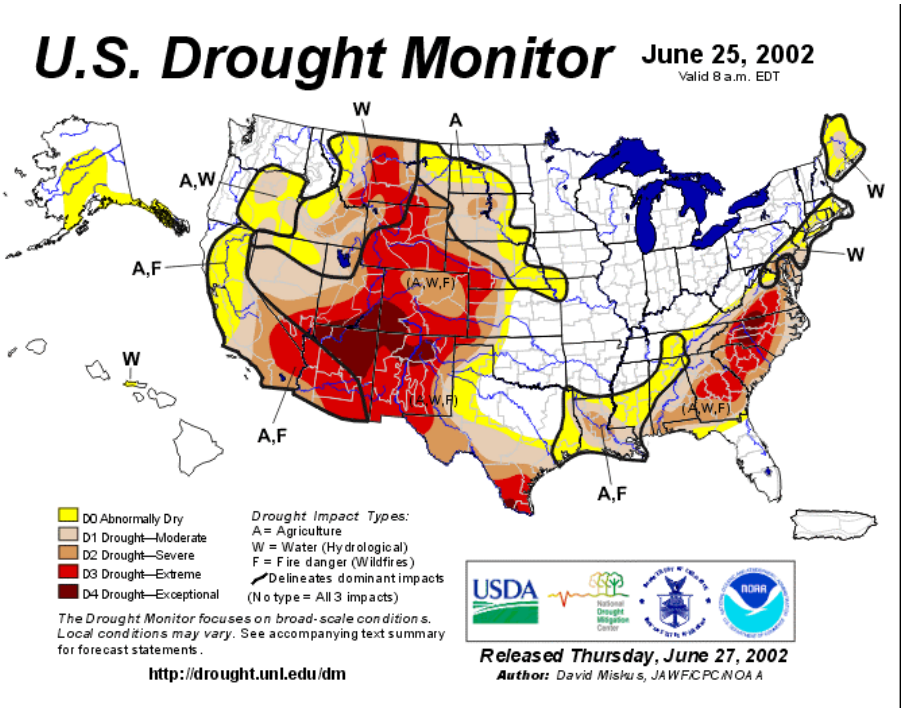
Wildland Fire Assessment Report
for the
Western United States
by
NICC Intelligence and Predictive Services
in conjunction with Predictive Services at the various Geographic Areas
(Issued June 30, 2002)

Synopsis

Much of the west will see above average fire activity in July. Fire potential has already diminished east of the divide in New Mexico and Colorado. Monsoon moisture will moderate fire activity in western New Mexico, eastern Arizona and western Colorado after mid July. However, thunderstorms will trigger increased fire activity especially over the Great Basin and western Colorado. There are no indications that July will see more or less lightning than usual but any lightning will be much more efficient at igniting fires. It will be hotter than normal for most of the area. Rainfall will be generally below normal except near normal in the Southwest. The combination of the expected weather, fire danger indices and drought conditions make most of the area conducive to rapid fire growth and extreme fire behavior conditions.

Current Situation

The US Drought Monitor (Figure 1) illustrates the extent of the drought over most of the western US. Approximately 50% of the nation is classified under moderate long-term drought or worse as of late June 2002. This is the most area under long-term drought since 1957.



June Weather: It was hotter and drier than normal over most of the West in June, particularly in the Southwest and Great Basin. Precipitation anomalies (figures 2 and 3) for the past month illustrate the extent of the dryness. In addition, the Southwest and Great Basin has experienced very poor relative humidity recovery at night. Lightning activity was above normal in southeast New Mexico and eastern Montana, below normal in Colorado, Wyoming and eastern Arizona, and near normal elsewhere.

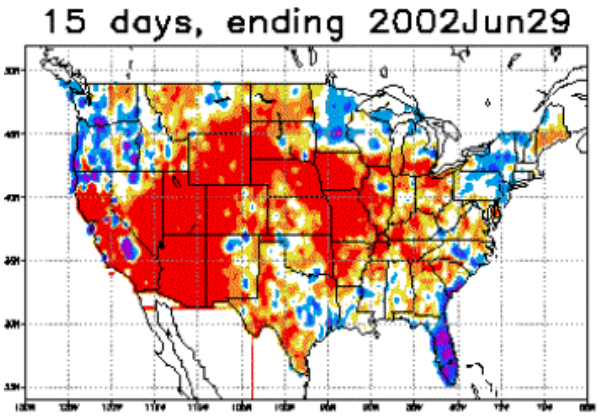


Figure 2

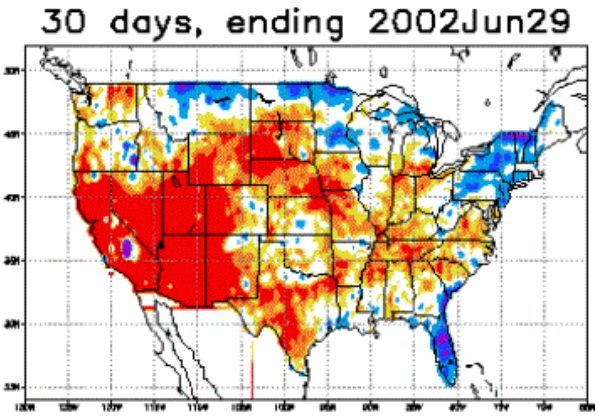


Figure 3

Live Vegetation Analysis: Live vegetation plays a key role in fire activity, providing significant, additional fuel when foliar and live woody fuel moisture is low. Abundant new season growth can retard fire spread and intensity due to moisture content in relation to the amount of plant fiber present in immature leaves and stems. However, plants in dormant condition or mature plants with approximately 80 percent or less moisture content (based on the plant's dry weight) can actively contribute to fire intensity.

Currently, much of the west is experiencing below normal live fuel moisture. Vegetation appears to be affected by the deficit soil moistures caused from deficient precipitation and the long-term drought conditions described above. In most western drought impacted areas, vegetation at upper elevations have greened-up and display active growth, albeit ahead of schedule. The mid and lower elevations show little if any green-up and/or new growth.

Remotely sensed images of the conterminous United States can be used to assess vegetation condition with regard to extent and timing of green up and curing. (Burgan and Hartford 1993, Burgan and others 1996.) The current vegetation condition, or greenness, is assessed with the Normalized Difference Vegetation Index (NDVI), based on remotely sensed red and near-infrared reflected light on a 1-km resolution. NDVI relates directly to the amount of actively photosynthesizing vegetation. High NDVI values indicate abundant, moist vegetation. NDVI values decline following peak plant growth as plants cure. Daily images are used to prepare a weekly composite image to decrease the interference of clouds and smoke in the images. Data archived beginning in the spring 1989 allow comparisons of current greenness to average or historical values.

Departure from Average images are used to compare the current vegetation condition to that calculated as an average for the same time of year. They reveal how the vegetation is trending

from a foliar moisture standpoint. They do not represent the current vegetation moisture situation.

Figures 4 and 5 display Departure from Average conditions for late June in 2002 and 2000. The gray areas indicate that current conditions are very similar to the average. Green indicates more actively growing vegetation than average, and yellow or brown indicates areas of less than average growth or areas which have cured earlier than normal.

Comparing the image for the composite week ending June 27th, 2002 with the image for the same period in 2000 illustrates the extent of below normal greenness across much of the west, especially in the Southwest, Southern California, Great Basin and Rocky Mountain areas. The below normal greenness east of the Cascade Crest in Oregon is also noteworthy. The only exception to this trend appears to be in Northern Montana where current conditions appear to be less severe than in 2000. Note the correlation between this image and the areas identified as drought in Figure 1.

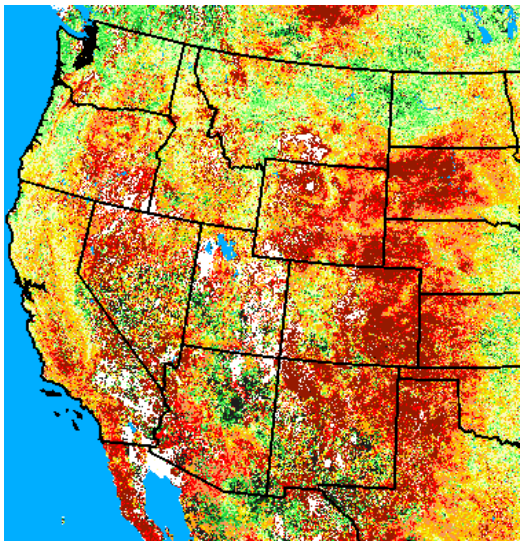


Figure 4 – DA for week ending June 27, 2002

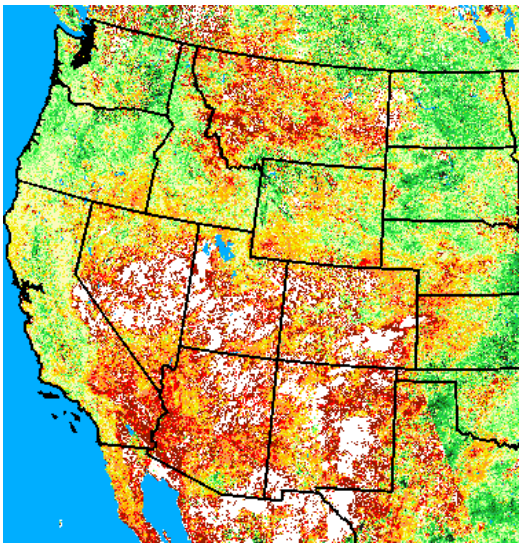


Figure 5 - DA for week ending June 29, 2000

While Departure from Greenness is only one indication of vegetative condition, live fuel moisture samples taken across much of the west support the widespread vegetative stress depicted by the greenness imagery.

Dead Down Fuels: Dead down fuel moisture plays an important role in fire behavior. While the fine fuels are most important when determining fire spread, larger fuels contribute to fire intensity, crown fire initiation and resistance to control. Below are two illustrations, which show the 1000-hour fuel moistures for 2002 (Figure 6) and 2000 (Figure 7). Note how much larger the extent of low 1000-hour fuel moistures are for this year, especially for values less than 5%. Generally, 1000-hour fuel moisture values less than 10% set the threshold value for when areas transition from normal to high fire potential conditions and any values less than 5% correspond to extreme fire danger conditions.

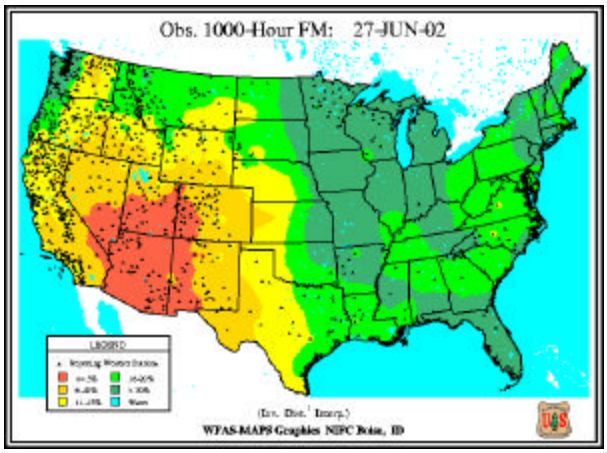


Figure 6

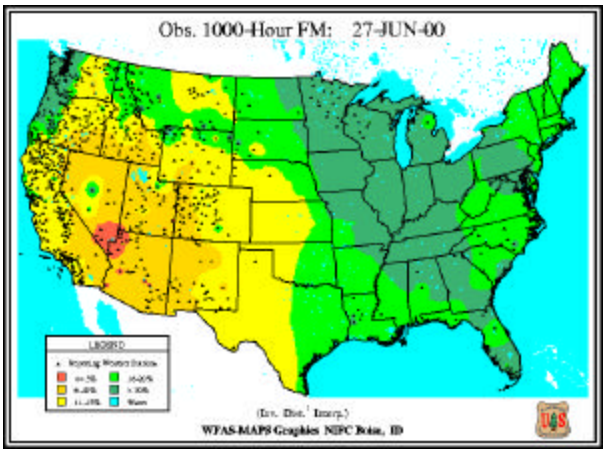


Figure 7

100-hour fuel moistures are also monitored across the United States. The Northwest Geographic area has found that their probability of large fires is greater when both the critical values for 100-hour fuels and ERC occur simultaneously. In most areas, 100-hour fuel moistures less than 7-9% serve as the breakpoint between normal and high fire danger. The two figures below show 100-hour fuel moisture for late June in 2002 (Figure 8) and 2000 (Figure 9). Notable are the very low 100-fuel moisture values in Southern California and Wyoming for this time of year.

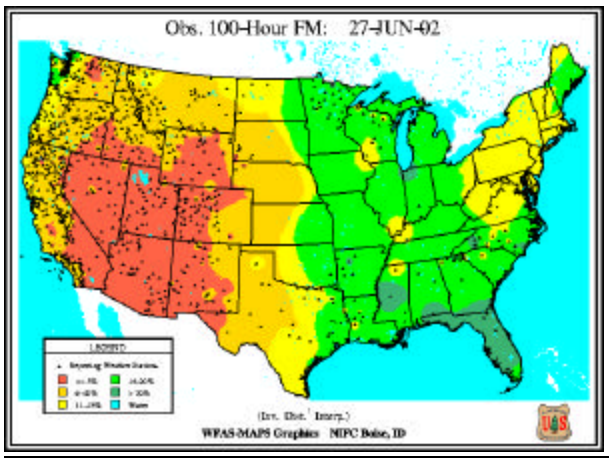


Figure 8

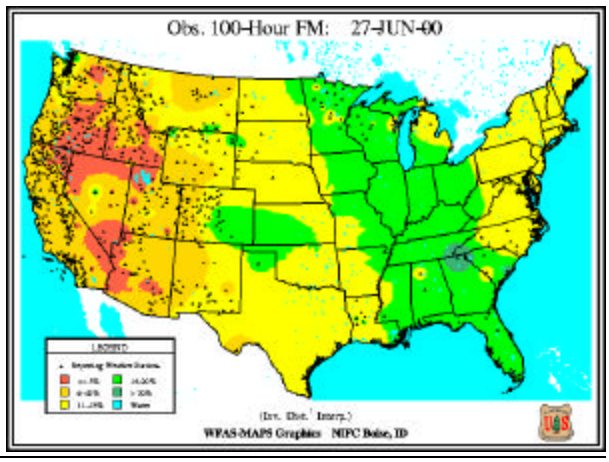


Figure 9

<u>Fire Danger</u>: The following map (Figure 10) illustrates the fire danger conditions across the lower 48 states as of June 30th using the National Fire Danger Rating System (NFDRS) Energy Release Component (ERC) index and Fuel Model G (A fuel model representing dense conifer stands where accumulation of duff, litter and down woody material is heavy, fires burn intensely and resistance to control is significant). ERC is considered to be the most representative index for monitoring long-term fire danger trends.

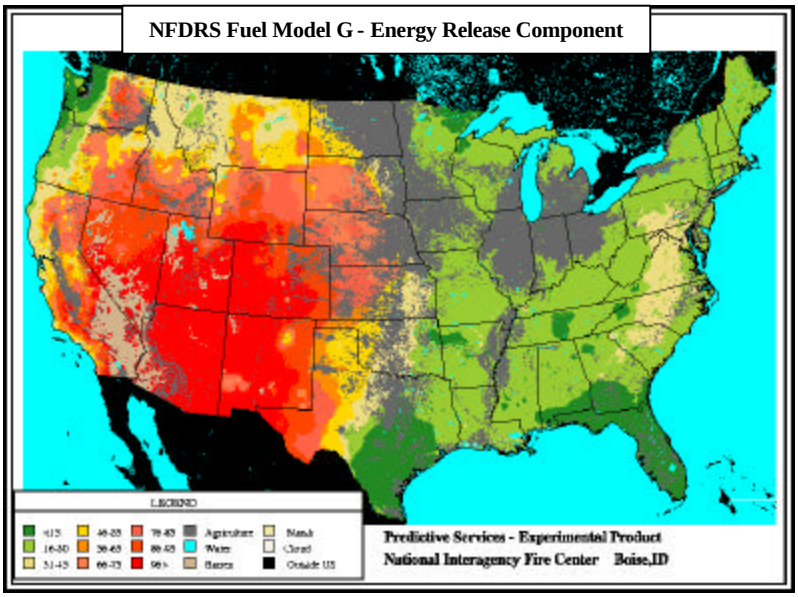


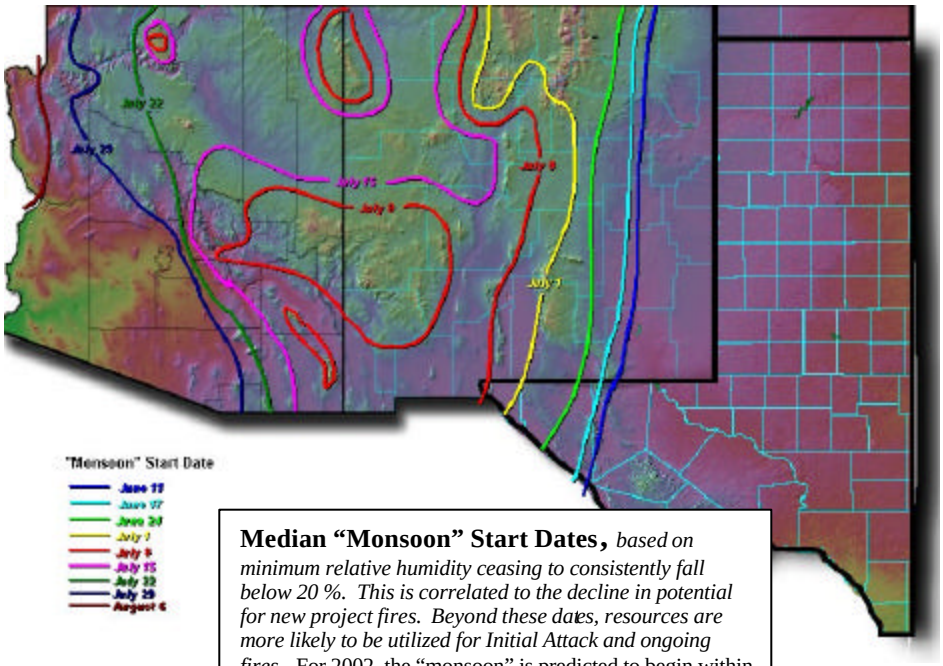
Figure 10

Note: An assortment of fire danger graphs from each of the western geographic areas are included in the Appendix to illustrate current conditions in more detail. Most of these graphs utilize ERC as the fire danger index and show the climatological average value, the maximum value and the current year value by date and sub-geographic area.

Outlook

<u>July and the Southwest Monsoon:</u> The normal arrival dates of the Southwest Monsoon vary across the Southwest (Figure 11). The "monsoon" in this chart shows the average date with the afternoon humidity consistently remains above 20 percent. The Southwest Area Predictive Service Unit has found a very good correlation between this humidity value and decreased fire activity. Another feature of the monsoon is that it typically arrives in pulses of moisture on interspersed with dry periods.

One of these moisture pulses will arrive in the Southwest/Rocky Mountain/Utah areas around July 3-6 followed by a dry southwest flow. Moisture will increase again after July 10 when the flow aloft turns more southerly and the upper high develops over the West. Moisture relief has already occurred east of the continental divide in Colorado and New Mexico. Monsoon moisture will provide some relief to Arizona, western New Mexico and western Colorado after mid July.



Median "Monsoon" Start Dates, *based on minimum relative humidity ceasing to consistently fall below 20 %. This is correlated to the decline in potential for new project fires. Beyond these dates, resources are more likely to be utilized for Initial Attack and ongoing fires.* For 2002, the "monsoon" is predicted to begin within a few days of these dates.

Figure 11

Overall, the West will be generally hotter and drier than normal for most areas (Figure 12). The monsoon will be near to above normal in eastern Colorado but the rest of the Southwest will see a more normal monsoon for July. The National Weather Service July-September outlook (Figure 13) continues this same general trend through the end of summer.

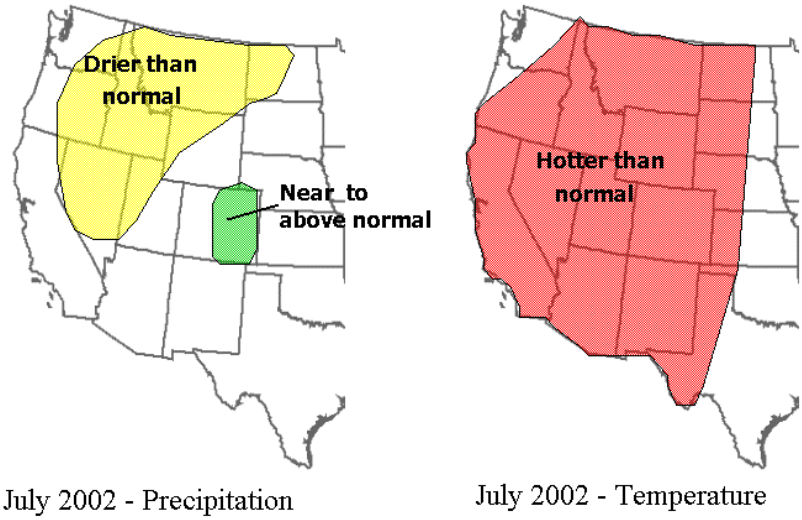


Figure 12

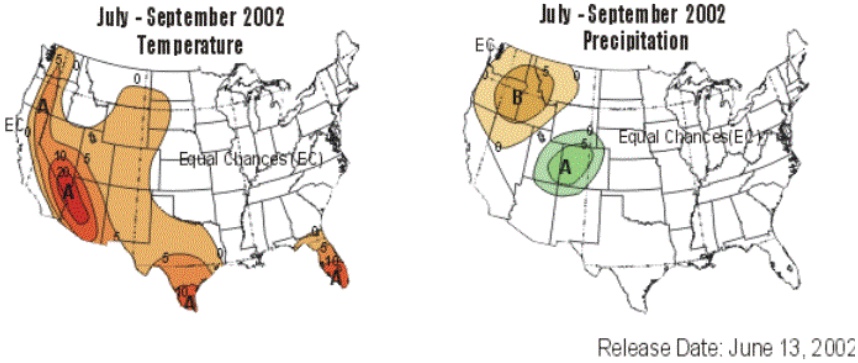


Figure 13

Wildland Fire Prognosis

Based on 17 years of data from 1980-1996, the graph below (Figure 14) shows the average number and average worst-case number of large federal agency fires (the average of the worst 3-5 years) in July for various areas in the Western US.

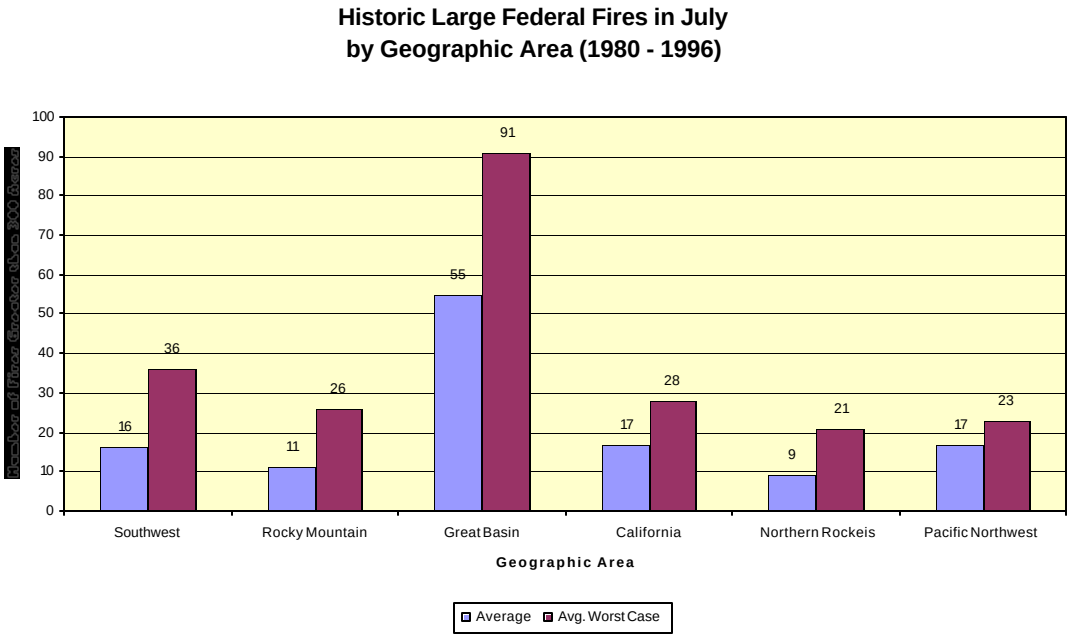


Figure 14

The following chart (Table 1) shows how the historic number of large fires occurring in July compares to the overall large fire activity for the year. It is interesting to note that even though the Rocky Mountains have experienced a large number of problematic fires to date, they historically have 30% of their large fires in July and 47% in August through October. Unless precipitation provides significant relief, it is expected that Wyoming and Western Colorado will continue to see a disproportionate number of large fires through the remainder of the fire season. In fact, all but the Southwest area can expect to have the majority of their large fires in July through the remainder of the summer and fall.

Large Federal Fire Summary Table

Area	Average number of fires >300 acres in July	Percent of fires >300 acres that occur in July	Percent of fires >300 acres that occur August - October	Percent of fires >300 acres that occur July - October
Great Basin	55	37%	46%	83%
Northwest	17	32%	57%	89%
California	17	24%	50%	74%
Southwest	16	27%	15%	42%
Rocky Mountain	11	30%	47%	77%
Northern Rockies	9	21%	58%	79%

Table 1

Great Basin Area: Drought conditions persist over majority of this area with southern Nevada and the central/southern parts of Utah and Arizona being classified as exceptional or extreme drought. The number of acres burned to date in Nevada is approximately three times their average. Elko is the only area in Nevada where live fuels are still in green up, however fine fuels should be cured by July 10th or so in that area. Therefore, the northern portion of Nevada is on track for normal conditions in July with activity increasing during the later half of the month. The fire potential in Eastern Great Basin is above normal for virtually the entire area. In general, thousand-hour fuel moistures less than 7% exist over much of the Great Basin, except in central Idaho and western Wyoming. Central Idaho and western Wyoming received near normal precipitation in June and higher elevations are still in green up.

The Great Basin area can expect to have between 55 and 91 large fires in July, the greatest number of all the Western areas. Given their current fuels situation, expected weather and trends in acres burned, it is anticipated they could easily exceed these estimates, especially in the southern half of the area.

Northwest Area: Fire Danger in the Pacific Northwest is trending below normal for Northwest Washington south through the Central Oregon Coast. Southwest Oregon and much of the remainder of their geographic area is trending normal. The exceptions to this are the Okanogan and Columbia Basin areas where indices are trending higher than normal and more like late July or mid-August. Southeast Oregon is also an area that could transition rapidly from moderate to high fire danger, but is anticipated to remain normal for most of July. Generally, the Northwest experiences 17 – 23 large fires in July and this seems reasonable

given their current situation. However, with a prognosis for above normal temperatures and below normal precipitation over much of their area through the remainder of the summer, it is anticipated they may see above average large fire occurrence starting in mid-July or August and not ending until mid-September when the probability of lightning has diminished.

California: Fuel moisture and Energy Release Component values continue to be at or surpassing historic levels for this time of year over most of the southern portion of the State. June was drier than normal across much of Northern California and the trends indicate above normal fire potential for this time of year.

In Southern California:

- Fire Danger is expected to be highest over the mountain areas beginning just above the valley floors in Southern California.
- Above normal conditions are expected over the desert and inland valley areas, especially in mountainous areas.
- Normal fire danger is expected along the immediate coastal areas as marine air continues to be a dominate feature there.

In Northern California:

- Greenup continues at elevations higher than 6000 feet while grasses are cured at lower elevations.
- Almost all weather stations are reporting below normal 1000 hour fuel moisture for this time of year.
- The Eastside, Northwestern and Mid-Coast areas have reached the 90th percentile with Energy Release Component values and are still climbing.

Historic fire analysis indicates California will experience between 17 and 28 large fires in July. However, with the magnitude and extent of high fire danger in both the Southern and Northern portions of the state, it is likely there will be a high probability of large fire growth from any ignitions during July, with August and September becoming very problematic if conditions don't change significantly.

Southwest Area: While July typically brings the onset of monsoon moisture and a decrease in overall fire activity in the Southwest area, historic data shows that a significant number of large fires (>300 acres) should still be expected in July. An additional 24-36 large fires in July is anticipated, with a substantial decrease in the number and size of fires after the middle of the month.

Rocky Mountain Area: Fire Danger conditions throughout Colorado remain dangerously high, especially in the southern and western parts of the state. Energy Release Component values are above historic maximums and the significant and sustained acreage consumed is a reflection of the current state of the fuels. Conditions are worsening in both Wyoming and South Dakota, currently worse than the 2000 fire season with ERCs hovering near historic values in many areas. Although the monsoon is expected to bring significant relief to Colorado's dry season, the Rocky Mountain area can expect to see approximately 11 - 26 or more large fires in July with 77% of their large fire activity remaining from July until the end of their fire season. Trends suggest Wyoming and South Dakota are on track to experience above normal fire activity this season.

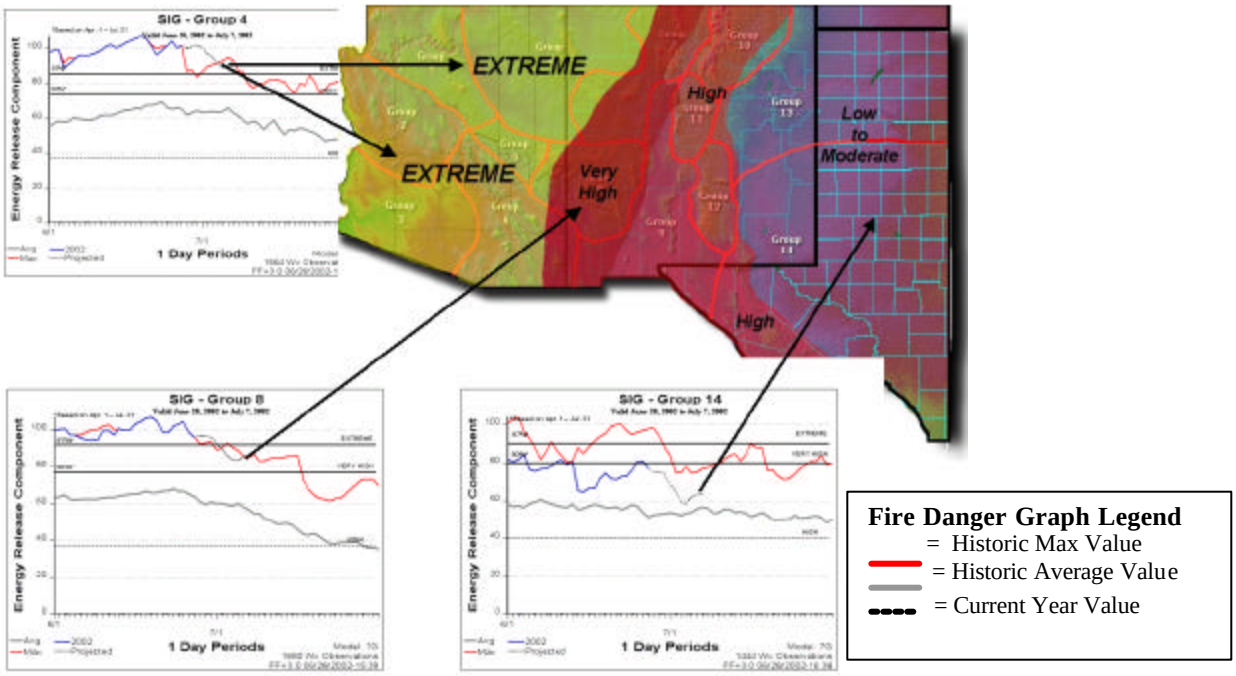
Northern Rockies: Long-term severe drought conditions still persist east of the Divide although some improvement has been seen since mid-May. The Long-Term Palmer Drought Severity Index (PDSI) indicates that most of southern and central Montana remains in the lowest 10th percentile since 1895. 1000-hour fuel moistures generally range from 20-30% west of the divide in Montana and Idaho, which is normal for this time of year. East of the divide 1000-hour fuel moistures are ranging from 8-20% with the southern and southeastern areas having the driest conditions. Fire occurrence to date is above average and over twice the average number of acres have burned so far this year, which mirrors the national trend. The average number of large fires in July is nine, however it is anticipated the northern Rockies will have closer to 21 large fires due to the dry conditions in the southern portion of the state. The majority of their activity is expected to occur in August and September as fuels in the higher elevations continue to cure and dry.

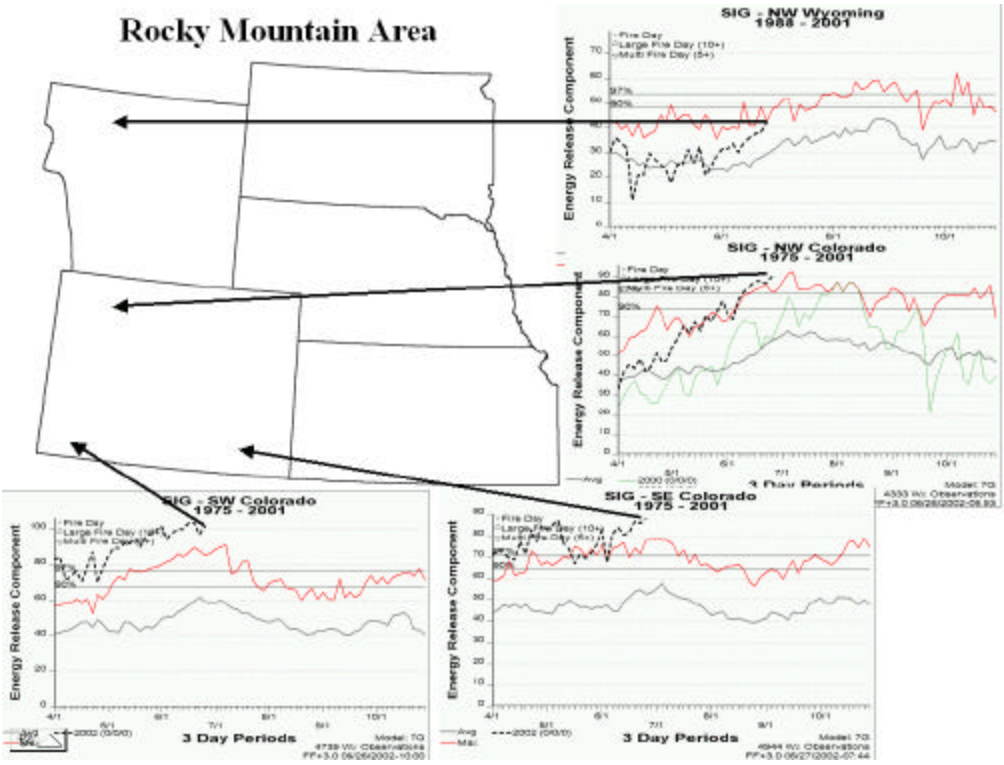
Resource Demands

Currently there are 2 Area Command teams, 10 Type I teams and 11 Type II teams deployed. Fire activity is not only expected to continue, but rapidly expand into the Great Basin area and north portions of the Rocky Mountain area in July. In addition, northern California, the Northern Rockies and the Northwest will begin to see significant increases in large fire activity during the month of July. We anticipate continued demand for Type I teams with an increase in the need for Type II teams through the period. The number of committed Type II Crews and Jumpers are expected to increase through the month of July with a potential of exhausting available resources. Other resource needs and shortages will likely increase with respect to Type I Crews, Air Tankers, Lead Planes, Helicopters and Overhead.

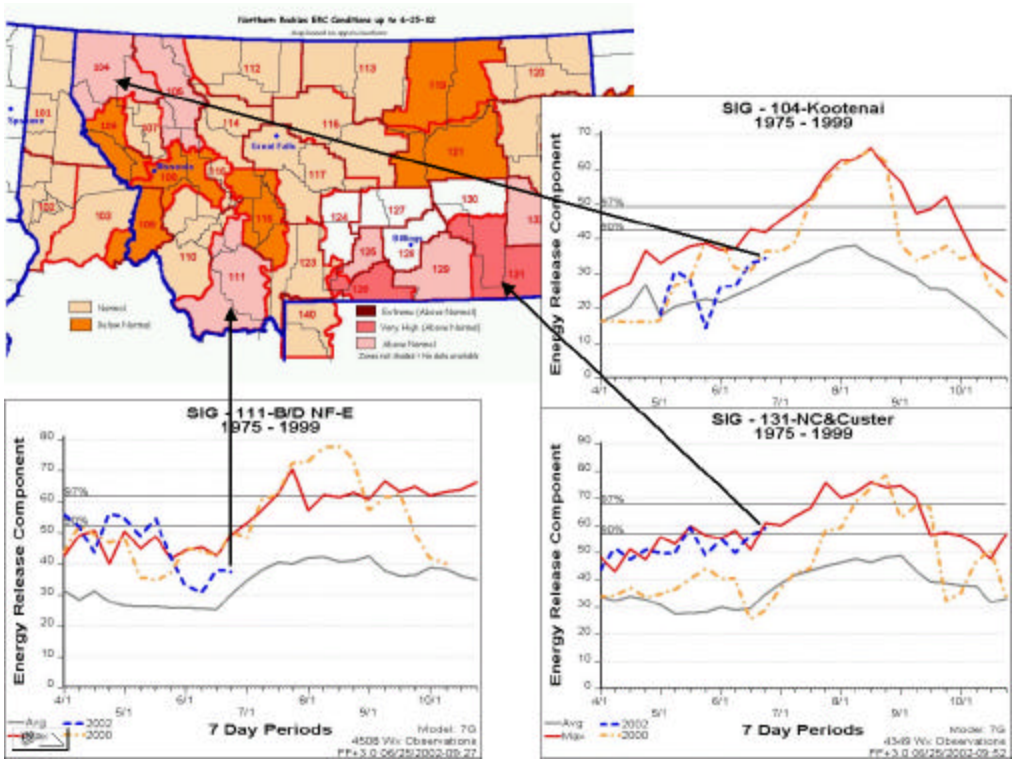
Appendix
Geographic Area Fire Danger Graphs

Southwest Area (with projections through July 4th)

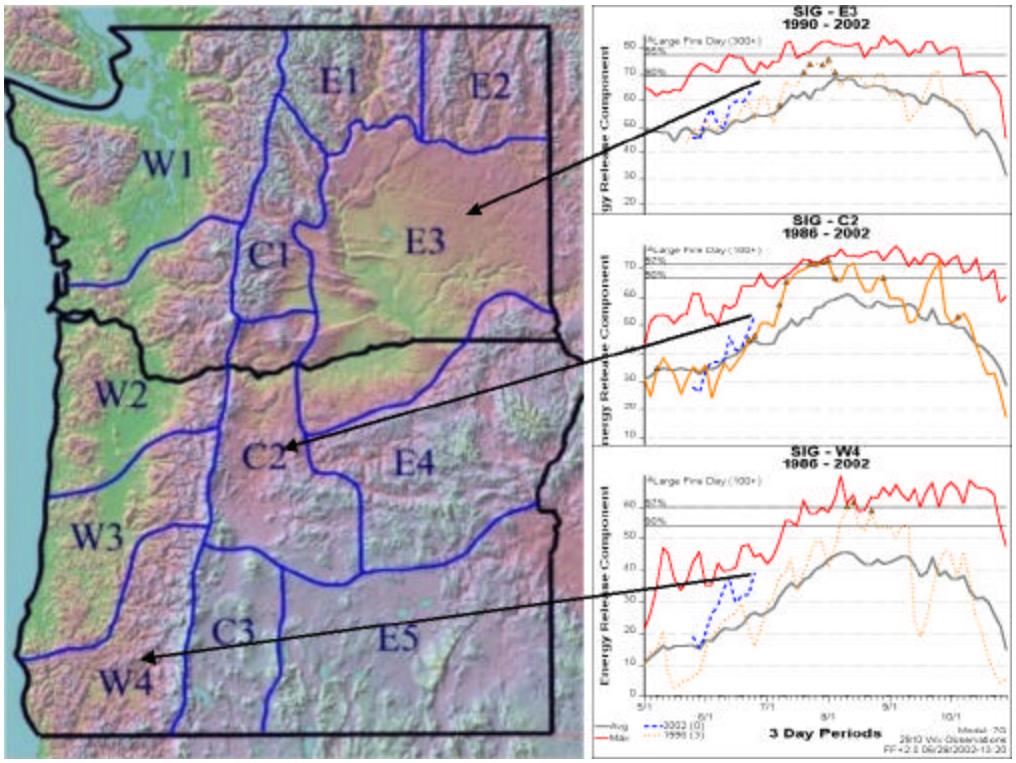




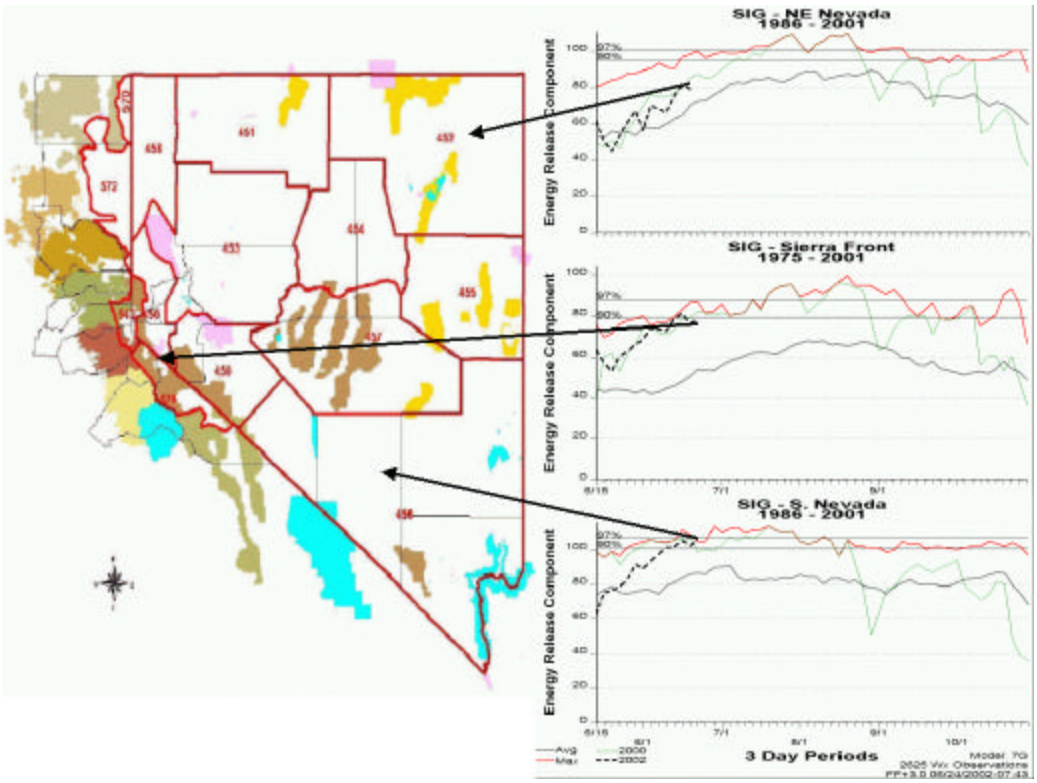
Northern Rockies



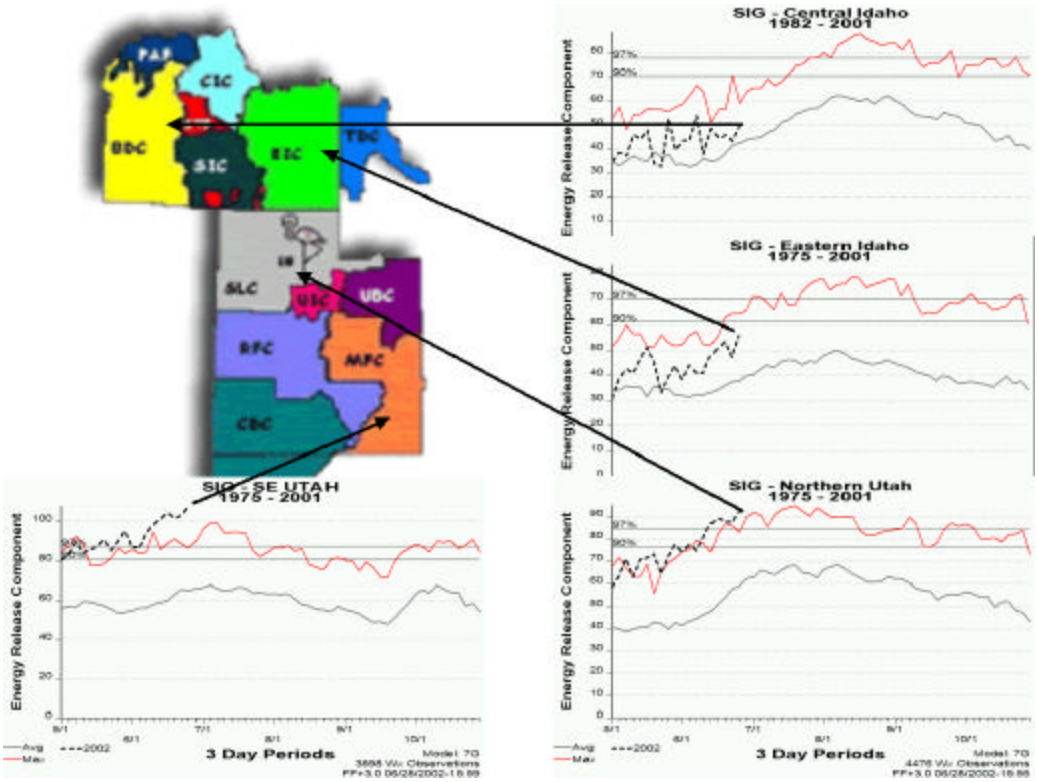
Pacific Northwest



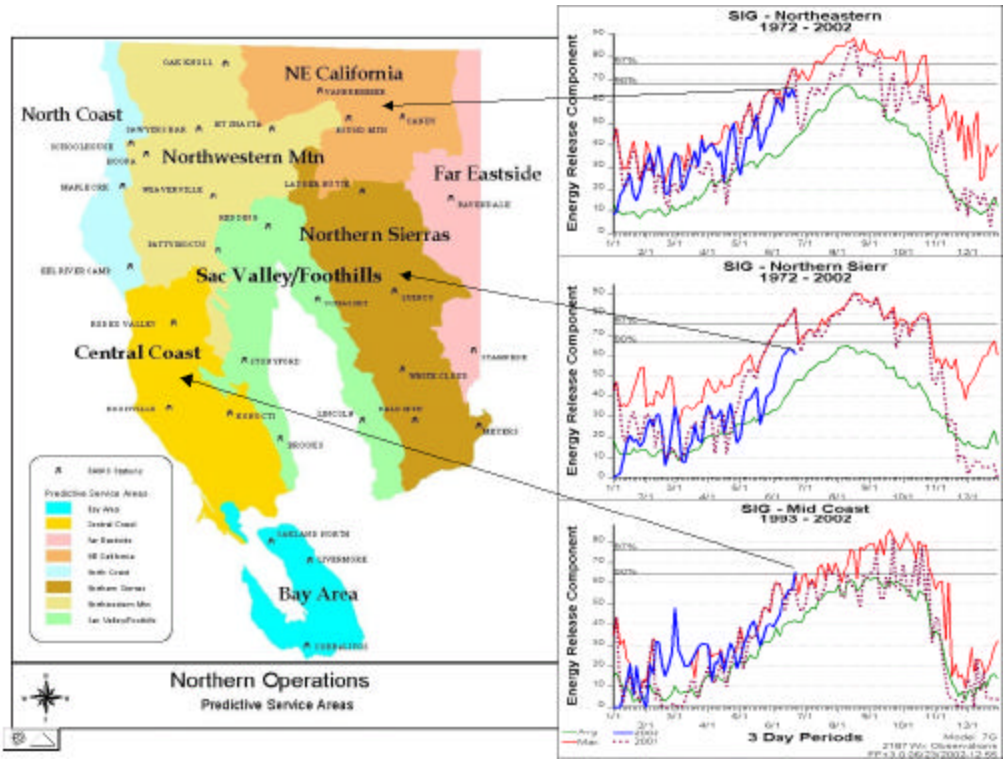
Western Great Basin



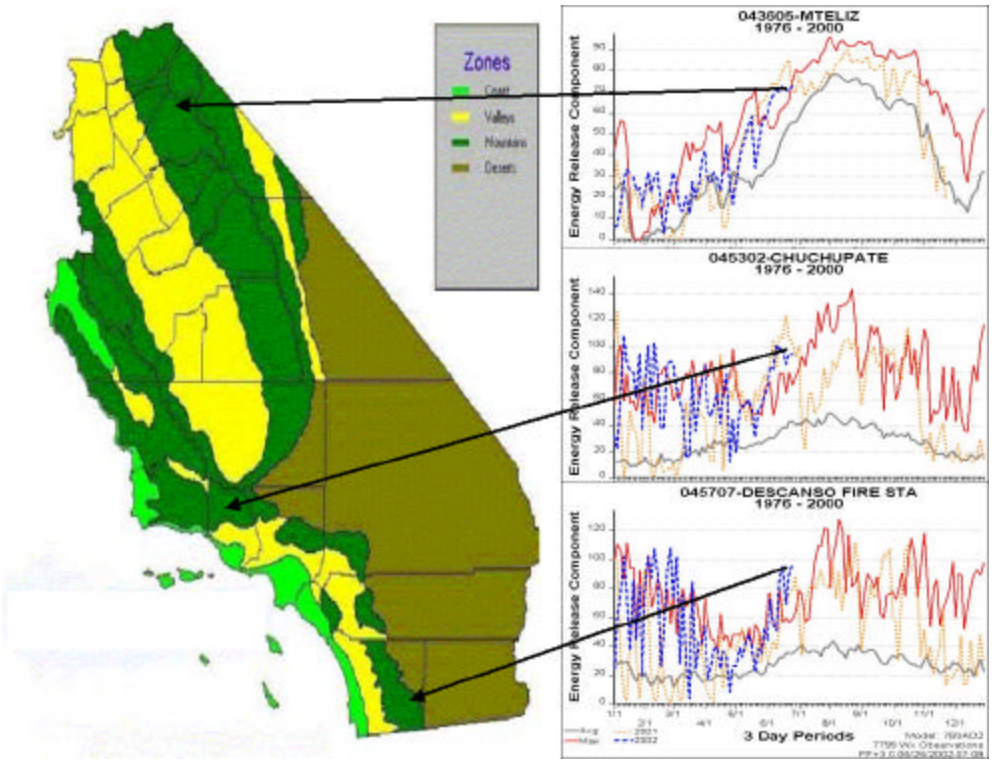
Eastern Great Basin



Northern California

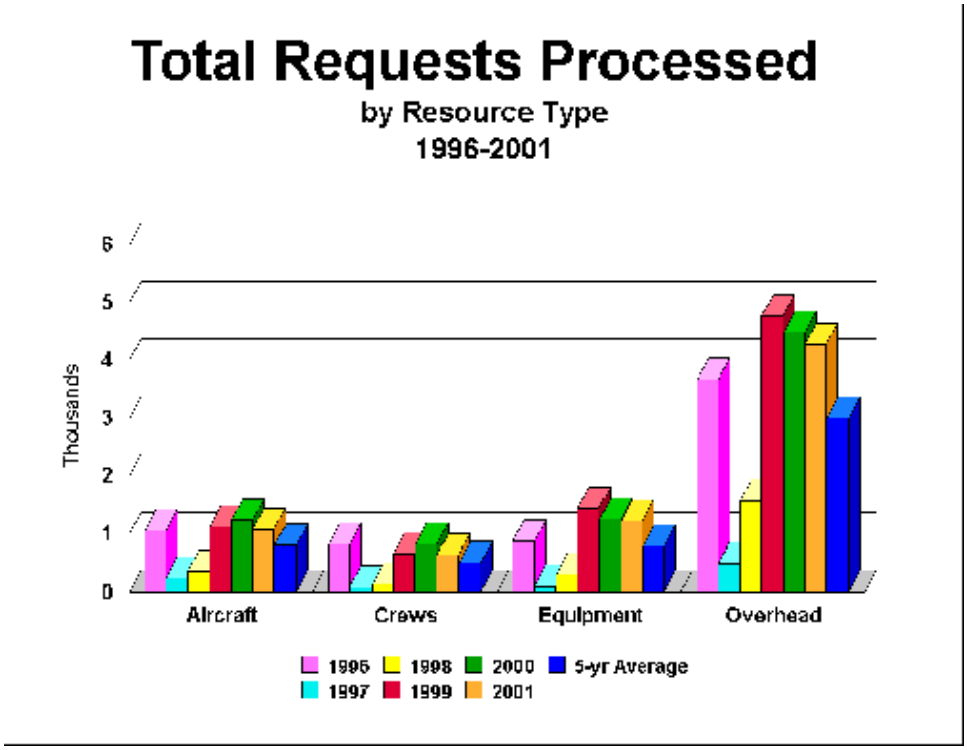


Southern California



Resource Information for the Western Great Basin

The following graph that illustrates resource demand was created for the Western Great Basin Area. It provides some idea of the number and type of resources required for various years. We anticipate resource demand for the Western Great Basin will be similar to 1999 – 2001.



The table below highlights the resource requests processed by the Western Great Basin area over the past several years. This table and the following information on Team assignments for 1999-2001 as a basis may provide some indication of the resource demand from July – October for this portion of the west.

Total Resource Requests Processed by Year 1996-2001					
Year	**Aircraft**	**Crews**	**Equipment**	**Overhead**	**Total**
1996	1,060	823	877	3,670	6,430
1997	240	84	109	501	934
1998	353	141	304	1,576	2,374
1999	1,133	660	1,434	4,783	8,010
2000	1,249	825	1,255	4,499	7,828
2001	1,081	641	1,233	4,278	7,233
5-yr. Average	807	507	796	3,006	5,115

Statistics for IMT assignments within the Western Great Basin for the last 9 years are as follows:

Year	WB Teams	Sierra Front Teams	EB Teams	Other Area Teams
1993	1	0	1	0
1994	3	1	3	0
1995	2	0	2	0
1996	7	1	4	1
1997	1	0	0	0
1998	4	0	0	0
1999	10	5	9	2
2000	7	3	3	4
2001	7	1	5	2

Maximum number of IMTs assigned at the same time for each of the last 9 years by year:

1993	1 IMT2
1994	2 (1 IMT2 and 1 IMT1)
1995	2 (1 IMT2 and 1 IMT1)
1996	3 (either 1 IMT1 and 2 IMT2s, or 3 IMT2s)
1997	1
1998	1
1999	7 (1 Area Command, 1 IMT1 and 5 IMT2s)
2000	5 (1 IMT1 and 4 IMT2s)
2001	4 (IMT2s)

Resource Information for the Pacific Northwest

Based on historical averages the PNW has 591 Federal fires in the month of July and require the following resources by type.

Resource Type	Number Needed	Days Required	Total Resource-Days Needed
Crews	350	7.5	2625
Engines	931	3	2793
Type I Helicopters	24	7	168
Type II Helicopters	27	8	216