2011
Fire Weather Annual Summary

San Joaquin Valley Fire Weather District
Hanford, CA

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I. Summation of the 2011 San Joaquin Valley/Hanford Fire Weather Season

The National Weather Service in Hanford began its fire season activities on May 23rd. Before this date, one narrative forecast was issued each afternoon. Warnings, watches, and spot forecasts were issued on an as needed basis. After May 23rd, Hanford Fire Weather began its full fire season activities, preparing two narrative forecasts and zone trend forecasts seven days a week. This continued through November 13th.

January

The very wet weather of December 2010 carried into the first few days of January 2011 as a storm system dropped out of the Gulf of Alaska, bringing 15 inches of snow to the Sierra Nevada and 4 to 8 inches of snow to the Kern County Mountains and Desert by January 3rd. This storm also brought rainfall amounts ranging from ½ to 2 inches in the San Joaquin Valley and up to 3 inches in the foothills. After January 3rd, the storm track shifted well to the north of California and a ridge of high pressure dominated the pattern until the last few days of the month. During this time, dry weather and above normal temperatures occurred in the mountains while low clouds and fog were persistent in the San Joaquin Valley. On the 30th, a storm system brought up to a foot of snow in the Sierra north of Kings Canyon with generally 4-7 inches across Tulare County and up to 4 inches in the mountains of Kern County. In the lower elevations, rainfall amounts were between 1/4 and 1 inch.

January ended up drier than normal, but with the wet weather in the previous 2 months, precipitation for the season averaged 210 percent of normal. Snowpack over the higher elevations of the Sierra Nevada averaged 150 percent of normal and reservoirs were at 70 percent of normal capacity.

February

A ridge of high pressure anchored along the west coast kept the weather dry for the first 13 days of February. On the 14th a storm system dropped south and stalled along the central California coast before moving inland on the 18th. By the time this storm moved into the Great Basin on the 19th, it had dumped up to 16 inches of snow over the Sierra, with up to 3 inches of rain in the foothills. In the San Joaquin Valley rainfall ranged from about a tenth of an inch at Bakersfield to as much as 2 inches from Fresno County northward. A colder storm system moved through on the 24th and 25th with 1 to 3 feet of snow over the high Sierra and it was cold enough to bring light amounts of snow down to the 1000 foot elevation. The month ended up colder and drier than normal with the snowpack averaging 125 percent of normal as of March 1st.

March

March 2011 was exceptionally wet and slightly cooler than normal. Nearly 90 percent of the month's precipitation fell between the 18th and the 28th as a succession of storm systems moved eastward across the central California interior. Outside of this period, the storm track resided well north of the area, although during the first week of the month, a couple of weak storm systems that moved eastward across the northern part of the state brushed the central California interior with light precipitation. A major

buckling of the pattern took place after St. Patrick's Day as storm systems originating in the Gulf of Alaska dropped southeastward along the West coast. At least two of these storms tapped into a rich supply of subtropical moisture as they approached from the northwest and were followed by below normal temperatures and low snow levels after they moved inland. During the frequently stormy period that began on the 18th and ended on the 28th, as much as 7 inches of rain fell in the San Joaquin Valley and up to 10 inches of rain drenched the adjacent foothills while the higher elevations of the Sierra (above 7000 feet) received snow accumulations of up to 15 feet. By the end of the month, the snowpack over the Southern Sierra Nevada averaged 165 percent of normal while most of the major reservoirs were holding 90 percent or more of their normal water capacity.

April

In contrast to the wet March, April 2011 was drier than normal. In fact, only one storm system brought significant precipitation to central California on the 7th and 8th. This system brought up to 19 inches of snow over the higher elevations of the Sierra Nevada with several inches of snow at elevations as low as 2500 feet. In the Kern County Mountains a light dusting of snow fell as low as 4000 feet. A second system moved through on the 20th, bringing only light precipitation.

Although there were a few short periods of above normal temperatures, the month ended up near to slightly cooler than normal. The snowpack in the Sierra Nevada averaged 170 percent of normal by the end of the month. Reservoirs were at 70 percent of normal capacity.

May

May 2011 averaged cooler than normal as storm systems moved from the Gulf of Alaska into the Great Basin, bringing frequent cold frontal passages through central California. The first of these storm systems brought showers to the mountains on the 7th through the 9th. In the wake of the front, isolated thunderstorms with small hail developed in the San Joaquin Valley on the 9th. The next storm system brought significant amounts of moisture with it as it arrived on the 15th. A major block in the upper air pattern across the continental U.S. forced this storm system to stall over the Great Basin for a few days. Rainfall during the 3 day event averaged a tenth to a quarter of an inch in the San Joaquin Valley, and from three-quarters of an inch to nearly two inches in the Sierra foothills and higher elevations. Up to 5 inches of snow fell above 7000 feet in the Sierra Nevada. The third storm system brought showers to the region during the first part of the Memorial Day weekend, producing up to a quarter of an inch of rain in the San Joaquin Valley and three-quarters of an inch in the mountains. Local rainfall amounts up to an inch and a half fell in the Kern County Mountains. There were 4 to 7 inches of snow above 6000 feet. In addition to the rain and snow, all three storm systems also brought strong and gusty winds to the west side of the San Joaquin Valley, the Kern County Mountains and Desert, as well as over the Sierra crest.

During stormy periods, temperatures averaged 15-25 degrees below normal. However, May 2011 also had some exceptionally warm weather. A ridge of high pressure was over the region for the first week of the month, with temperatures averaging 5 to 15 degrees above normal. The cooler than normal temperatures for much of the month slowed the melting of the snow pack.
The major reservoirs averaged 67 percent of their normal capacity by the end of the month.

June

June 2011 was a month of extremes that produced near record heat in the San Joaquin Valley, many days of unseasonably cool weather, and even a day of record shattering rainfall. But probably the most profound aspect of the month was an overabundance of precipitation and late season snow in the southern Sierra. In fact, June ended up being the 2nd wettest on record in Fresno.

June began with cooler than normal temperatures. An unusually deep and cold storm system moved through the region and dumped up to 9 inches of snow over the higher elevations of the Sierra and brought soaking rain to the San Joaquin Valley and the higher elevations north of Kern County. Nearly 2 inches of rain fell in the wettest portions of the San Joaquin Valley and Sierra foothills. Cold air aloft associated with the storm produced thunderstorms and small hail on the 7th. Although the weather warmed up a bit, temperatures were still cooler than normal for the second week of June as a dry onshore flow prevailed. A weak ridge of high pressure pushed temperatures several degrees above normal on the 14th, but this was short-lived as onshore flow returned on the 16th keeping temperatures near normal through the third week of the month. Strong high pressure developed over California on the 20th and brought dramatically warmer temperatures. Temperatures in Fresno and Bakersfield peaked at 107 degrees between the 21st and 23rd. After a brief cool down, temperatures once again warmed on the 27th. An unusually deep upper level trough off the California coast on the 28th tapped into a rich supply of tropical moisture and brought measurable precipitation to much of central California on the 28th and 29th. Up to a third of an inch of rain fell in the Sierra foothills from Fresno County northward. In Fresno, 0.27 inches of rain fell on the 29th, setting a new 24-hour rainfall record for the date. In the wake of this storm system, an unseasonably cool air mass settled in. High temperatures remained below 80 degrees in the San Joaquin Valley on the 29th and did not rise above 40 degrees above the 6000 foot elevation in the Sierra.

All in all, the month averaged slightly cooler than normal. The 2010-2011 rainfall year (July 1st to June 30th) averaged 157 percent of normal. It was the 5th wettest rainfall season on record in Bakersfield and the 7th wettest season or record in Fresno. At the end of June, reservoirs were holding 95 percent of their normal water capacity.

July

There were two distinct influxes of monsoonal moisture in July 2011. The first surge of moisture began July 3rd and continued through July 6th. During each one of these days, afternoon thunderstorms erupted over the Kern County Mountains and Desert, in addition to the higher elevations of Tulare County. The next influx of moisture did not occur until the end of the month. Its arrival sparked isolated thunderstorms over the mountains and desert on the afternoon of the 30th. A few thunderstorms wandered northward out of the Tehachapi Mountains and into the San Joaquin Valley on the morning of the 31st and produced locally heavy rain. Outside of these two monsoonal events, dry weather prevailed throughout the central California interior.

The synoptic pattern favored a dry southwesterly flow aloft in between a nearly stationary and very strong upper level ridge of high pressure over Texas and a quasi stationary upper level trough off the

Pacific Northwest coast. A prevailing onshore flow brought frequent intrusions of marine air into the San Joaquin Valley and kept temperatures elsewhere at seasonable levels. A particularly deep intrusion of marine air into the San Joaquin Valley cooled temperatures several degrees below normal during the second week of July. Thermometer readings were no higher than the 80s in the San Joaquin Valley from the 14th to the 16th as a result. In contrast, the month had two significant periods of above normal temperatures. A particularly long spell of hot weather occurred during the first nine days of the month which included an 8-day string of triple digit heat in the San Joaquin Valley from the 2nd to the 9th. Hot weather made a brief comeback toward the end of the month as the upper level ridge of high pressure over Texas expanded westward.

August

August was characteristically dry with temperatures averaging slightly above normal. A southwesterly flow aloft prevailed for much of the month as central California remained situated between an upper level ridge of high pressure that extended from Texas to the Four Corners region and a quasi-stationary trough off the Pacific Northwest coast.

A brief influx of subtropical moisture occurred on the 26th and 27th and was channeled northward into the mountains and desert between an upper level low off the central California coast and the Four Corners ridge of high pressure. Isolated thunderstorms that developed as a result produced locally heavy rain. After a historically wet winter and spring, it was no surprise that there was still some snow left on the highest peaks of the southern Sierra during the first week of August. In fact, as of August 4th, up to a half foot of snow was observed on the north side of Donahue Pass (elevation 12,023 feet). Although flows continued to diminish along all of the rivers, water levels in many of the major reservoirs remained higher than normal and were at or above 70 percent capacity as the month drew to a close.

September

A rather persistent upper level ridge of high pressure that extended from the Four Corners region to west Texas brought warmer than normal temperatures during September 2011. In fact, temperatures were 3 to 5 degrees above normal for the month. Although the month was predominantly dry, there were three episodes when northward surges of mid level tropical moisture brought thunderstorms to the region. In each case, a weak upper level low pressure system formed off the southern California coast and helped channel the moisture northward into central California.

The first monsoonal influx began on the 9th and continued through the 14th. Red Flag warnings were issued for dry lightning on the 9th for the Sierra Nevada below 5000 feet and these warnings were extended through the 10th. Although there were new fire starts in the Sierra and the foothills, the greatest concentration of thunderstorms occurred during the predawn hours of the 10th across Kern County, where there were more than 50 wildfires in the mountains and also the south end of the San Joaquin Valley. Several of the fires became large and took nearly a week to completely contain. Although isolated thunderstorms continued each day through the 14th, they became wetter with time.

A second bout with the monsoon moisture occurred on the 23rd and a Red Flag Warning was issued for the Kern County Mountains. Lightning strikes from dry thunderstorms ignited over 20 wildfires in the Kern County Mountains and the Tulare County Foothills. Both this monsoon event and the previous event were abruptly ended by cold fronts that brought dry, stable and noticeably cooler air masses into the region. Marine pushes in the wake of these cold fronts cooled temperatures in the San Joaquin Valley by a good 7 to 10 degrees. The third and final influx of monsoonal moisture was shallow and relatively brief and was limited to the Sierra crest on the 29th and 30th. Otherwise, the month ended dry and cooler, thanks to the return of an onshore flow.

October

October ended up much wetter than normal even though precipitation fell on only two days of the month. Had it not been for a major winter-like storm that trekked southward across the state from the 4th through the 6th, October, 2011 would have been bone dry. The storm, which originated in the Gulf of Alaska, brought the first wetting rain of the season to the San Joaquin Valley and 18 inches of heavy, wet snow to the higher elevations of the Sierra Nevada. As the storm exited into the Great Basin on the 6th, an unseasonably cold airmass settled in behind it with temperatures averaging a good 10 to 20 degrees below normal. In the San Joaquin Valley, rainfall from this system ranged from a quarter of an inch or less on the west side and south end to nearly an inch elsewhere. The Sierra foothills received 1 to 3 inches of rain from the storm. In Kern County, up to a half inch of rain fell in the desert while up to 2 inches fell in the mountains.

Otherwise, much of October, 2011 was dominated by an upper level ridge of high pressure and a prevailing offshore flow which brought generally clear skies and above normal temperatures. The ridge was temporarily flattened by the passage of a weak upper level trough on the 10th. The cold front associated with this system moved southward across the region on Columbus Day and produced scattered showers in the Sierra Nevada mainly north of Kings Canyon. Precipitation amounts were relatively light and ranged from just a few hundredths in the Tulare County mountains to nearly a quarter of an inch in Yosemite National Park. The ridge of high pressure aloft was flattened a second time during the middle of the month as another upper level trough moved through the Pacific Northwest. However, precipitation with this system remained to the north. Temperature-wise, October, 2011 averaged slightly warmer than normal.

November

November 2011 brought a significant change in the overall weather pattern across central California. During the first 3 weeks of the month, storm systems tracked southeastward across the state on the average of every 5 days. Back-to-back storms, which occurred on the 3rd and the 6th, produced up to 8 inches of snow over the highest elevations of the Sierra with 1 to 4 inches down to about 3000 feet in the Sierra foothills. Precipitation was much lighter in the Kern County Mountains with up to a couple inches of snow falling above pass level. In the San Joaquin Valley, combined rainfall from these two storms totaled about a quarter of an inch to a half inch. The next storm system moved through on Veteran's Day and produced another 1 to 4 inches of snow in the mountains above 5000 feet with locally higher amounts. The Kern County Mountains fared much better with this storm with reports of up to 7 inches of snow in Pine

Mountain Club (elevation 6100 feet) by the morning of the 12th. Two cold frontal passages, one during the early morning hours of the 18th and the second during the early morning hours of the 19th, did not produce any measureable precipitation. Within 36 hours, another storm brought generous precipitation to the central California interior. By the time this storm system exited into the Great Basin on the evening of the 20th, it blanketed the higher elevations of the Sierra with up to 10 inches of new snow. In the Kern County Mountains, precipitation was lighter with up to 3 inches of fresh snow above 6000 feet. Rain in the lower elevations averaged about a third of an inch in the San Joaquin Valley with up to three quarters of an inch in the Sierra foothills. The final storm of the month fizzled when it moved inland from the Pacific on Thanksgiving Day. Precipitation from this weak storm system was scanty at best with local amounts of up to a few hundredths of an inch. Even the highest elevations of the Sierra got nothing more than snow flurries out of it.

After Thanksgiving Day, a strong upper level ridge of high pressure anchored itself over southern California and remained in control through the 29th. During this time, night and morning fog and low clouds frequented the San Joaquin Valley while the higher elevations remained mostly clear with mild afternoon temperatures. Low clouds and fog were finally scoured out of the San Joaquin Valley during the afternoon of the 30th as blustery northerly winds associated with a deepening upper level trough over the Great Basin brought a much drier airmass into the central California interior.

In summary, November was slightly cooler than normal. Despite the frequency of storm systems, precipitation averaged slightly below normal in most areas, with the exception of the Bakersfield area, which ended up slightly wetter than normal.

December

December, 2011 ended up being one of the driest Decembers on record. Officially, not a drop of rain fell in Fresno, making it the driest December since 1989 when rainfall was zero. In Bakersfield, where only a trace of rain fell, it was the driest December since 2000. Precipitation was also scanty over the higher terrain, with meager snowfall over the southern Sierra Nevada and the Tehachapi Mountains. This is a sharp contrast from December, 2010 when nearly 6 inches of rain drenched the San Joaquin Valley and snow piled 15-20 feet deep over the high Sierra.

The month began with a major wind storm in the San Joaquin Valley from Fresno County northward which extended into the foothills and higher elevations of the Sierra. The strong winds, which frequently gusted over 40 mph in the valley and as high as 74 mph along the Sierra crest, downed numerous trees and power lines and caused roof damage to several homes in the Fresno area during the afternoon of December 1st. An invasion of a dry and very cold airmass in the wake of this storm system led to a week long period of below freezing minimum temperatures in the San Joaquin Valley beginning December 3rd.

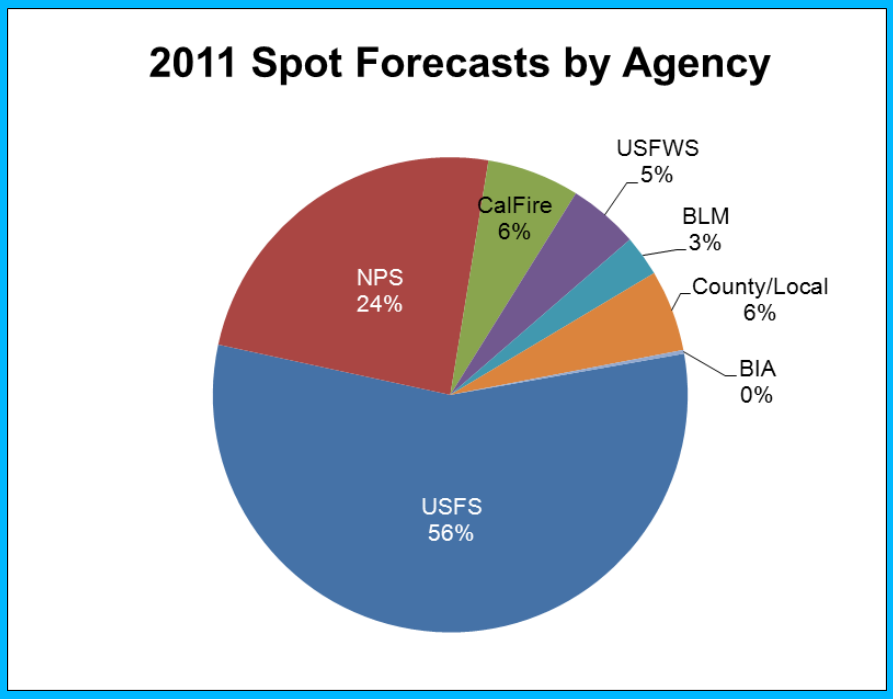
A storm system that formed over the eastern Pacific during the second weekend of the month tracked too far west and south to bring measurable rain to the San Joaquin Valley. However, the storm did brush the extreme south end of the San Joaquin Valley and the Kern County

Mountains and Desert with some light precipitation from the evening of the 11th into the 13th. The air was cold enough for a dusting of snow and ice down to pass level in the Tehachapi Mountains on the morning of the 12th, which ultimately closed a few secondary roads for a short time. A second storm followed closely behind this system but moved inland into northern California on the 14th, and it then dragged a cold front southward through the central California interior on the 15th with little more than a few light showers across the northern half of the district. The second half of the month was very dry as the storm track remained well to the north and an upper level ridge of high pressure dominated the weather pattern.

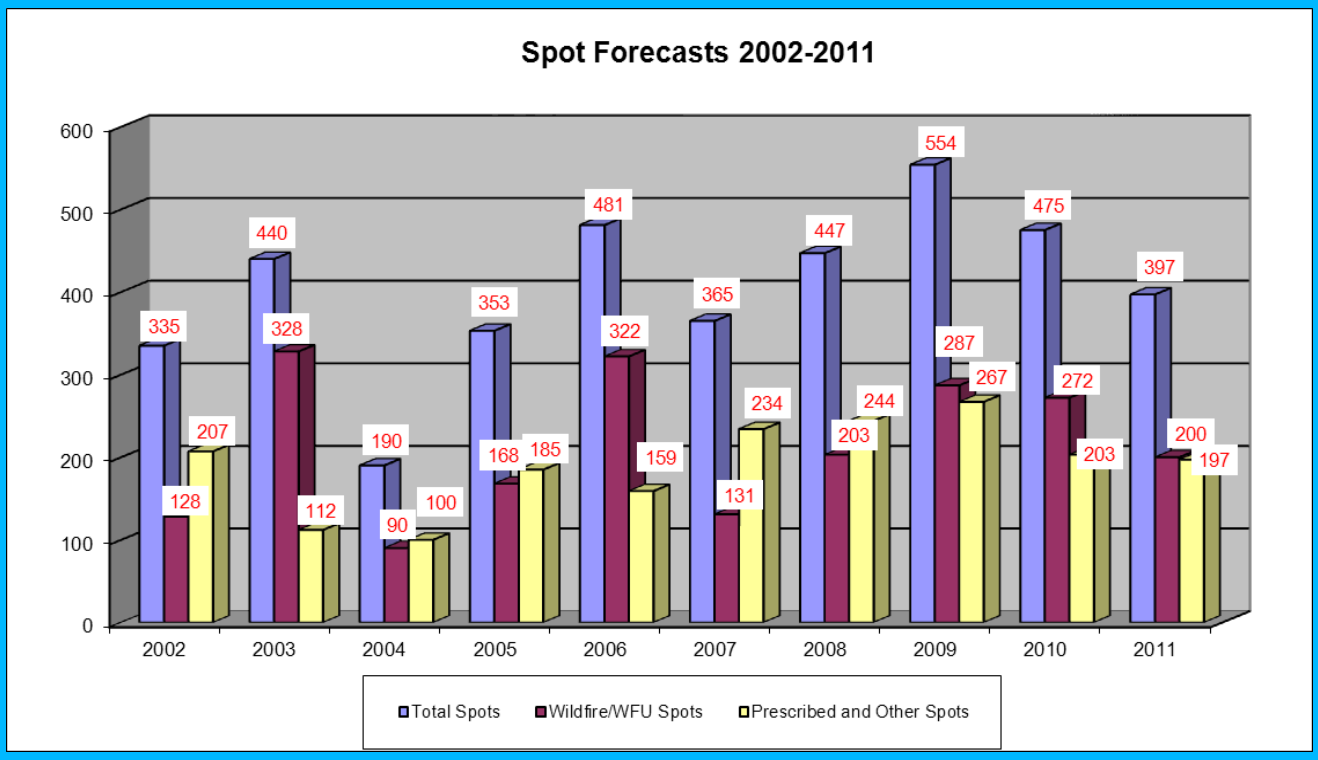
II. Spot Forecasts

The following Spot Forecasts were prepared by the National Weather Service San Joaquin Valley Office in 2011:

Total Spots: 397
  RX spots: 184
  Wildfire spots: 200
  Hazmat/SAR spots: 13
Monthly average: 33.08



Average yearly spot forecasts from 2002 to 2011: 403.7



III. ATMU Dispatches

The San Joaquin Valley Office responded to the following Incident Meteorologist (IMET) requests during 2011:

Incident Name	IMET	Dispatch Dates	Fire Weather District
Motor Sierra NF	Cindy Bean	8/27/11 -9/2/11	Hanford, CA
Great Fire Cal Fire Monte Vista Unit	Dan Harty	10/3/11 – 10/6/11	San Diego, CA

Total IMET days out of the office: 11

IV. Teaching Assignments

The San Joaquin Valley Office participated as instructors at the following Courses in 2011:

Course Name	Location	Agency Served	Instructor
S-290	Bakersfield, CA January 31-Feb 1	Kern County Fire	Cindy Bean
S-290	Visalia, CA February 14-16	Cal Fire Tulare Unit	Cindy Bean
S-290	Bakersfield, CA June 6-7	Kern County Fire	Dan Harty
S-290	Bakersfield, CA December 5-6	Kern County Fire	Cindy Bean
S-390	Bakersfield, CA March 28	Kern County Fire	Cindy Bean
BLM Refresher	Bakersfield, CA May 19	BLM	Cindy Bean

V. Training

The following training was completed by the San Joaquin Valley office in 2011:

IMET Workshop, Boise, ID, March 2011 - Cindy Bean
Dan Harty

VI. 2011 Red Flag Warning Verification

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

Total Events

Number of Red Flag Warnings issued:	13
Number of Red Flag Warnings verified:	12
Number of missed events:	1

Warnings preceded by a Fire Weather Watch:	5
Watches not followed by a Warning:	0

Probability of Detection (POD):	85.7%
False Alarm Ratio (FAR):	7.7%
Critical Success Index (CSI):	80.0%
Average Lead Time for Warnings:	10.73 hrs
Watches:	26.63 hrs

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

Dry Thunderstorm Events

Number of Red Flag Warnings issued:	10
Number of Red Flag Warnings verified:	9
Number of missed events:	1

Probability of Detection (POD):	82%
False Alarm Ratio (FAR):	10%
Critical Success Index (CSI):	75%

Wind and Low Humidity Events

Number of Red Flag Warnings issued:	3
Number of Red Flag Warnings verified:	3
Number of missed events:	0

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