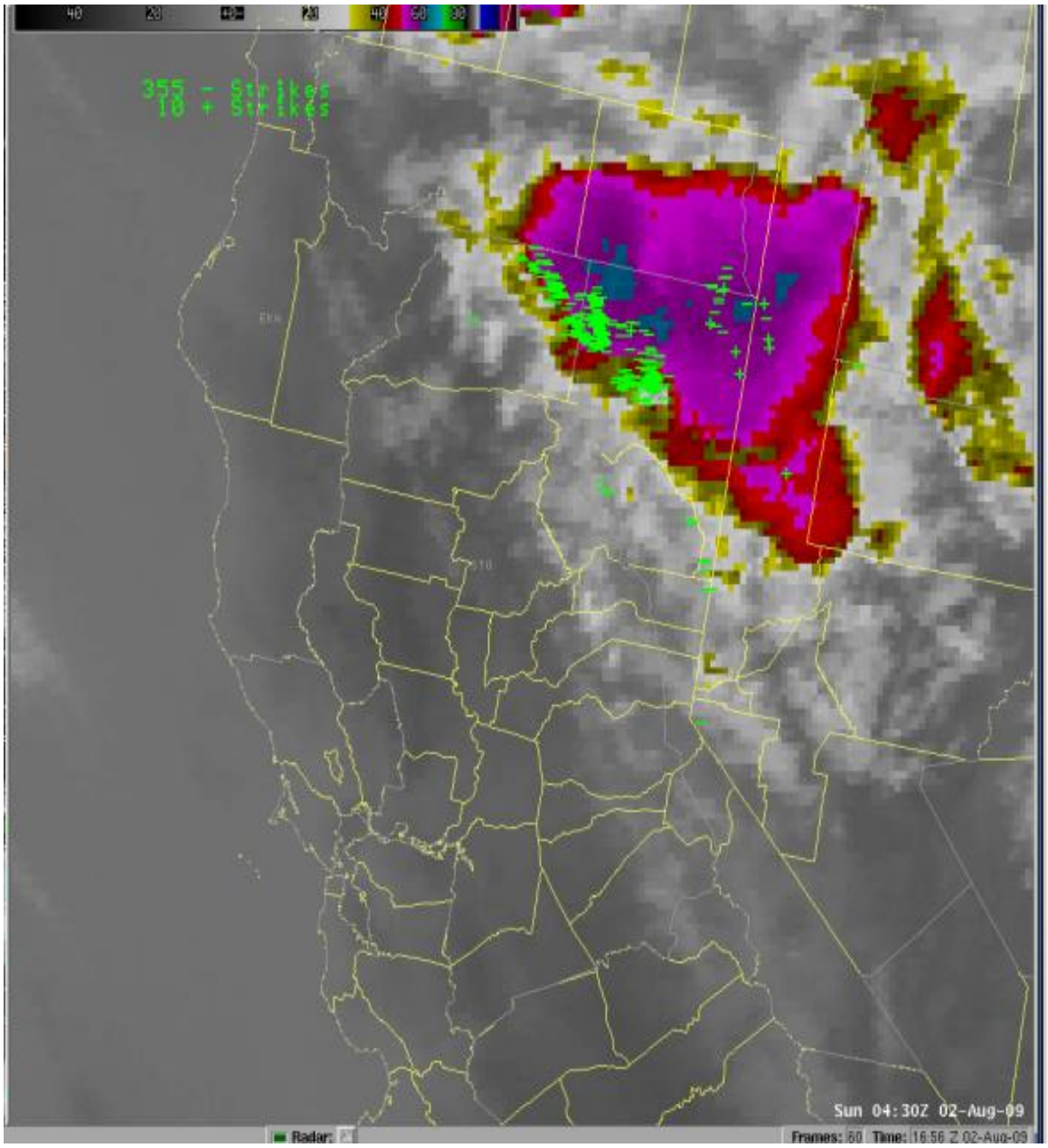
SACRAMENTO FIRE WEATHER 2009 ANNUAL SUMMARY



IR Satellite Imagery with Lightning Plot
Evening of August 1st 2009

SACRAMENTO FIRE WEATHER ANNUAL SUMMARY - 2009

107,149 acres burned in northern California during the 2009 fire season. This is 71% of the 15 year average of 151,065 acres (2008's extreme numbers were not factored in). 2009 will rank tenth in the last 16 years in terms of total acres burned for NORCAL. If you factor in the 2008 season, 2009's total acres burned are 43,156 acres below the median of 150,305 acres per year.

There were great concerns heading into the 2009 fire season given the long term drought and the severity of the previous fire season. Winter precipitation got off to an abysmal start in 2009. January precipitation for the northern Sierra was 33% of normal and the month was California's 8th driest January on record. On February 15th the drought in northern California was classified as "severe" to "extreme". Record dry fuels were already being anticipated by summer.

Some relief began in the form of predominant low pressure off the California coast from mid-February through the end of March. Storm systems began impacting the state with beneficial rain and snow. By March 1st the snowpack had recovered to 80% of normal. On April 1st it was 90% of normal in the northern Sierra. However, the 2008-2009 winter was the third consecutive dry winter; the water year was the fourth consecutive with below normal precipitation.

WFO's across northern California transitioned to 'high' fire season on May 1st. May was a relatively wet month as storms continued to impact the region. The northern Sierra received over 200% of normal precipitation in May, however it is important to keep in mind that May only represents 4% of our seasonal rainfall total on average.

The spring rains moistened live fuels, which rose to over 200% in early May. Fuels experienced rapid drying through the end of May, but moistened again as more rain fell in June. June of 2009 was the second consecutive June with a lot of lightning in northern California. There were over 12,000 lightning strikes from June 3rd through June 10th. There appears to be a correlation between La Niña and spring thunderstorm outbreaks in northern California. In the springs of 2008 and 2009, strong cold pools of water persisted in the Gulf of Alaska with large warm water anomalies north of Hawaii. Other features common to both spring thunderstorm outbreaks were unusually strong polar jetstreams dropping down from Canada and rich sources of mid and high level tropical moisture streaming over California from extended western Pacific jetstreams.

It was fortunate that the June, 2009 thunderstorms contained wetting rains. One big difference in the 2009 thunderstorm outbreak was that the subtropical jetstream tapped into tropical water off the Baja California coast, where another warm water anomaly was located. This injected deeper, lower level moisture into the mix. The trof of low pressure that ignited thunderstorms in 2009 was not as dynamic as the one that caused the June 2008 outbreak. Fuels were also running wetter than normal in 2009 given the above normal precipitation experienced earlier. This was in stark contrast to June of 2008, which was bone-dry with 100 degree heat immediately preceding the historic dry

lightning outbreak.

The June rains set fuel levels back to those usually observed in mid April. Fuels rapidly dried out for the remainder of the month, but remained above the 20 year average well into July. Concern about the 1000 hr fuels persisted but the drought was downgraded to "moderate".

Wildfire activity increased in the beginning of August as a strong upper level disturbance rotated around high pressure over central California. This feature just clipped the Burney Basin the evening of August 1st, triggering over 1800 lightning strikes. More than 40 fires were started in the Lassen NF and 50 in the Shasta-Trinity NF. These merged into two large fires that impacted our CWA.

The **SHU Lightning Complex** began August 1st and grew to 17,600 acres, impacting mainly the Burney Basin. It caused 22 injuries, forced the evacuation of the town of Burney and closed portions of highway 299. This fire cost $31.1 million to contain, and was fully contained by 8/18.

The **Hat Creek Complex** was a complex of 34 fires that began in the Lassen NF; eventually moving into Shasta County. It forced the closure of portions of highway 299, SR 36 and SR 89. It grew to over 11,000 acres. Evacuations were ordered at campgrounds in the area, an RV park and at the community of Old Station. The fires occurred in steep terrain and were finally contained on August 26th. The initial cost estimate to contain these fires was $7 million. The complex caused 1 injury.

Another fire of interest in August was the **49'er** fire, a man made fire near Auburn that burned 343 acres from 8/30 through 9/2. It destroyed 63 residences and 6 commercial buildings, causing over $10 million in damage. The fire caused the evacuation of portions of Auburn and necessitated the rapid deployment of hundreds of firefighters because of its location near a populated area.

The **Yuba fire** also burned 3800 acres in a remote area of Yuba County from 8/14 through 8/23.

In September, a fairly potent low pressure system picked up tropical moisture and displaced a strong ridge of high pressure over northern California on the 12th. This weather system sparked dry thunderstorms and prompted the issuance of Fire Weather Watches and warnings for lightning. More than 50 fires were started; the majority in Lake County and over the Tuolumne-Calaveras ECC.

By the 18th north pressure gradients caused a period of gusty winds and low humidity. 100 degree heat developed under strong high pressure until the 26th, when more gusty winds prompted the issuance of Red Flag Warnings from the 27th through the 30th. September as a whole was warmer and drier than normal.

September Wildfires in the STO CWA:

FIRE	SIZE	LOCATION	STARTED	CONTAINED
Elephant Fire	500 ac.	Feather River Canyon	8/19	9/1
Silver Fire	350 ac.	Plumas NF	9/12	9/19
Sunset Fire	100 ac.	Placer Co.	9/27	9/30
Magnolia Fire	100 ac.	Nevada Co.	9/27	9/30
Tuolumne-Calaveras Ltg.	7 fires each about 200 ac.	Tuolumne Co.	9/12	9/14
Sonoma-Napa Ltg.	9 fires about 100 ac. Each	Lake Co.	9/12	9/14
Mendocino ltg.	2 fires 110 ac.	Tehama Co.	9/12	9/14
Oasis Fire	1575 ac.	Lake Co.	9/7	9/12

October began cool and dry, perfect conditions for prescribed burning. A historic storm affected northern California the week of October 12th. Moisture from the remnants of a super-typhoon got caught up in an extension of the Pacific jetstream as a potent MJO (Madden-Julian Oscillation) shifted into the western Pacific. This allowed a precipitable water plume over 300% above normal to move over northern California. A strong surface extra-tropical cyclone spun up from this jetstream on the 14th. Northern California was slammed with heavy rain, strong winds, urban and small stream flooding and reports of mud slides. Sacramento received 3.04 inches of rain in 24 hours on the 14th, which ranked as the second highest 24 hour rainfall total ever (the first was the October, 1962 super storm). Portions of Shasta County received over 10 inches of rain from the 14th through the 16th. Two to three feet of snow also fell above 7000 feet. This impressive storm effectively ended fire season. All the offices throughout northern California officially ended fire season on October 24th.

Drier weather toward the end of October prompted a period of very active prescribed burning. WFO Sacramento issued 92 spot forecasts during the second half of October and another 80 spot forecasts during November. We issued 132 spots between October 20th and November 11th. To put this in perspective, in June of 2008 (our highest single month spot forecast total ever) we issued 107 spot forecasts for wildfires.

RED FLAG WARNING VERIFICATION FOR 2009

Sacramento fire weather forecasters issued 39 Red Flag Warnings in 2009, significantly less than the 184 issued in 2008. All of these were issued in August and September. 40 Fire Weather Watches were issued; again well down from the 117 issued the previous year. Our wet spring kept live fuel moistures above normal until the end of July; after which they fell close to the 20 year average.

MONTH	FIRE WX WATCHES	RED FLAG WARNINGS	
		Wind / Low RH	Dry Lightning
May	0	0	0
June	0	0	0
July	4	0	0
August	16	0	11
September	20	24	4
October	0	0	0

Red Flag Warning verification can be subjective, especially with regard to dry lightning. To verify as a correct warning for winds and RH, we refer to the matrix agreed upon by the California Wildfire Coordinating Group (CWCG):

The wind event should be expected to last for at least 8 hours to qualify for a red flag warning.

W indicates that the forecaster should consider a warning.

Relative Humidity	Sustained Wind 6-11 mph	Sustained Wind 12-20 mph	Sustained Wind 21-29 mph	Sustained Wind 30+ mph
Daytime Minimum RH 29-42% and/or Nighttime Maximum RH 60-80%				W
Daytime Minimum RH 19-28% and/or Nighttime Maximum RH 46-60%			W	W
Daytime Minimum RH 9-18% and/or Nighttime Maximum RH 31-45%		W	W	W
Daytime Minimum RH < 9% and/or Nighttime Maximum RH < 31%	W	W	W	W

In 2009 our POD for synoptic scale, or gusty wind and low humidity Red Flag Warnings was virtually unchanged from the previous year (.950 in 2009 vs. .976 in 2008). Both years were better than 2007 (.830); suggesting that we are doing very well issuing Red Flag Warnings for wind and humidity. There was a slight increase (20.8% from 15.1%) in FAR in 2009. Our lead times for synoptic Red Flag Warnings have remained

remarkably similar during the last three years (20.4, 21.6 and 21.5 hours respectively for 2009, 2008 and 2007).

2009 lightning Red Flag Warnings demonstrate improved POD scores from 2008 (.666 to .588 respectively). Our CSI for these warnings were similar to last year (.421 vs. .420) and our FAR was slightly improved (.467 vs. .520). We can say that we showed somewhat better skill forecasting lightning outbreaks this season. Our lead times for lightning Red Flag Warnings improved to 10.1 hours in 2009, up from 7.1 hours in 2008.

Red Flag Warnings for lightning continue to be a real forecast challenge with the occurrence of monsoonal thunderstorms that transition from 'dry' to 'wet'. Documentation states that such lighting outbreaks are to be covered by highlighting statements and not Red Flag Warnings.

Statistically, POD is the ratio of warned events to total events. So if

A= the # of correct warnings
B= the number of incorrect warnings
C= the number of events not warned

Then POD = A / (A+C)

FAR is the ratio of warnings without an event to total warnings: B / (A+B)

CSI = A / (A+B+C)

2009 Red Flag Warnings

	Synoptic Scale	Dry Thunderstorms	Total or Average
Number of Red Flag Warnings	24	15	39
Number of Correct Warnings	19	8	27
Number of Incorrect Warnings	5	7	12
Number of Events Not Warned	1	4	5
POD for Red Flag warnings	95.0%	66.6%	84.4%
CSI for Red Flag warnings	76.0%	42.1%	61.4%
FAR for Red Flag warnings	20.8%	46.7%	30.8%
Red Flag warning Lead Times	20.4 Hours	10.1 hours	16.4 Hours

One of our biggest improvements this season was excellent lead time for Fire Weather Watches for lightning. Our lead time for lightning watches that were upgraded to warnings was a full ***43 hours*** longer than in 2008 (50.7 hours vs. 7.0 hours). The short lead time in 2008 was primarily caused by the issuance of too many watches that did not verify. In 2009, 15 of the 21 Fire Weather Watches we issued for lightning were upgraded to Red Flag Warnings.

The synoptic Fire Weather Watches also did well in this category. All 19 Fire Weather Watches that were issued in September were later upgraded to Red Flag Warnings. This provided over 30 hours of lead time, an increase of 3 hours from 2008.

2009 Fire Weather Watches

	Synoptic	Dry Thunderstorms	Total or Average
Number of Fire Weather Watches	19	21	40
Number of Watches Verified	15	8	23
Lead time of verified Watches	31.5 hours	50.7 hours	41.56 hours

SPOT FORECASTS ISSUED FOR THE YEAR 2009

WFO Sacramento issued 435 spot forecasts last season; our second highest total ever. While we issued 82 less spot forecasts than the 2008 season, we saw a record number of spot forecast requests for prescribed burns in October and November. In 2008 we issued 302 spots for wildfires; in 2009 this dropped to 82. This decrease is best illustrated by comparing the number of wildfire spots in June of 2009 vs. 2008. In June of 2008 we issued 107 spot forecasts for wildfires – in June of 2009 we issued only two!!

In the table that follows note the large increase in prescribed spot forecasts for October and November. We were quite busy with spots in these months, sometimes receiving up to 6 requests per day. The monthly breakdown of our 2009 spot forecast requests follows:

Month	Rx Burns	Wildfire	WFU	HAZMAT	Training	Other
JAN	13	0	0	0	0	0
FEB	3	1	0	0	0	0
MAR	9	0	0	0	0	0
APR	24	2	0	0	0	0
MAY	16	0	0	0	8	3
JUN	33	2	0	0	8	4
JUL	3	21	0	0	1	1
AUG	5	46	20	0	0	0
SEP	11	9	0	0	0	0
OCT	85	1	0	0	3	1
NOV	80	0	0	0	0	0
DEC	22	0	0	0	0	0
TOTAL	**304**	**82**	**20**	**0**	**20**	**9**

USFS spot requests (225) and CALFIRE spot requests (99) set records for our CWA in 2009. There was also a big increase in spot requests from US Fish / Wildlife. These trends are expected to continue in 2010. Removing the extreme fire season of 2008, we note a steady increase in spot forecast requests from 2007 (364), 2006 (324), 2005 (269) and 2004 (234).

Spot Forecast Requests	2009	2008	2007
Wildfires (USFS)	22	241	44
Wildfires (CALFIRE)	14	61	24
Burns (USFS)	225	140	195
Burns (CALFIRE)	99	39	52
Burns (US Fish / Wildlife)	48	25	30
Burns (NPS)	7	5	10
WFU	20	5	9
HAZMAT (OES)	0	1	0

WFO Sacramento had an average spot forecast completion time of 31.7 minutes in 2009 (wildfire spots); an improvement from 46.5 minutes in 2008. We achieved our goal of bringing this number below 40 minutes. Excellent! We were not so inundated with wildfire spot forecast requests this season, allowing us to complete them faster. At the height of the 2008 wildfire outbreak, we received up to 14 spot forecast requests per day. Prescribed burn spot forecast requests, which almost always came in a day ahead of time in October and November, were not figured into these calculations.

INCIDENT METEOROLOGIST DISPATCHES FOR 2009

Sacramento fire weather participated in 5 IMET dispatches in 2009, the same number we supported in 2008! However, the number of days STO IMETs were dispatched fell to 36 (compared to 47 in 2008). Previous years saw 34 dispatch days in 2007 and 31 in 2006.

Jason Clapp became a certified IMET on the Backbone Fire in July, giving WFO STO two certified IMETS for the first time since July of 2006. A breakdown of WFO STO IMET dispatches including incident name, dates dispatched and fire weather district of the incident is as follows:

Incident Name	IMET	Dispatch Dates	Fire Weather District
Backbone Fire	Jason Clapp	7/9/09-7/23/09	Eureka
Upper Complex	Mike Smith	8/2/09-8/4/09	Medford
Summit Fire	Mike Smith	8/13/09-8/16/09	Monterey
La Brea Fire	Jason Clapp	8/22/09-8/30/09	Oxnard
Silver Fire	Jason Clapp	9/20/09-9/24/09	Sacramento

Number of days on Incidents

Mike Smith 7
Steve Goldstein (T)..... 0
Jason Clapp 29

Total Days of IMET support
from WFO Sacramento..... 36

FIRE WEATHER TRAINING ASSIGNMENTS IN 2009

Sacramento fire weather participated in 23 teaching assignments in 2009, up from 13 in 2008. Jason Clapp was a huge help this year, teaching or assisting with seven "Basic Fire Behavior" S-290 courses. Mike Smith also taught six S-390 courses and one S-590 course. WFO Sacramento continues to be a big help to state and local agencies that must comply with the S-290 wildland fire fighting course. The trend of forecaster support seems to be increasing again after dropping off last year. We taught 17 classes in 2007 and 24 in 2006.

Special thanks go to Mike Smith, who continues to shoulder a large teaching workload each year.

The courses taught, locations, agency served and instructors follow:

Course Name	Location	Date	Agency Served	Instructor
Wldnd Fire Calc S-390	Magalia	1/5-1/6	CALFIRE	Mike Smith
Basic Fire Behavior S-290	Auburn	1/10-1/11	CALFIRE	Mike Smith
Basic Fire Behavior S-290	McClellan	1/13-1/14	Various	Mike Smith Jason Clapp
Basic Fire Behavior S-290	McClellan	1/20-1/21	Various	Mike Smith Jason Clapp
Basic Fire Behavior S-290	McClellan	1/26-1/27	Various	Mike Smith
Basic Fire Behavior S-290	McClellan	1/27-1/28	Various	Jason Clapp
Basic Fire Behavior S-290	Modesto	2/9-2/10	CALFIRE	Mike Smith
Wldnd Fire Calc S-390	Ione	2/17	CALFIRE	Mike Smith
Basic Fire Behavior S-290	McClellan	2/24-2/25	Various	Jason Clapp
Wldnd Fire Calc S-390	Magalia	3/2-3/3	CALFIRE	Mike Smith
Basic Fire Behavior S-290	Sonora	3/31-4/1	USFS	Mike Smith

Adv. Wldnd Fire Calc S-390	Ione	4/7-4/8	CALFIRE	Mike Smith
Basic Fire Behavior S-290	Woodland	4/20-4/21	Various	Jason Clapp
Basic Fire Behavior S-290	Woodland	4/22-4/23	Various	Mike Smith
Basic Fire Behavior S-290	Woodland	4/23-4/24	Various	Mike Smith
Wldnd Fire Calc S-390	McClellan	5/4-5/5	Various	Mike Smith
Basic Fire Behavior S-290	Garden Valley	5/12-5/13	Various	Jason Clapp
Fire Wx Refresher	Camino	5/22	USFS	Mike Smith
Basic Fire Behavior S-290	Granite Bay	6/1-6/2	USFS	Mike Smith
Basic Fire Behavior S-290	Sonora	6/30-7/1	USFS	Jason Clapp
Wldnd Fire Calc S-390	Ione	11/2-11/3	USFS	Mike Smith
Adv Fire Behavior S-590	Tucson	12/7-12/11	Various	Mike Smith
Basic Fire Behavior S-290	McClellan	12/14-12/15	Various	Jason Clapp