

# California Seasonal Fire Weather/ Fire Danger Outlook

April 1, 2005



## California Executive Summary

This report is a product of the National Seasonal Assessment Workshop held March 28 - April 1, 2005 in Boulder, Colorado. This workshop brought together experts in the field of climatology, meteorology, fuels and fire danger.

The objective of this report is to assess the factors that will affect wildland fire potential in California during the 2005 wildland fire season. The assessment is based on past developments, current conditions, trends and predictions for the next six months (April through September).

Given that this report was generated prior to the significant weather months of April and May, it provides a baseline of information that can be utilized as a preliminary outlook and improve preparedness for wildland fire management agencies. The GACC Predictive Service Units (PSA) will issue monthly assessments of fire weather and fire danger. An updated version of this California Seasonal Fire Weather/Fire Danger Outlook will be prepared by the end of June.

The specific objectives of this report are to:

- State current fire weather and fuel conditions in California.
- Develop fire weather predictions for spring into summer.
- Develop a statement of probable fuel conditions for spring into summer, and identify areas of concern for fuel conditions across the state.
- Develop a prognosis of the wildland fire potential based on available fire weather and fuel predictions.
- Provide a general statement on resource availability for wildland fire agencies.

A fairly typical spring weather pattern is expected over California. Temperatures in spring are forecast to be near normal statewide. Spring precipitation overall is expected to average near normal in the south and just below normal in the north. For the summer period, we can expect a continuation of near normal temperatures in the coastal areas, while interior portions of the state will likely experience near to slightly higher than normal temperatures. Precipitation for this period is anticipated to be at or below normal, but it should be noted that average rainfall during the summer for much of the state is insignificant. The confidence factor in these weather forecasts is about average.

A trend in funding levels reduction could result in a reduction of initial attack resources that may cause decreased initial attack capability and an increase in average annual acres burned and resource value losses.

The current and expected weather and fuel conditions will lead to above normal fire potential over the southern California desert areas and the extreme northern and northeastern corner of California. Elsewhere, near normal fire potential will exist.

Fire season is expected to begin a few weeks earlier than normal in the southern California desert areas and a little later than normal in the higher elevations.

Although above to much above normal precipitation occurred in most areas, there remains large areas of brush and timber mortality throughout many portions of the state. The most significant areas continue over the southern forests.



## Current Weather Conditions

### Northern California

On the large-scale, northern California has been the precipitation transition zone along the West coast this past winter. The north half of the Geographic Area has received precipitation ranging from approximately 60-100% of normal (see Figure 1). Meanwhile the south half of Northern Operations has, in general, been wetter than normal, with 90-130% of normal precipitation to date. With mean temperatures mostly within two degrees of normal (see Figure 2), most winter storms have had snow levels close to long-term averages. For these reasons, the northern California snowpack presently ranges from below normal at the Oregon border to above normal at the south end of the Geographic Area.

Percent of Normal Precipitation (%)      Departure from Normal Temperature (F)  
10/01/04 -03/29/05                      10/01/04 -03/29/05

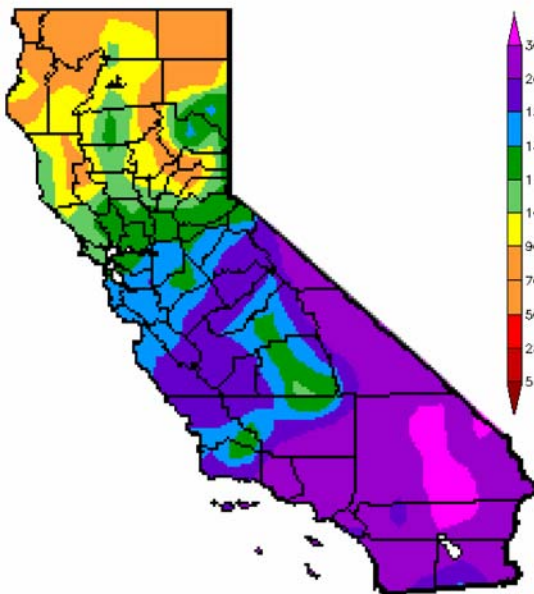


Figure 1

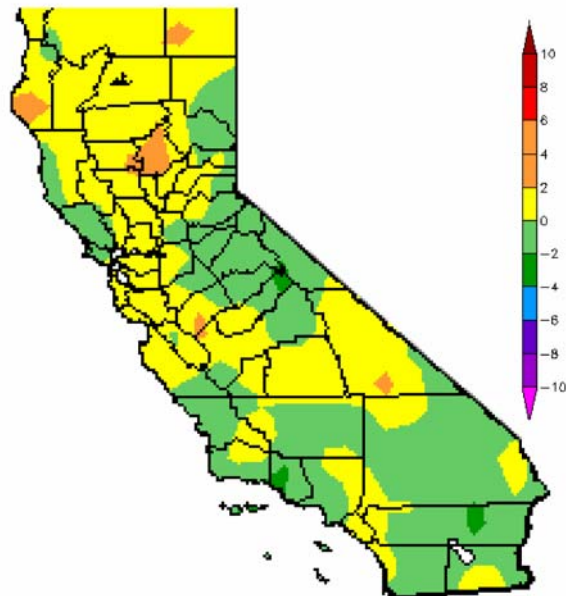


Figure 2

Wind speeds with northern California's winter storms, while locally strong, were well within the typical ranges, and no new significant areas of blowdown have yet been reported.

Long-term drought has not been an issue within the north state the past two years, but northeast California does border on some 3-5 year drought areas in the Great Basin (see Figure 3).

A two-week warm spell in the first half of March allowed for some prescribed burning at lower elevations, but wetter weather since has kept the main spring burn season on hold.

A borderline-moderate El Niño was in place during the latter half of 2004, and while it faded in strength in January,

there is recent data indicating a moderate or stronger El Niño could redevelop this year. The weather forecasts contained in this document are consistent with the scenario that indicates warming eastern-Pacific sea-surface temperatures during 2005.

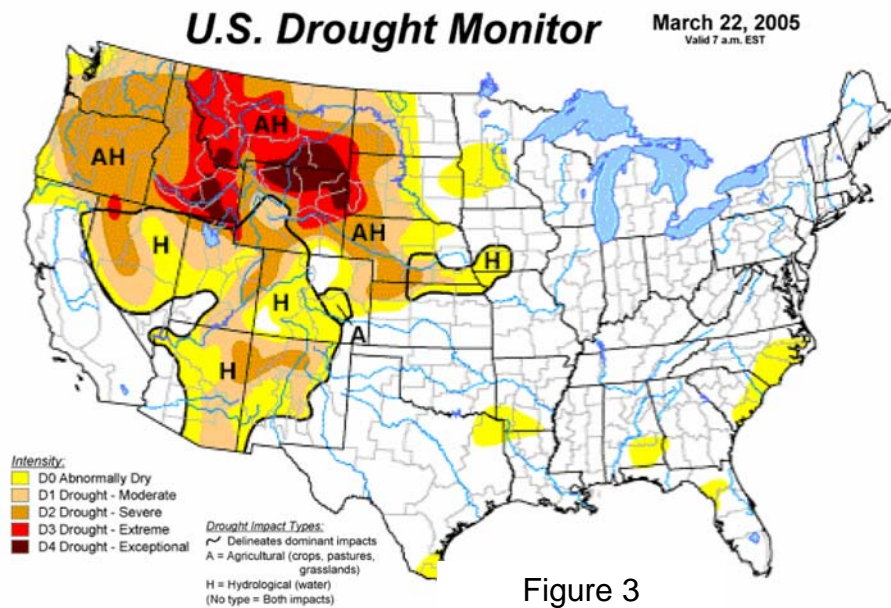


Figure 3

### Southern California

Precipitation during this past year was above to much above normal throughout the entire area. A number of locations in the far southern areas broke all time precipitation records. Even the normally dry desert areas received much above normal precipitation. Precipitation since October 2004 ranged from 250% above normal in some of the northern portions to over 400% above normal in southern areas. The drought condition over the past five years, especially in the southern areas, certainly improved this year. The unusual aspect of this high amount of precipitation is the fact that it was spread out over the entire precipitation season. In the past, most years with excessive precipitation, especially for the southern areas, typically occurred within a few months. This year found periods of significant precipitation continuing over a period of six to seven months. This was not only extremely unusual, but very beneficial to the improvement in the long term drought stress in vegetation. The weather pattern responsible for the very significant precipitation over much of the region cannot be explained exclusively by an El Niño condition, but it probably was a contributor.

Similar to the winter season of last year, the dominating weather pattern across the eastern Pacific Ocean into the West Coast was a split-flow pattern in the upper atmosphere. Last year found most of the upper flow energy (storms) in the northern branch of the split, while this year found the main energy and associated storms in the southern branch. This produced much above normal precipitation over southern California and well below normal precipitation over much of the Pacific Northwest. As

opposed to last, year when the upper level ridge dominated the weather over southern California, this year found the ridge to dominate the weather over the Pacific Northwest and western Canada.

Average maximum temperatures across the region were actually quite similar, and ranged from near to a degree or so below normal northern areas to around one to three degrees below normal southern areas. The slightly below normal temperature differences between the northern and southern areas was a function of the amount of storm activity and daytime cloud cover.

January of 2003 saw a record breaking month of high temperatures and a minimal amount of precipitation. In most areas there was no precipitation at all. March of 2004 had a record breaking month of high temperatures and little to no precipitation. No extremely high temperatures or prolong dry periods occurred during the late winter/early spring period of this year.

For the forests, numerous periods of significant precipitation over the past six to seven months, and no extreme or prolong periods of high daytime temperatures, have resulted in an above normal snow pack.

### Current Fuel Conditions

#### Northern California

Winter precipitation described above has allowed for excellent fuel moisture recovery in all timelag categories. One exception is the north half of Northern Operations which to date has received 60-100% of normal precipitation. The dead fuel moisture recovery in this area could be characterized as good to very good.

The winter precipitation has resulted in a substantial increase of grass and annual vegetation especially in the valleys and foothills. The Normalized Difference Vegetation Index (NDVI) departure from average image (Figure 4) shows most live fuel moistures ranging from 105-150% of average. Brush has come out of dormancy and started greening up in the valleys and lower elevations.

Some curing of the fine fuels has started at lower elevations.

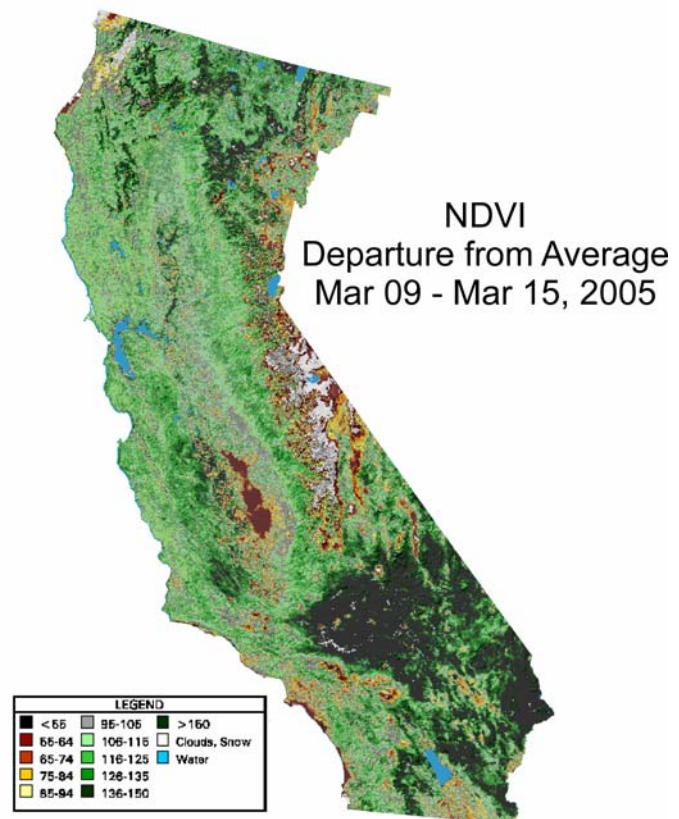


Figure 4

Mortality of conifers and hardwoods has resulted in areas of heavier fuel loadings and increased flammability (Figure 5). Mortality includes insect, disease, blowdown, damage from fire and other agents.

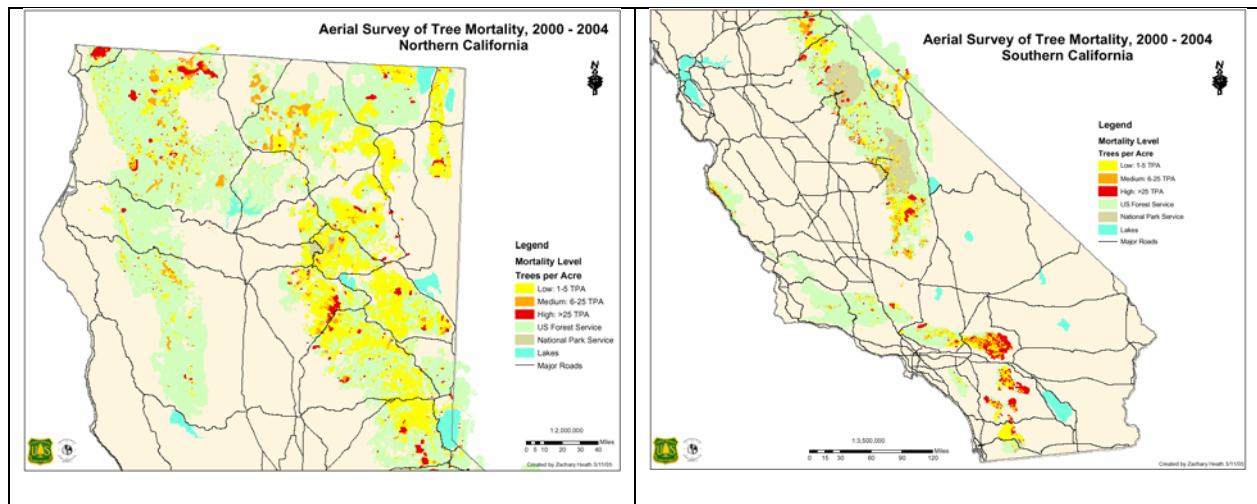


Figure 5

Tree mortality coverage by National Forest can be downloaded at:  
<http://www.fs.fed.us/r5/rsl/clearinghouse/tree-mort.shtml>

2004 Insect and Disease Aerial Detection Surveys will be posted at:  
<http://www.fs.fed.us/r5/spf/about/aerial-survey-mortality.shtml>

The 1000-hour fuel moistures on March 29<sup>th</sup> ranged from 16 to 52% and average 31%. The increased dead fuel moistures have significantly reduced fuel availability compared to last year at this time. Minimal prescribed burning took place in March compared to the same month last year when 23,656 acres were accomplished.

### **Southern California**

As a result of the substantial winter and spring precipitation, the NDVI shows that the average fuel moisture in Southern California is around 150%. (Figure 4) The abundant rainfall has resulted in a large increase of grass and annual vegetation that has not been seen in years. At this time grasses and annual vegetation are green, though curing has started on the south aspects.

Chaparral is recovering and live fuel moistures are normal to above normal for this time of year; however, there is a large dead component in the vegetation from the preceding drought. The new growth in the chaparral is widespread which has not occurred in several years.

The rate of mortality in the timbered areas has slowed. The epidemic beetle population has diminished significantly within the last year to more normal levels. Mortality is still occurring as trees succumb to further infestation. Many areas with dead standing trees

have dropped their needles changing the configuration of the fuels from a vertical to a more horizontal arrangement.

Mortality of oak trees, tanoaks, and other species from Sudden Oak Death (SOD) in the Central Coast area is a growing concern. For further information on SOD visit <[www.suddenoakdeath.org](http://www.suddenoakdeath.org)>

The 1,000-hour fuel moistures have recovered to more normal ranges of around 21-48% for most areas with the deserts and eastern Sierra areas ranging from 15-20%.

Prescribed burning has been limited to mostly pile burning as a result of the rainfall.

## **2005 Forecast Conditions**

### **Climate and Weather Outlook April through September**

A large ridge of high pressure persisted over or near the region from British Columbia to Oregon for much of the past winter. This is what led to a strongly split Pacific storm track several hundred miles west of Oregon. This split, in turn, resulted in the much-drier than normal Pacific NW weather, while making central and southern California wet to very wet. Recently the high has moved east and weakened, allowing the first consolidated Pacific westerlies into the Pacific NW in many weeks. At present, it looks like this governing pattern will hold until about mid-April, but confidence on the next large-scale pattern shift after that is not very high. A return to some version of a split flow in the eastern Pacific during late April or May would not be a surprise.

In June, we expect the return of an expanded ridge of high pressure in the eastern Pacific. However, following the scenario of a developing El Nino, there are indications that the high may be stronger farther to the north, while remaining a bit weaker than normal west of California, at least through July. Stronger high pressure aloft should expand into the western U.S. interior during the latter half of the summer.

Consensus forecasts for temperatures and precipitation were developed for both April-May-June and July-August-September. These were produced by a group of climatologists from both the federal government and climate research community. As mentioned above, a parallel set of forecasts consistent with a developing El Nino, was also provided (see Figure 6). The following California forecasts favor the latter scenario though temperature and precipitation forecasts are fairly similar from either scenario.

For precipitation graphics, numbers in green areas indicate percent chance of above normal, while numbers in brown areas indicate percent chance of below normal. For temperature graphics, numbers in the pink to red indicate percent chance of above normal, while numbers in the blue are the percent chance of below normal.



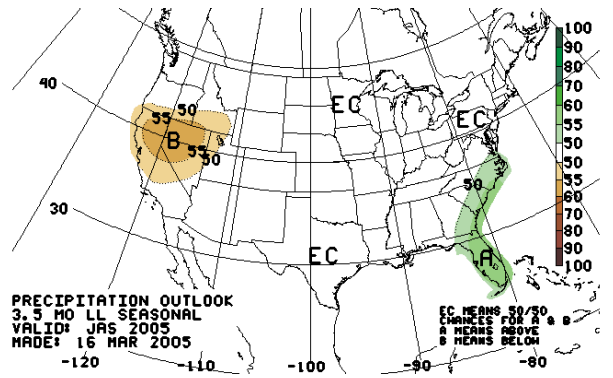
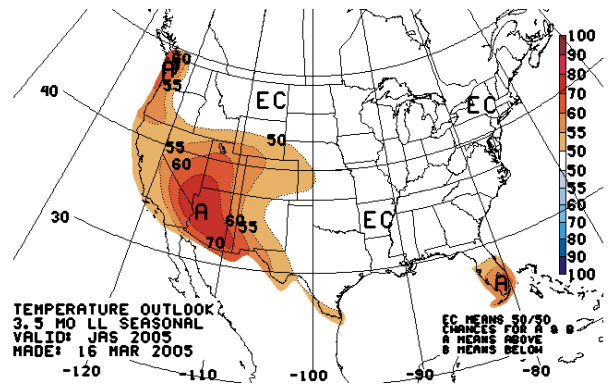
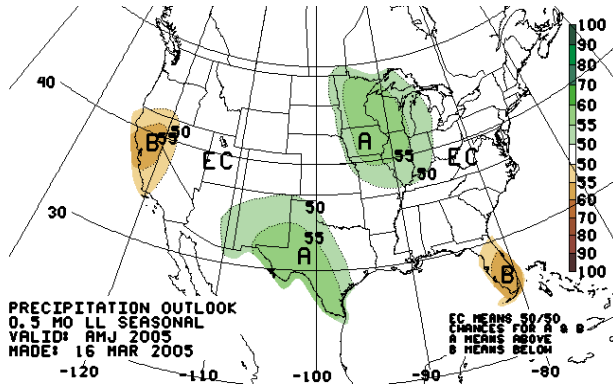
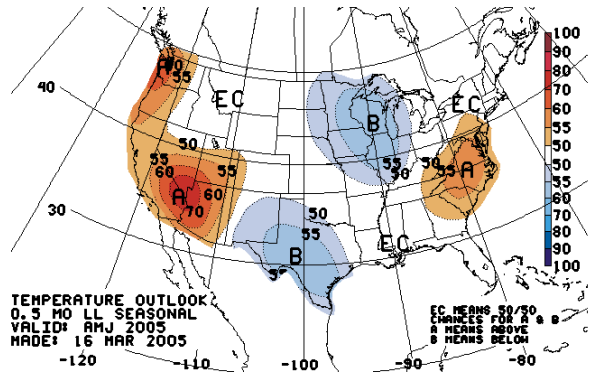
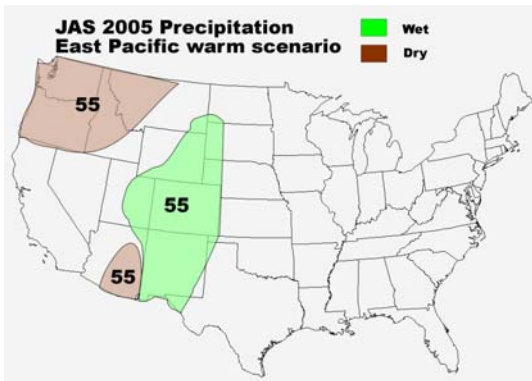
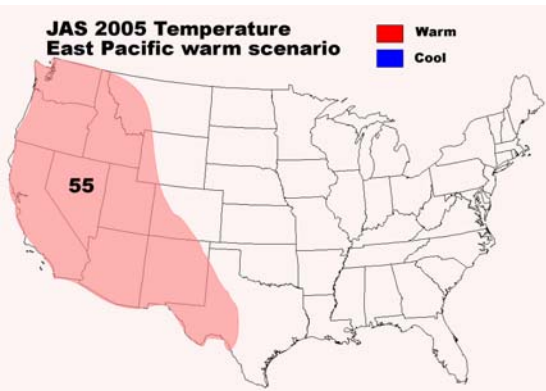
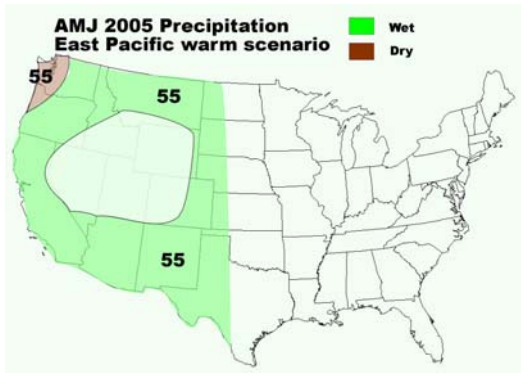
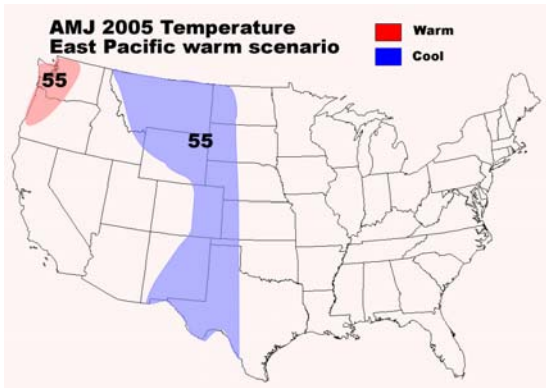


Figure 6

### **Northern California – Spring (April through June)**

April 2005 is forecast to see near normal mean temperatures in northern California, (ranging from -2 to +2 deg F departure from normal). May and June are both forecast to be a slightly warmer with respect to normal, with departures ranging from 0 to +2.5 deg F. Precipitation is forecast to be near to a little below normal in each of the months April-June, ranging from 70-105% of normal across Northern Operations. Unlike the winter months, the higher percentages in spring are forecast to occur in the northern most PSA's. Expect north to east (foehn) wind patterns to gain frequency during these three months, particularly in May and June. The months of May and June often see two to four events of moderate or greater strength.

### **Northern California – Summer (July through September)**

Temperatures for July through September are forecast to become warmer compared to normal than in the spring. This could make a normally very warm climate in the interior even hotter than normal for summer 2005.

Forecast Departures from Normal				
Temperature (degrees F)		Precipitation (%)		
July	August and September	July	August	September
+0.5 to +2.5	+ 1.5 to + 4.0	below normal with 60% confidence		

NOTE: Precipitation for these months is often the lowest 3-month total in a given year; therefore the term 'below normal' implies very little precipitation.

As fuels dry, lightning occurrence will become a more important factor by early August. There is a good chance of at least one dry lightning event in the far northern or northeastern California during August.

July and August are times of year when local winds (slope winds and sea-breezes) are predominate, with the Pacific jet stream weak and well to the north. By mid or late September, weak to moderate north to northeast winds could return to the north half of the Geographic Area. These winds are more critical than in the late spring, due to the much lower large dead fuel moistures, and the more-stressed live fuels.

### **Southern California – Spring (April through June)**

The upper-air pattern that has persisted over the eastern Pacific Ocean and western United States over the last few months will begin to slowly transition into a spring/summer pattern by June. This will result in an occasional deepening of the marine layer west of the coastal mountain range, accompanied by stronger onshore flow. However, at this time, it appears there will be less of a marine influence over the coastal areas than normal due to slightly warmer sea surface temperatures along the coast.

Temperatures for the month of April are expected to average below normal through about the middle of the month, with a transition to above normal conditions after mid-month. Temperatures will likely average near normal through much of May and June,

but there will likely be a couple of brief periods of much above normal conditions accompanied by low humidity.

Typically, average rainfall amounts begin to drop off fairly rapidly through the spring months. Latest climate analysis suggests that precipitation will be slightly below normal for April, and near normal for May and June. Any lightning activity that occurs this spring will not result in significant fire activity.

Given the fact that the current upper-air pattern will be slow to change, we expect at least one moderate offshore wind event in April with the possibility of several weak offshore wind events before July.

### **Southern California – Summer (July through September)**

Significant fire activity this time of the year is strongly related to the amount of lightning activity. Once again there seems to be a great deal of uncertainty regarding the amount, placement, and duration of monsoonal moisture over the Southwestern United States. However, the overall consensus seems to point to an eastward shift in Monsoon moisture, which would yield a little below normal lightning activity this summer. Consequently, we would expect only a few lightning episodes (an episode is defined as 3 to 5 days in length) during this period.

Temperatures are expected to be above normal for much of the area this summer, mainly due to the likelihood of a persistent upper ridge over the western United States.

Since the precipitation type during the summer months is convective in nature, rainfall amounts will be spotty over the region. Average precipitation amounts tend to drop down to less than one quarter inch per month and we would expect this summer to have near to slightly below normal rainfall through this period.

## **Fuels Outlook**

### **Northern California**

Special fuel considerations include the increase of fine fuels, and continued tree mortality. The increase of grasses and annual vegetation especially in the valleys and foothills when cured will contribute to higher fire potential by increasing ease of ignition, spread rates, and spotting. The tree mortality from insects, disease, and blowdown has affected considerable areas of hardwoods and conifers. These areas will see increased potential for higher intensity fires, torching, crowning, and spotting.

Live fuel moistures in the brush are anticipated to increase to normal levels with potential for an increase in the new growth component compared to past years. Higher moisture levels will inhibit rapid fire spread until fuel moistures reach critical levels in the late summer and fall. Good to excellent dead fuel moisture recovery in the large diameter 1000 hour fuels will likely allow for a normal start and duration of fire season.

## **Southern California**

The increased volume and continuity of grasses and fine fuels, especially in the desert, valley, and foothill areas, will add significantly to fire potential. Depending on rainfall and temperatures, curing should be complete by the end of June, though it could be later for the southern Sierra forests especially at the higher elevations. As a result, initial attack activity may increase around that time. Quick ignition with rapid rates of spread is possible. The availability of more receptive fuels to burning embers is high which can result in increased spotting potential.

In areas where there was mortality and dieback in the chaparral, the large dead component is significant. Though live fuel moistures may be higher in these areas, this may be offset by the combination of a high dead component and cured grasses. In the event of a wildfire this dead component will contribute to higher intensities and increase the difficulty of control. In areas where the chaparral was not as affected by the drought, the stands are healthier and the live fuel moistures should inhibit fire growth in the chaparral until late June to mid-July when fuel moistures begin to drop. Once fuel moistures reach their critical low levels in the late summer or early fall the potential increases for very high to extreme rates of spread.

Timber mortality is anticipated to continue in the timbered areas. High resistance to control and potential for high rates of spread are expected in these areas. In many areas of mortality, standing dead trees will continue dropping their needles. Crown fires occurring in these areas may drop to surface fires with the change in fuel arrangement. Fuel treatment has been completed in many wildland urban interface areas which reduces the threat of crown fires occurring, but a threat still exists in and around some wildland urban interface areas where work has not yet been completed.

Mortality in the oaks, tanoaks, and other species of the Central Coast is expected to continue throughout the fire season. Healthy looking trees break with no wind and without warning. This may present a safety hazard to fire suppression resources working in these areas due to falling trees and branches. The additional fuel loading creates higher burning intensities.

## **Fire Occurrence and Resource Outlooks**

Given the current conditions and predicted fire weather in California, fire occurrence will most likely be normal for the 2005 fire season. Historically, Incident Management Team (IMT) deployments have occurred throughout the year, although they are most likely between April and November. The months of July and September typically result in two or more IMT deployments in the area at the same time. August historically results in three or more incident management teams activated at the same time. The average number of team deployments for Operations Northern California decreases late in the month of September, and lessens the competition for resources with Operations Southern California. Although large fire activity typically decreases in late fall, the potential for Santa Ana winds remains through the fall and winter months and can result in significant, complex events with large resource demands.

### **Federal Suppression Resources**

In general, numbers of fire suppression resources (engines, crews, and helicopters) in California for the 2005 fire season will be equivalent to 2004. Federal resources will be at full strength by approximately the first of June. There are five Type 1 and seven Type 2 Incident Management Teams available from California.

### **State Suppression Resources**

The number of California Department of Forestry and Fire Protection fire engines, helicopters and air tankers are expected to be similar to 2004. Available Type I fire crews will be 198. CDF has 10 Incident Management Teams available.

### **Future Scenarios and Probabilities**

Only when a significant El Nino or La Nina is in place or imminent does longer-range spring time weather forecasting in California become a little simpler. As stated earlier in this document, recent information indicates that a large body of anomalously warm subsurface water is currently moving east in the tropical east Pacific. This might be the early signs of a renewed, stronger El Nino development during the remainder of 2005, but it's too early to tell for sure.

The confidence level for these weather forecasts is about average. In general, confidence in springtime weather forecasts is fairly low due to the problems weather models normally have with the changeable, high-amplitude jet stream patterns that exist. Even though it is farther out in time, confidence for the summer months this year is about the same as for spring. With these forecasts not deviating too far from normal, we have no alternative scenarios to offer that are both significantly different, and yet realistic. It is expected that in the June update to this Assessment we will be able to either raise confidence levels for the present forecast, or to provide a different scenario based on new information. The status for 2005 El Nino development will be much better known by then.

The single weather factor that has the most potential to cause significant errors in our fire season forecasts is lightning. Factors such as the amount, location and timing of lightning events, as well as the general precipitation amounts with the events (mostly dry, mostly wet, or mixed) can have incredible effects on the course of a California fire season. In 2003 the Southwest U.S. monsoon came exceptionally far westward and California had a great amount of lightning. However, much of it was wet, at least through the end of August. In 2004 there was less lightning than in 2003, but again no significant dry lightning outbreaks. If a widespread dry lightning outbreak does materialize during 2005, the forests bordering Oregon may see some of the biggest impacts.

## Management Implications and Concerns

- Congress believes that decisive action is needed to manage escalating fire suppression costs. One important component of reducing such costs is maintaining initial attack capacity so that more fires are contained before they escape and cause serious loss of life, property and natural resource damage (from Congressional intent notes). A trend in funding levels reduction could result in a reduction of initial attack resources that may cause decreased initial attack capability and an increase in average annual acres burned and resource value losses.
- USDA Forest Service -There is a widening gap between planned Fire Fighter Production Capability (FFPC) needs versus national Wildland Fire Pre-suppression allocation. Funding levels, even with Wildland Fire Suppression offsets, do not cover projected or actual costs of maintaining the required FFPC resources in California.
- Access for suppression resources will be a problem in many areas of the Southern Forests throughout fire season. Longer response times may occur, resulting in larger fires. Use of air tankers and helicopters for initial attack will be more critical than in previous years until these roads are accessible. The extent of the damage and lack of funds for road repair are affecting the forests, state, and local agencies ability to repair roads. See photos in Appendix A
- Movement of resources outside of the GACC / Region will be monitored closely. Proactive management of initial attack capability should reduce the likelihood of large fires, thereby moderating overall suppression costs.
- Due to financial constraints BLM will have 5-day effective staffing on engines in all three California Regions.
- Modification of resource draw down levels to compensate for lack of air tanker and lead plane availability.
- CDF will staff lookouts only when predicted weather and fire danger reach critical thresholds.
- Prevention clearance inspections should be given high priority within flashy fuel areas.
- State/Local Government transportation departments should be strongly encouraged to focus on roadside clearances/treatments within these areas.

Appendix A



Bouquet Canyon



Trabuco RD – CNF



San Francisco



Trabuco RD – CNF



BDF



Pine Canyon Road

## **Team Members**

**John Snook** – Fire Weather Meteorologist, Redding Interagency Fire Weather Center, USDA Forest Service

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**Tom Rolinski** – Fire Weather Meteorologist, Riverside Interagency Fire Weather Center, USDI Bureau of Land Management

**Mike Lococo** – Intelligence Officer, USDA Forest Service, Northern California Geographic Area Coordination Center

**Bruce Risher** – Intelligence Officer, USDA Forest Service, Southern California Geographic Area Coordination Center

**Carol Henson** – Fire Management Specialist, Adaptive Management Services Enterprise Team

**Larry Hood** – Fire Planning Specialist, USDA Forest Service, Regional Office

**Doug Forrest** – Weather Program Manager, California Department of Forestry and Fire Protection

**Beth Little** – Regional RAWS Coordinator, USDA Forest Service