEMBER WEATHER SUMMARY

By Gary Sanger
Climate Services Focal Point
WFO San Joaquin Valley-Hanford

In the wake of the severe weather outbreak that hit the central and southern San Joaquin Valley on October 29th, there were pools of standing water in areas that received the heaviest rains. With an upper-level ridge providing a stable environment, and moisture from these pools recharging the low levels of the atmosphere, patchy fog formed during the overnight and early morning hours. During the first few days of November, the densest fog developed in the Merced-Atwater and the Lemoore-Visalia-Selma areas. Shortly after sunrise on November 3rd, one dense fog patch drifted over the 99 Freeway with tragic results. A series of accidents, involving over 100 vehicles, resulted in two deaths and 41 injuries.

The upper-level ridge remained of California through the first week of the month, allowing temperatures to warm to several degrees above normal, with central and southern San Joaquin highs in the mid 70s to lower 80s. An upper-level trough reached the state late on November 8th, weakening the ridge and setting the stage for precipitation to reach the region over the Veterans Day weekend.

The first storm moved through the region on the 9th. Although only a few showers developed, they produced locally heavy rainfall near Lemoore. This storm was followed two days later by a second system, which brought more widespread precipitation to the region.

The storm brought as much as a quarter of an inch of rain to the Valley floor (with the highest amounts in Merced County, tapering off to a few hundredths in Kern County), with higher amounts in the foothills. Snowfall over the higher elevations of the Southern Sierra Nevada was spotty, with only a few locations reporting measurable snow.

Weak high pressure aloft moved into California behind the trough, resulting in more patchy fog development in the central and southern San Joaquin Valley. Locally dense fog developed on the morning of November 12th, with visibilities of 200-300 feet reported on the west side of Hanford. Even thicker fog developed on the 19th, with visibilities down to 100 feet in a few spots. The upper-level ridge also brought another round of warming to the region. Valley high temperatures on November 15th soared to as much as 10-15 degrees above normal.

A dry cold front trough dropped through

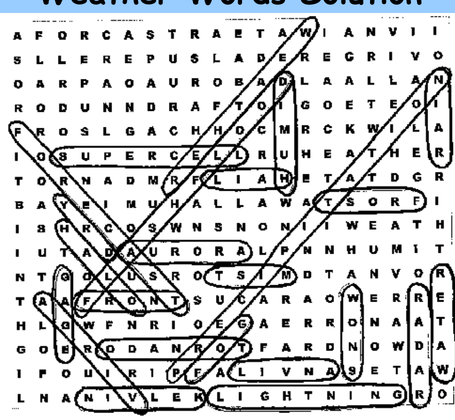
California November 21st, ahead of an upper-level trough that arrived the next day. A very cold airmass moved into internal central California during the 21st-22nd, bringing the first hard freeze of the season to the Kern County deserts (the low bottomed out at 23 degrees at Edwards Air Force Base), and patchy frost to the San Joaquin Valley floor.

An upper-level trough dropped into the Great Basin early on November 23rd, while a surface high pressure moved into southern Idaho. This resulted in a northeast flow over the Southern Sierra Nevada, both aloft and at the surface. Strong winds developed over the Sierra crest near Yosemite National Park, with gusts at Tioga Pass reaching 74 mph. This “Mono wind” event toppled numerous trees in Yosemite National Park.

Another very dry airmass moved into the region behind the trough, with relative humidities over the mountains and deserts dropping into the teens, and, in some locations, single digits. High clouds associated with an upper-level trough spread into the region beginning the night of November 24th-25th, bringing mid-level moisture to the region and allowing mountain humidities to recover a bit. The base of the trough pinched off, forming a closed low west of Baja California. The circulation around this low drew a fetch of tropical moisture northward into California beginning the night of November 27th-28th, initially in the form of bands of high clouds. Deeper tropical moisture moved into southern California on the night of November 29th, and into Kern County the morning of the 30th. This moisture brought measurable rain to the Kern County mountains and deserts—with amounts ranging from a couple of hundredths to over half and inch (0.53 inch at Edwards AFB)—and even to the far south end of the San Joaquin Valley, where Arvin recorded 0.12 inch of rain. However, Bakersfield only received a trace of rain, and it remained dry further north in the San Joaquin Valley and the Sierra foothills.

Lodgepole recorded 0.01 inch of rain, the farthest north that precipitation was reported in the higher elevations of the Southern Sierra Nevada. Due to the tropical nature of the moisture, snow levels remained high and no snowfalls were noted by either spotters or cooperative observers.

Weather Words Solution



anvil
aurora
downdraft
dry
flash flood
fog
forecast
front
frost
gage
hail
halo
humid
kelvin
lightning
mist
precipitation
radar
rain
snow
supercell
tornado
virga
water
weather

Our Newest Team Member

Steve Mendenhall
Meteorologist in Charge

I'd like to introduce Bill Peterson, who recently joined us at the San Joaquin Valley forecast office in September. Bill is one of our hydrometeorological technicians (HMT), or forecaster assistants. He has a great deal of weather experience working in the San Joaquin Valley. Bill retired from the Navy, where he worked as a weather observer and aviation forecaster. Afterward, he continued in this capacity at Lemoore NAS as a civilian employee. Most recently, Bill was the supervisor of the contract observers who augment and backup the automated weather-observing system at Fresno-Yosemite International Airport.

You will probably speak with Bill from time to time when you call in your storm reports. Please join me in welcoming Bill to the National Weather Service!

Runnin' the Numbers		Fresno			Bakersfield		
		SEPT.	OCT.	NOV.	SEPT.	OCT.	NOV.
TEMPERATURE (°F)	Average Maximum	87.2	76.6	69.0	85.8	76.2	68.1
	Average Monthly	73.7	64.4	57.3	74.1	64.5	57.7
	Departure from Normal	-0.9	-0.6	4.6	-2.6	-2.7	2.9
	Average Minimum	60.2	52.2	45.6	62.4	52.8	47.3
	Maximum	106	91	79	102	89	80
	Date(s)	1st	24th	5th, 7th	1st	3rd, 23rd, 24th	7th
	Minimum	50	44	35	53	45	38
	Date(s)	20th	6th, 21st	30th	30th	22nd	24th, 29th
	Number of Days Max ≥90	22	1	0	11	0	0
	Number of days Min ≤32	0	0	0	0	0	0
PRECIPITATION (In.)	Total	0.02	0.20	0.09	0.13	0.28	0.06
	Departure from Normal	-0.24	-0.45	-1.01	-0.02	-0.02	-0.53
	Greatest in 24 hrs	0.02	0.14	0.09	0.13	0.26	0.06
	Date(s)	22nd	12th	11th	21st-22nd	29th	11th
	Number days w/precip.	2	6	1	4	5	2
	Seasonal Total	0.04	0.24	0.33	0.13	0.41	0.47
	Departure from Normal	-0.24	-0.69	-1.70	-0.10	-0.12	-0.65
	Compared to Normal	14.3%	25.8%	16.3%	56.5%	77.4%	42.0%
WIND (mph)	Peak Speed	28	41	32	33	33	23
	Direction	NW	W	SW	NW	NW	NW
	Date(s)	12th	18th	9th	19th	29th	30th
PRESS (in.)	Highest	30.09	30.36	30.33	30.08	30.33	30.32
	Date	24th	22nd	28th	24th	22nd	28th
	Lowest	29.66	29.77	29.68	29.66	29.74	29.68
	Date	5th	4th	30th	5th	4th	30th

Need A Gift Idea For The Holidays?

Give A NOAA All Hazards Weather Radio!

NOAA All-Hazards Weather Radio (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest National Weather Service office. NWR broadcasts official Weather Service warnings, watches, forecasts and other hazard information 24 hours a day, 7 days a week.

Working with the Federal Communication Commission's (FCC) Emergency Alert System, NWR is an "All-Hazards" radio network, making it your single source for comprehensive weather and emergency information. In conjunction with Federal, State, and Local Emergency Managers and other public officials, NWR also broadcasts warning and post-event information for all types of hazards – including natural (such as earthquakes or avalanches), environmental (such as chemical releases or oil spills), and public safety (such as AMBER alerts or 911 Telephone outages).

Known as the "Voice of NOAA's National Weather Service," NWR is provided as a public service by the National Oceanic and Atmospheric Administration (NOAA), part of the Department of Commerce. NWR requires a special radio receiver or scanner capable of picking up the signal. Broadcasts are found in the VHF public service band on seven frequencies (MHz).

In The Clear is a newsletter issued by the:

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