Changing Wildfire Conditions

By Matthew Johnson

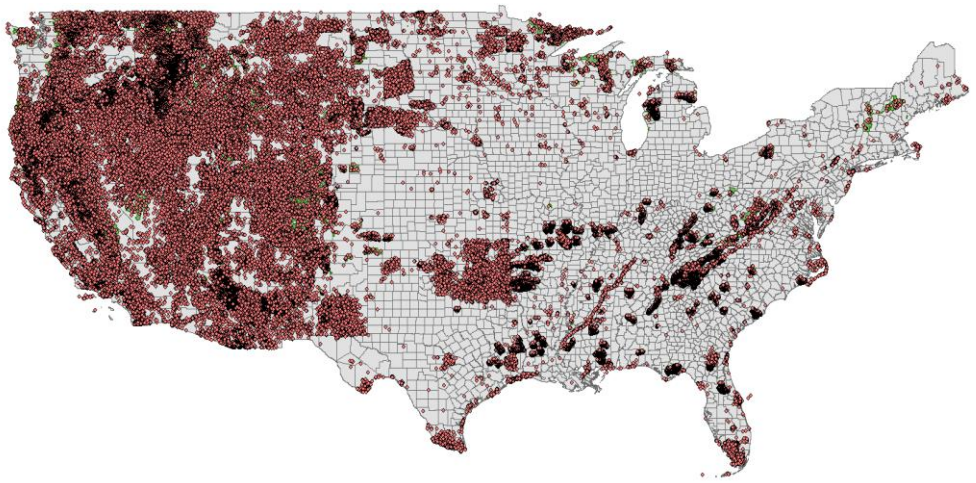
Statistics for California 2017

- Fatalities: 1 firefighter, 45 civilians
- 8,900+ structures
- $9.4 billion (2017)

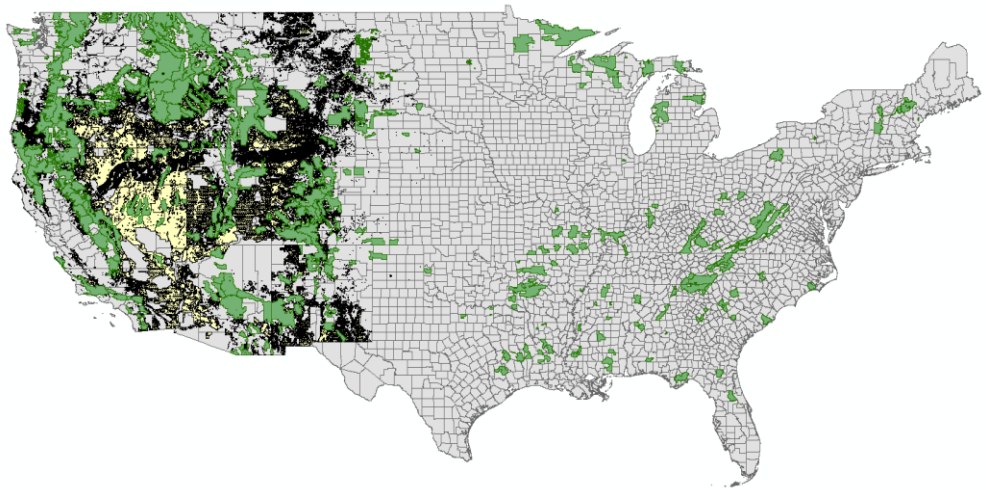
Overview

- Wildfire Occurrence Statistics
  - Where wildfires occur
  - Seasonality of fires
  - Trends in wildfire occurrence
- How Does Weather Impact Fire?
- Climate connections
  - Indices of low frequency climate variations (ENSO)

Data and Methodology



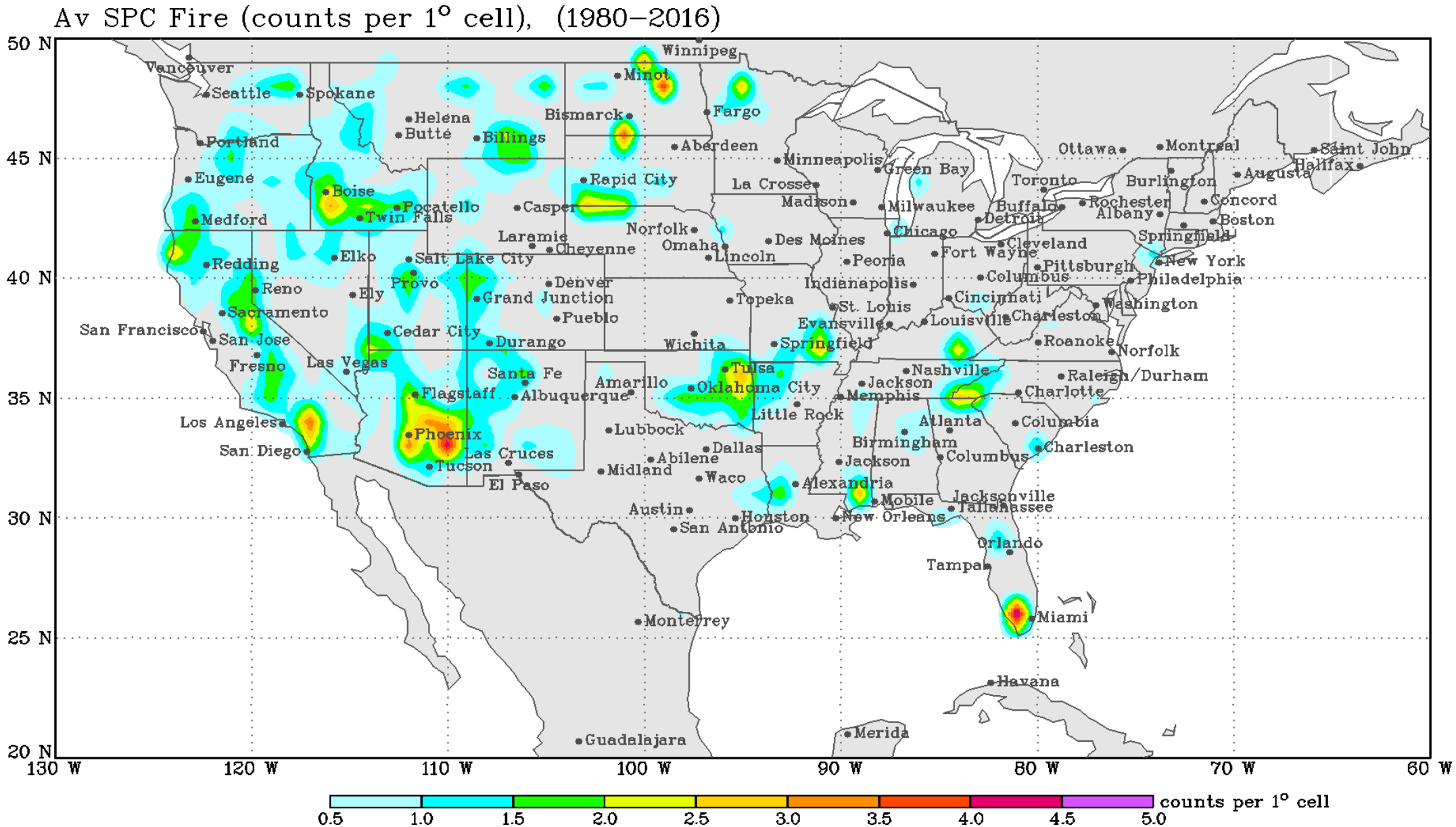
GIS map of all USGS wildfire points



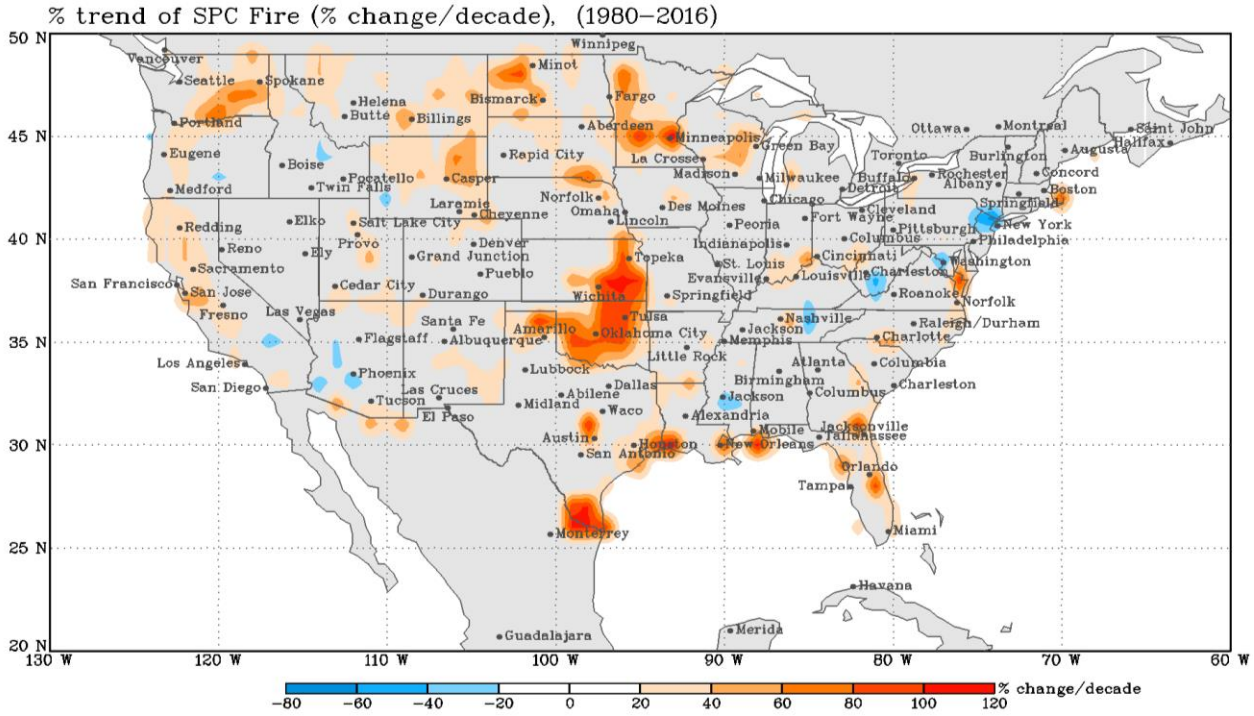
GIS map of USFS and BLM Boundaries

- Wildfire Point Data Set from the USGS
  - Location of all U.S. wildfires, with size, date, and other parameters
- Eliminated incomplete data and fires under 1 acre.
- Used ERAU software package to compare with gridded weather data from NOAA.
- Wildfires in the point data set line up with the USFS and BLM boundaries.

Wildfire Occurrence – all U.S. Wildfires 1980-2016

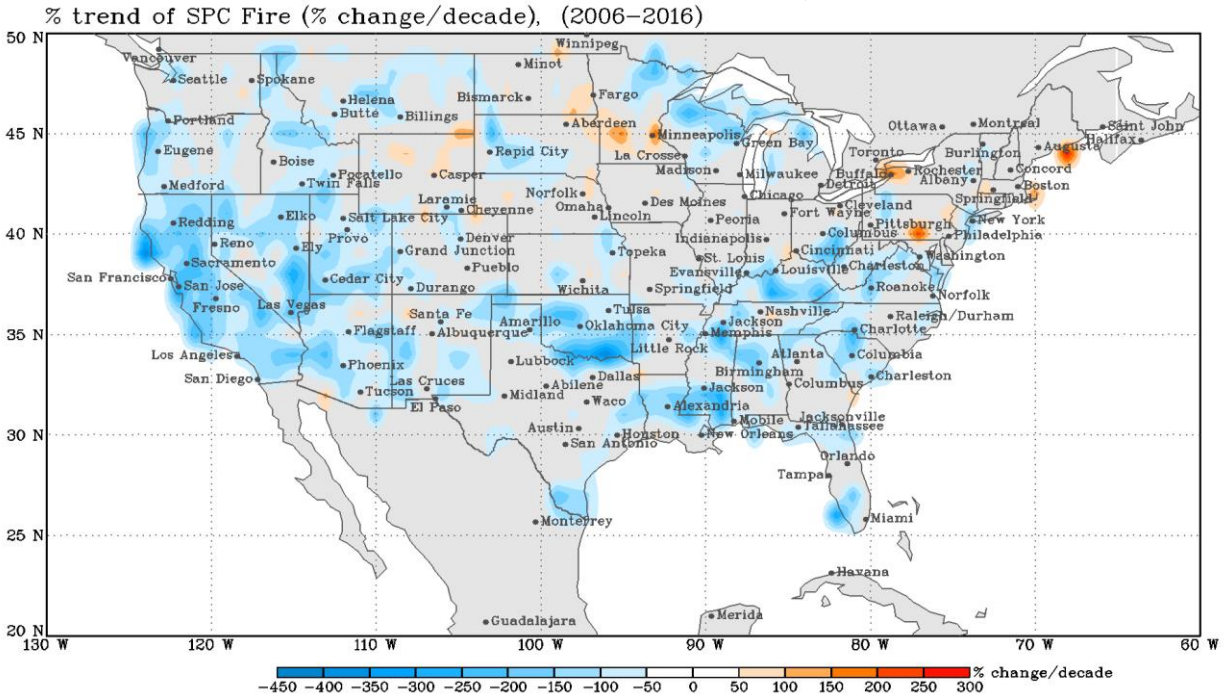


Wildfire Trends All Over the U.S.



- Wildfire incidence increasing in most places from 1980-2016

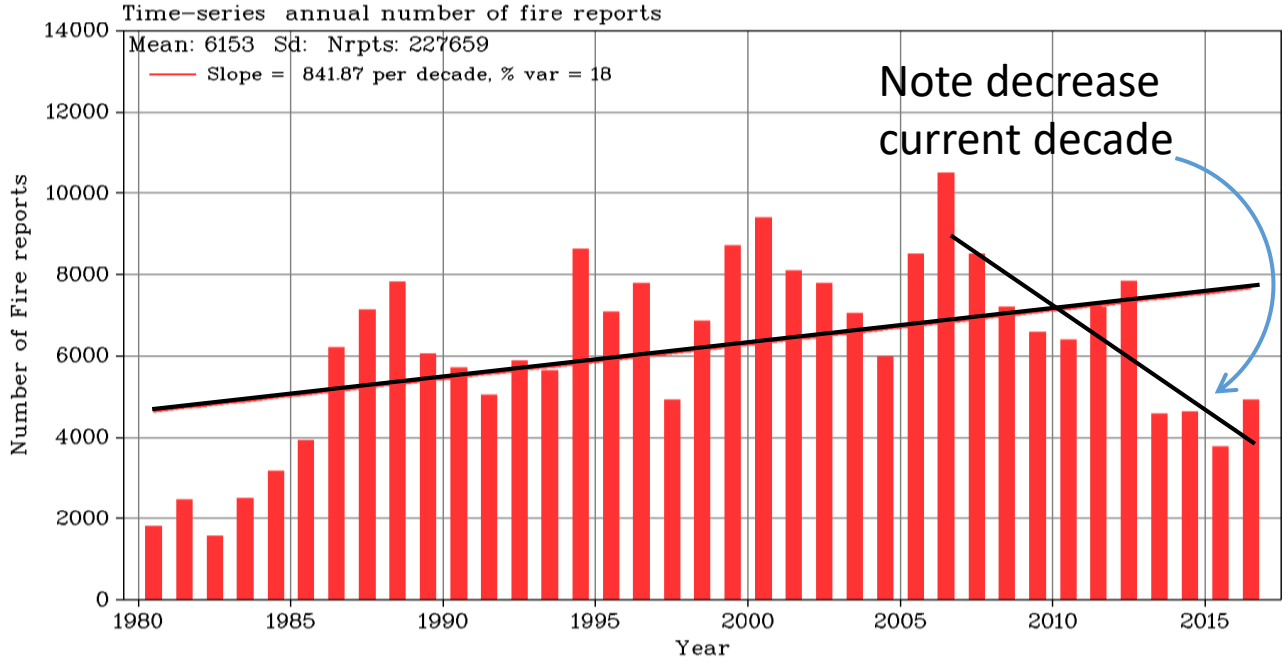
- But, decreasing in the current decade (2006-2016).



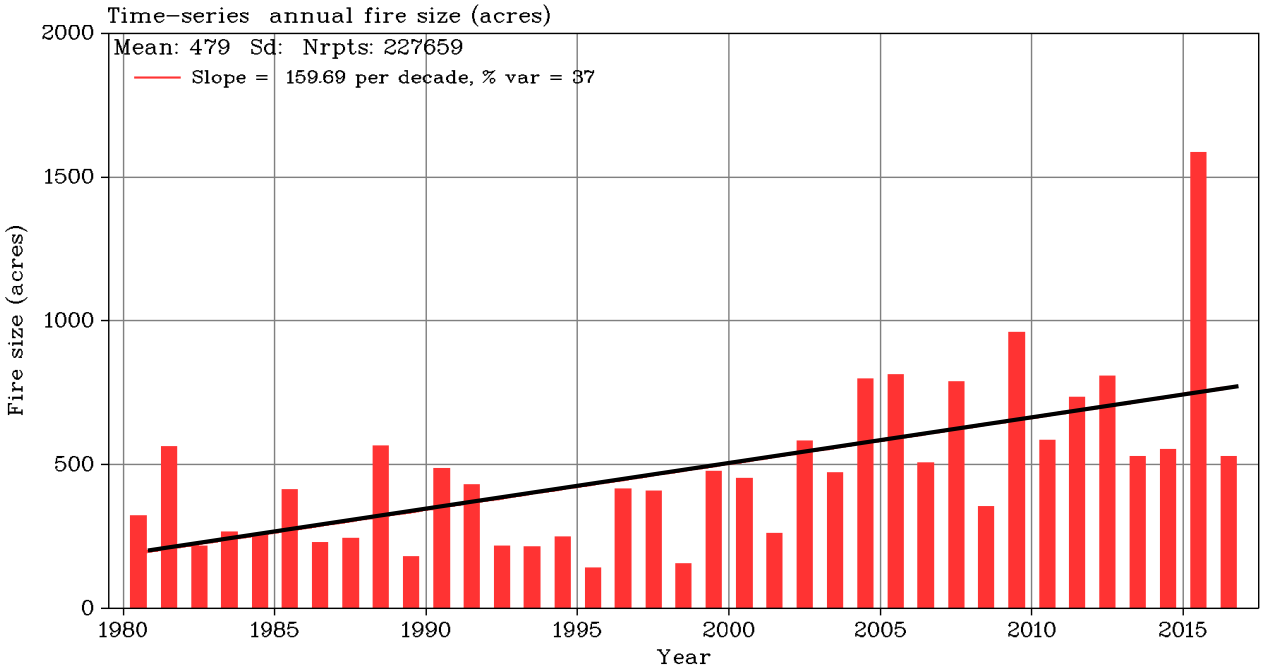
Trends Across the United States

- Overall, wildfire occurrence across the U.S. is trending up.
- Wildfire size is increasing.
- Last the 10 years, the number of wildfires has been decreasing.

Number of Wildfires

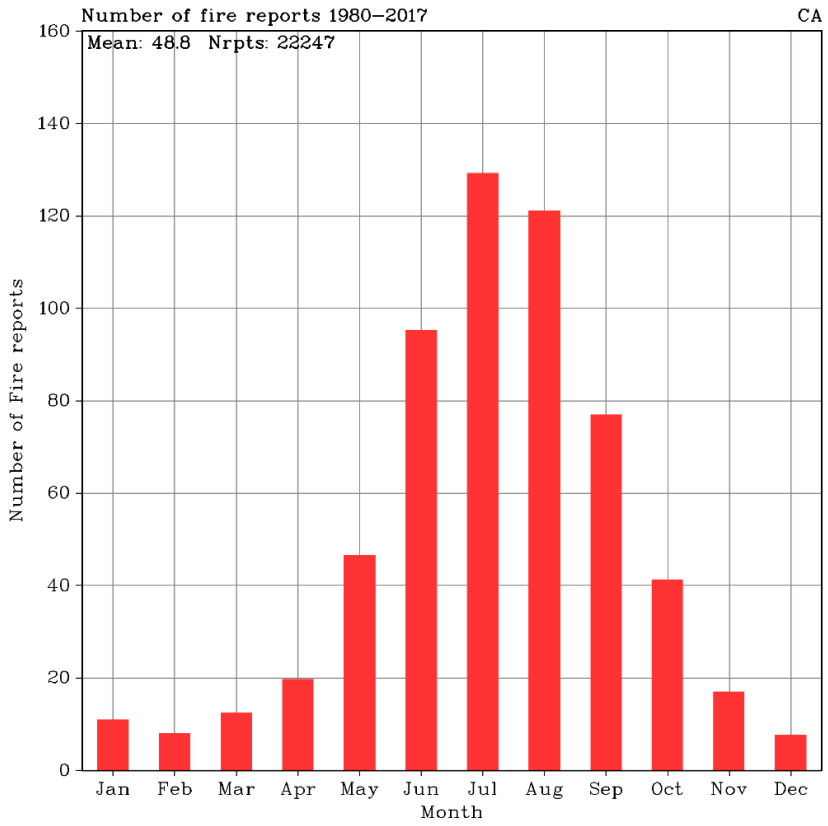


Wildfire size

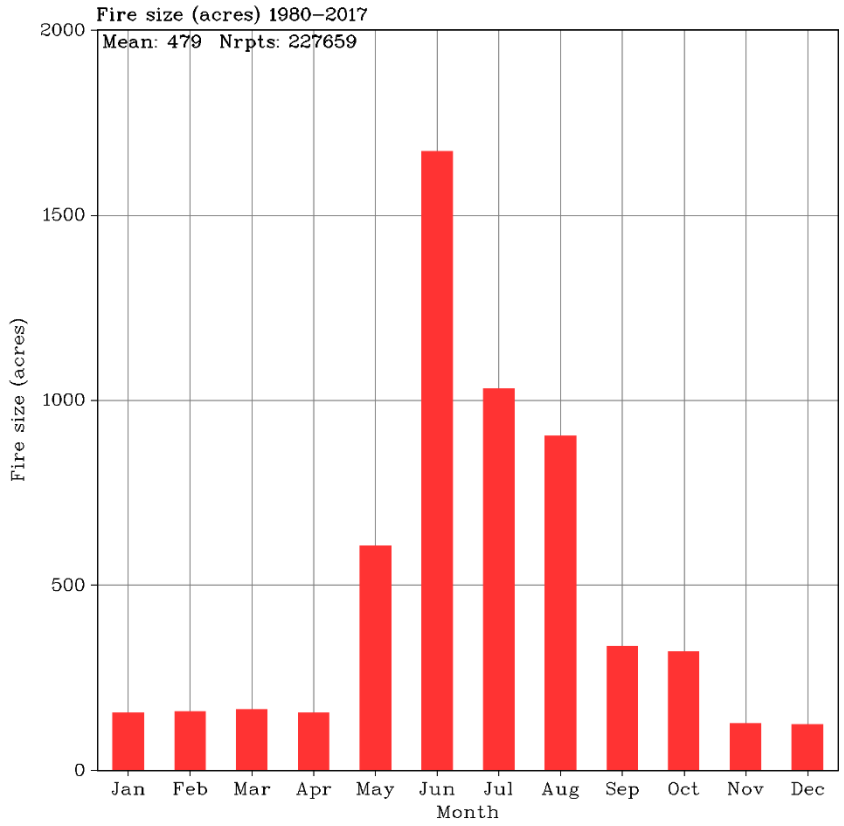


Wildfire Occurrence by month (all fires, all states)

Number of Fires



Size of fires (acres)

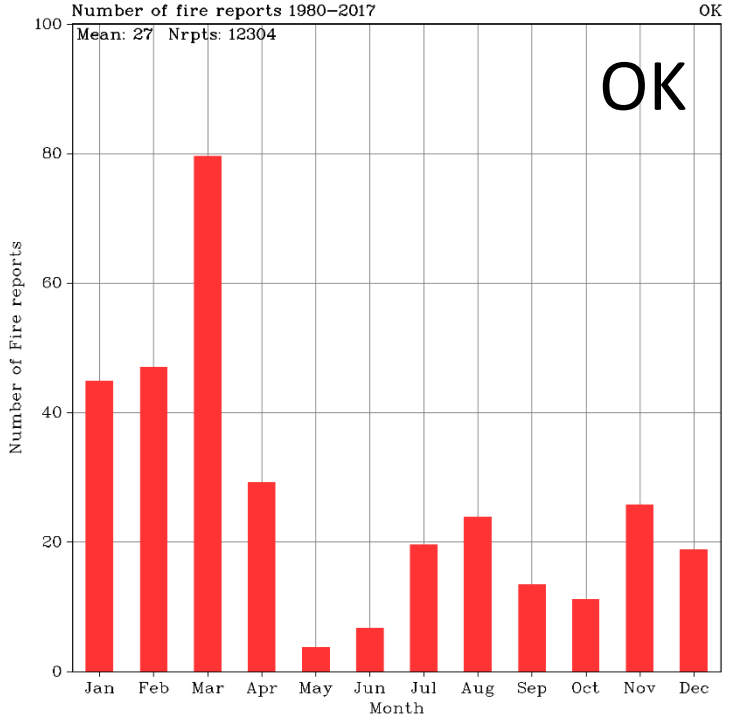


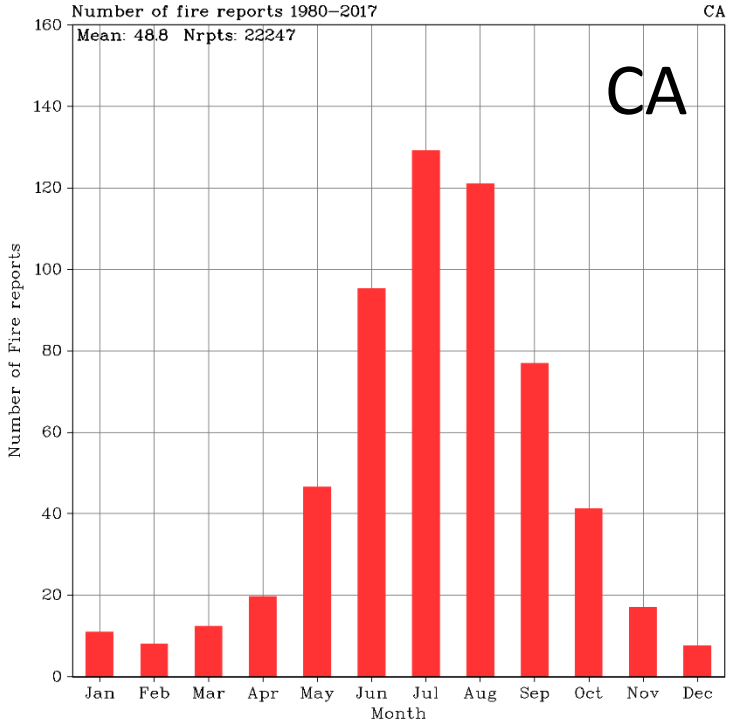
Most wildfires occur spring/summer

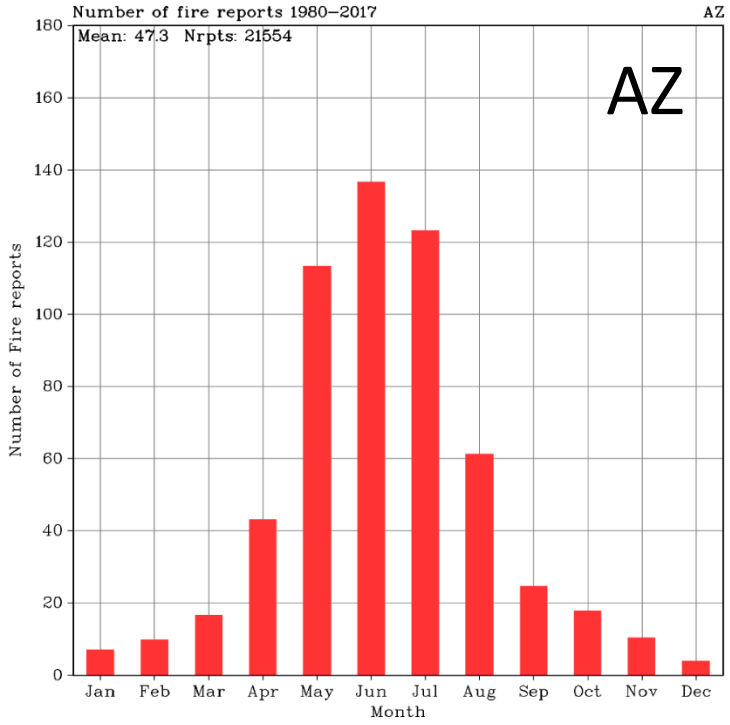
Largest wildfires summer/fall

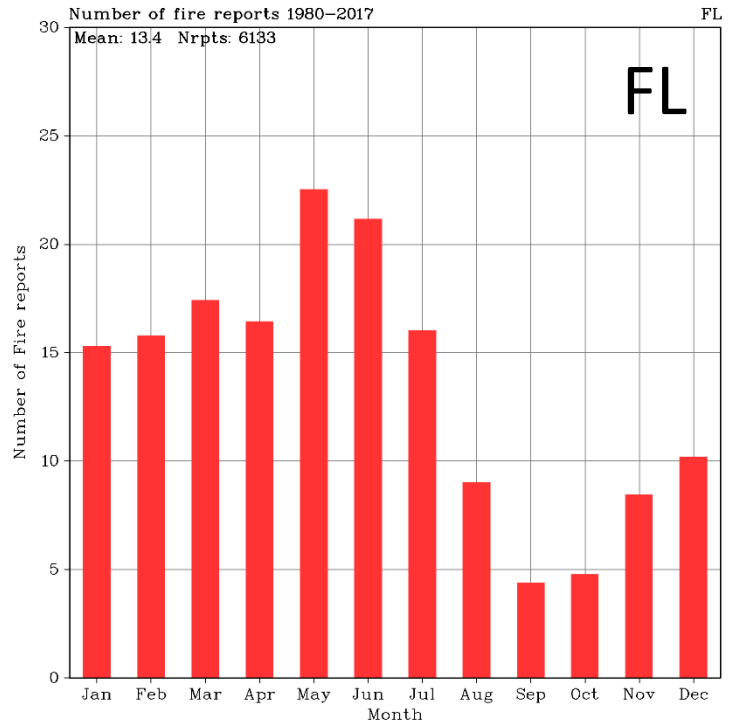
Are wildfire seasons different for diverse regions in the U.S.?

- YES! Note that Fire Seasons are different all across the United States.



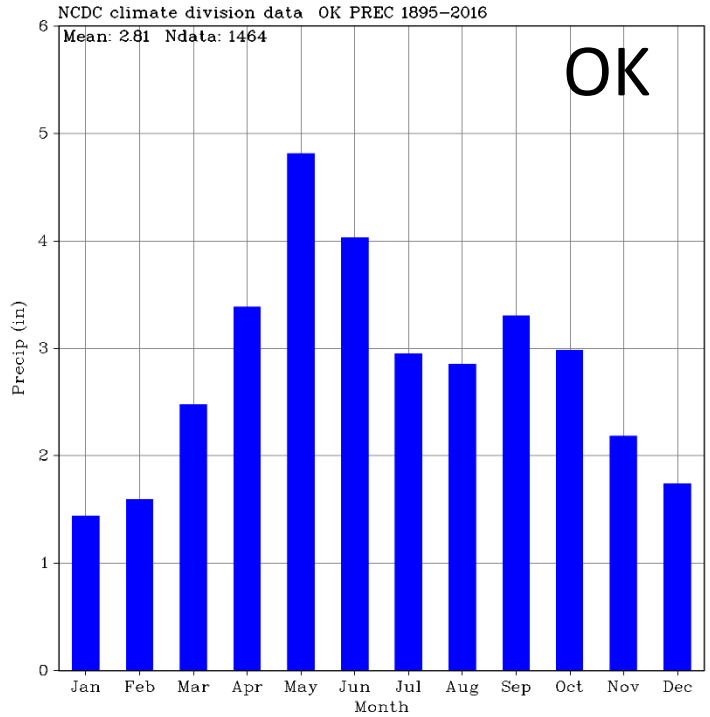


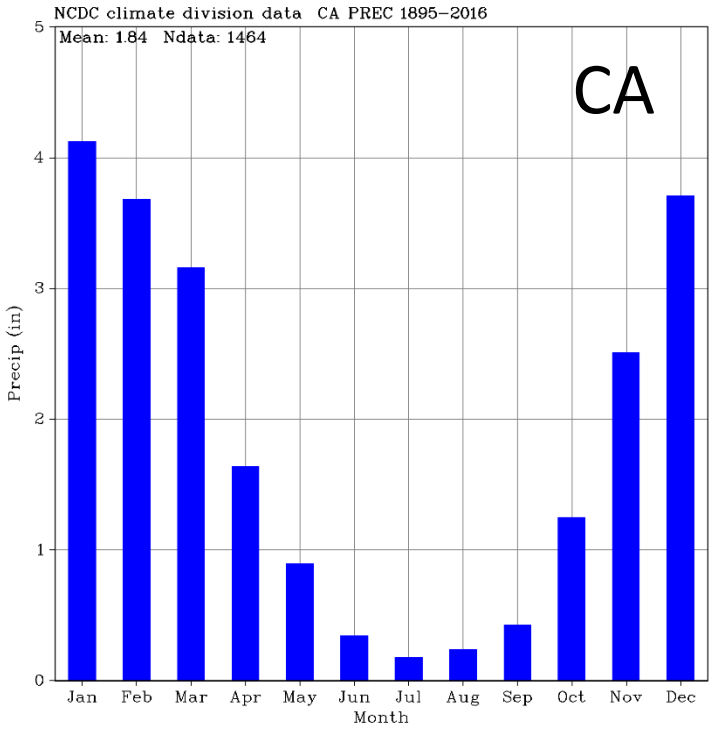


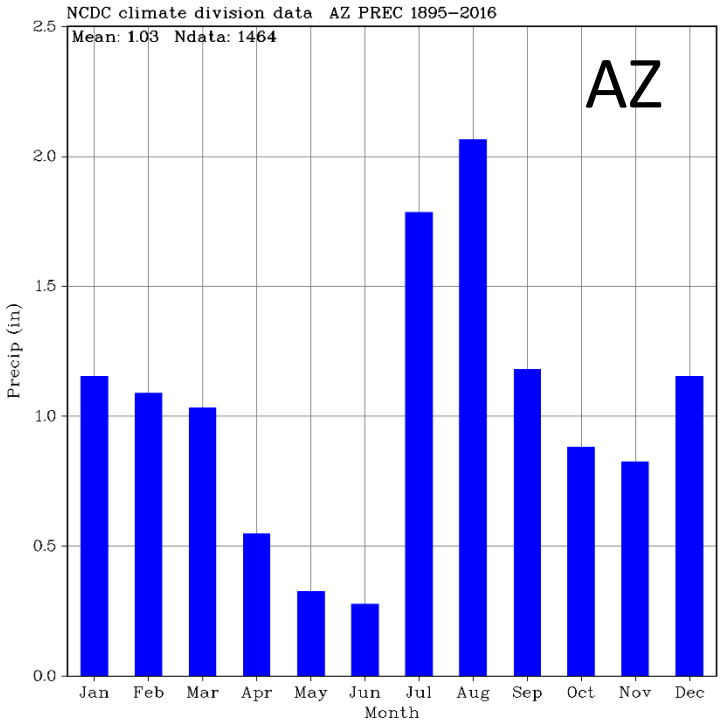


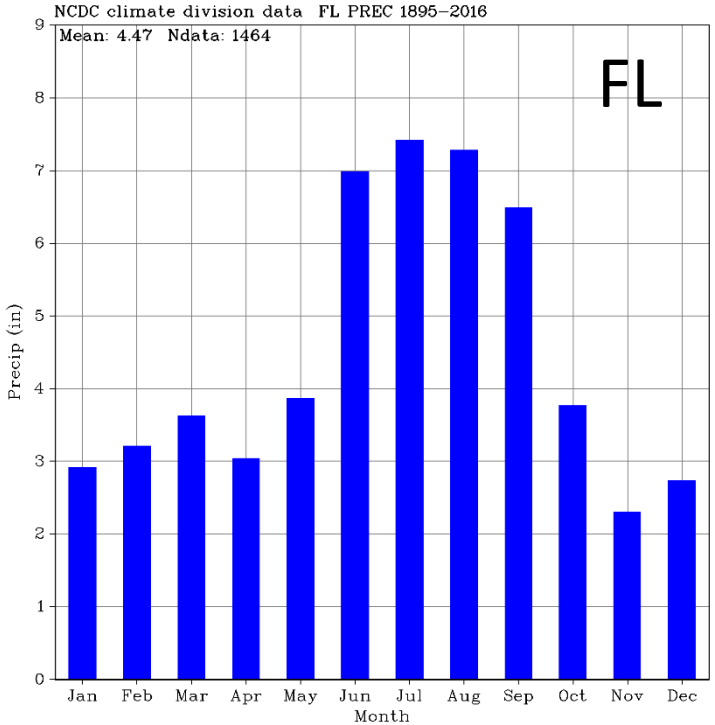
Precipitation for these four regions.

- Note that most wildfires occur at the end of the driest months

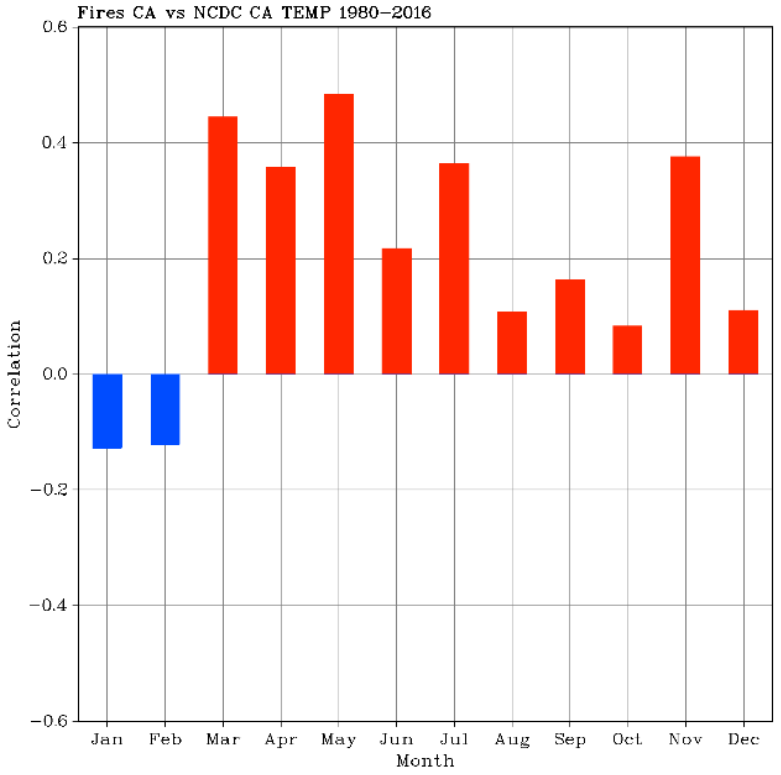




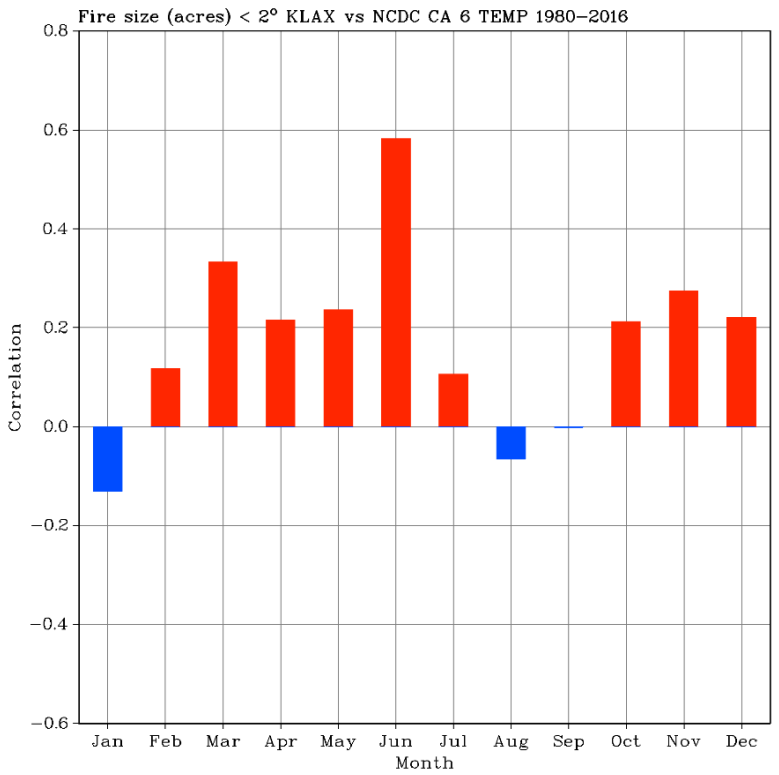




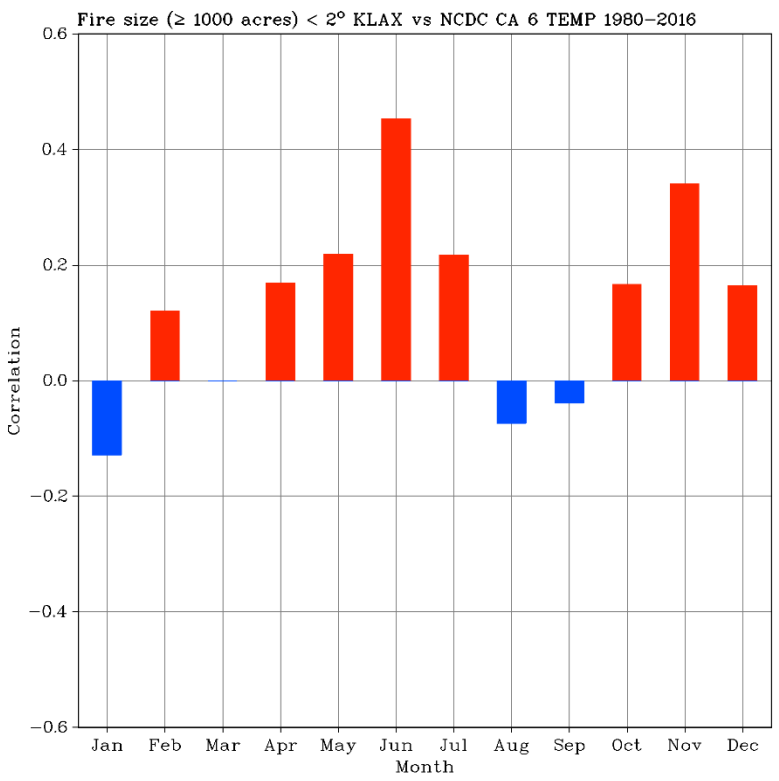
Correlations with Temperature in Southern CA



Number of fires correlated with temperature



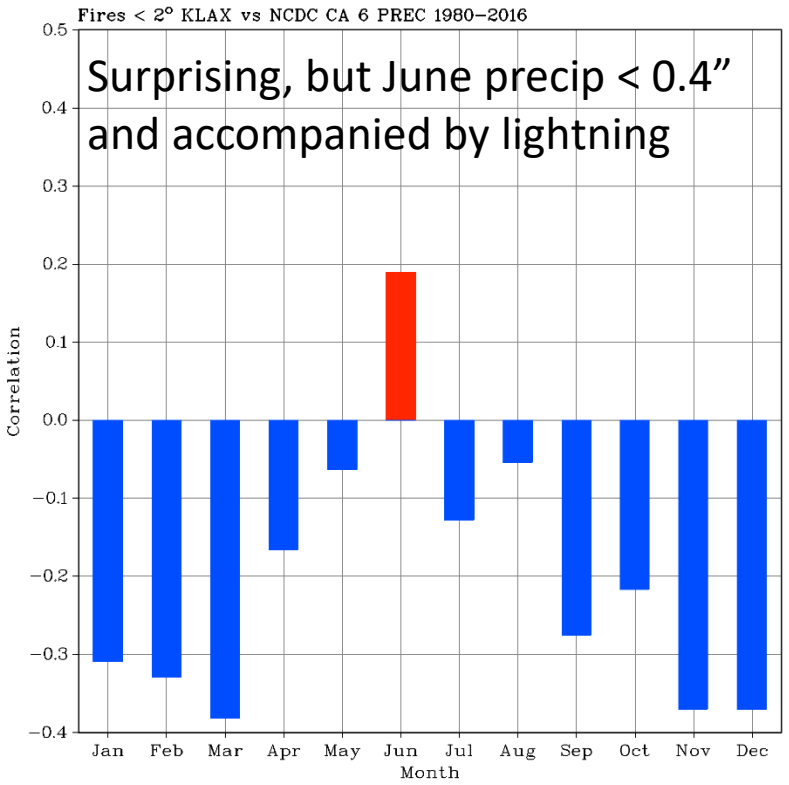
Fire size in acres correlated with temperature



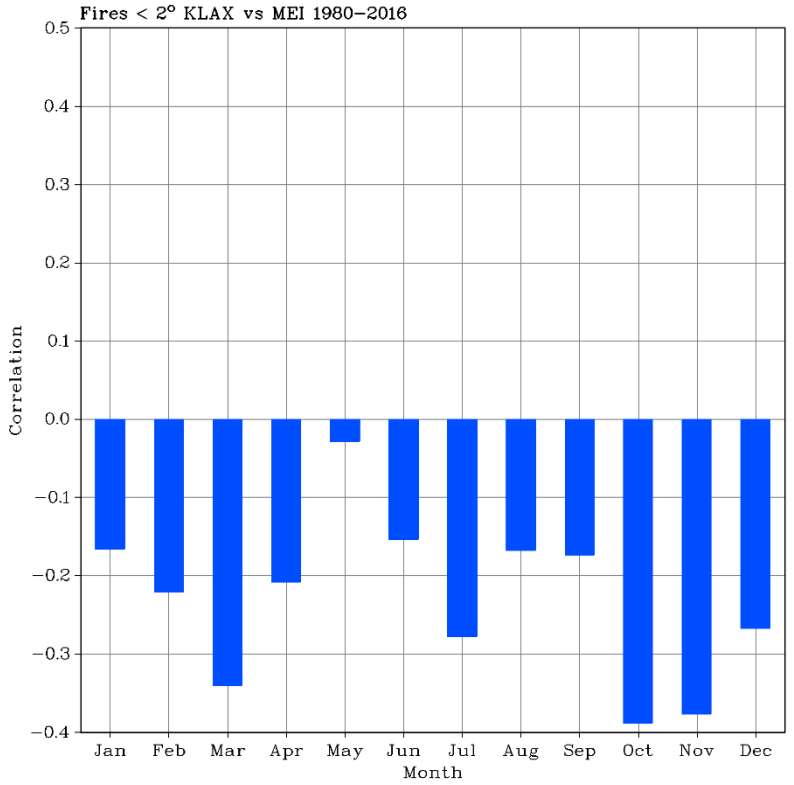
Fire Size above 1000 acres correlated with temperature

High temperature help wildfires by drying out fuels

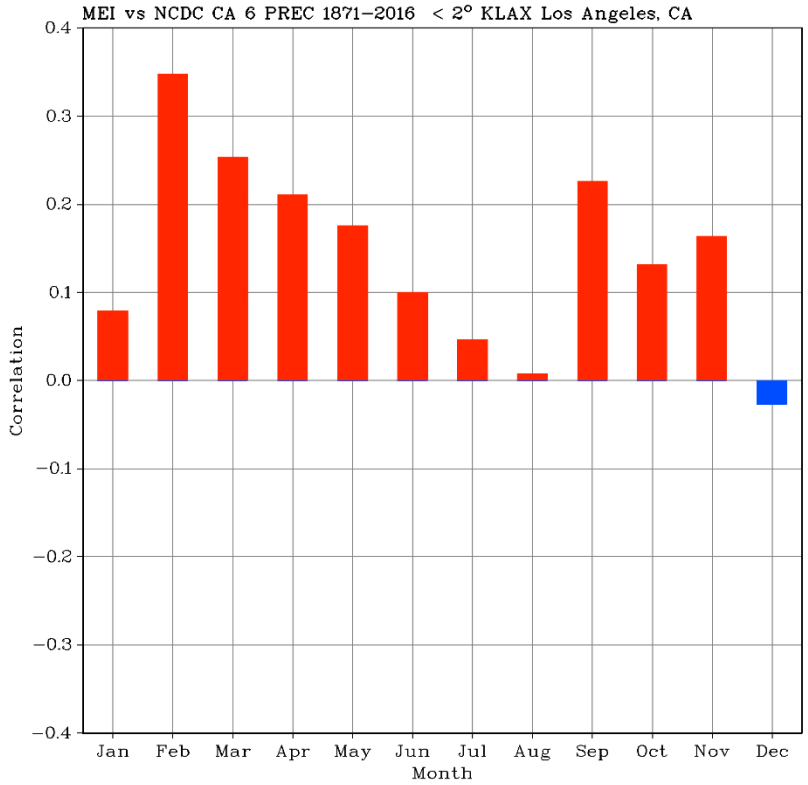
Correlations with ENSO (El Nino) in SOCAL



Fires vs precipitation
- Precipitation hinders fires except in June



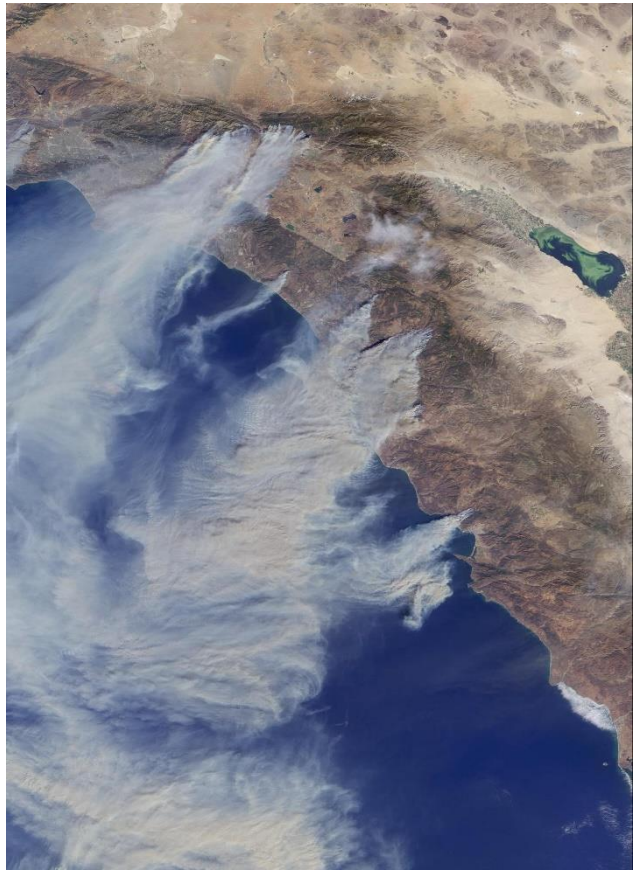
Fires vs ENSO
- La Nina favors fires



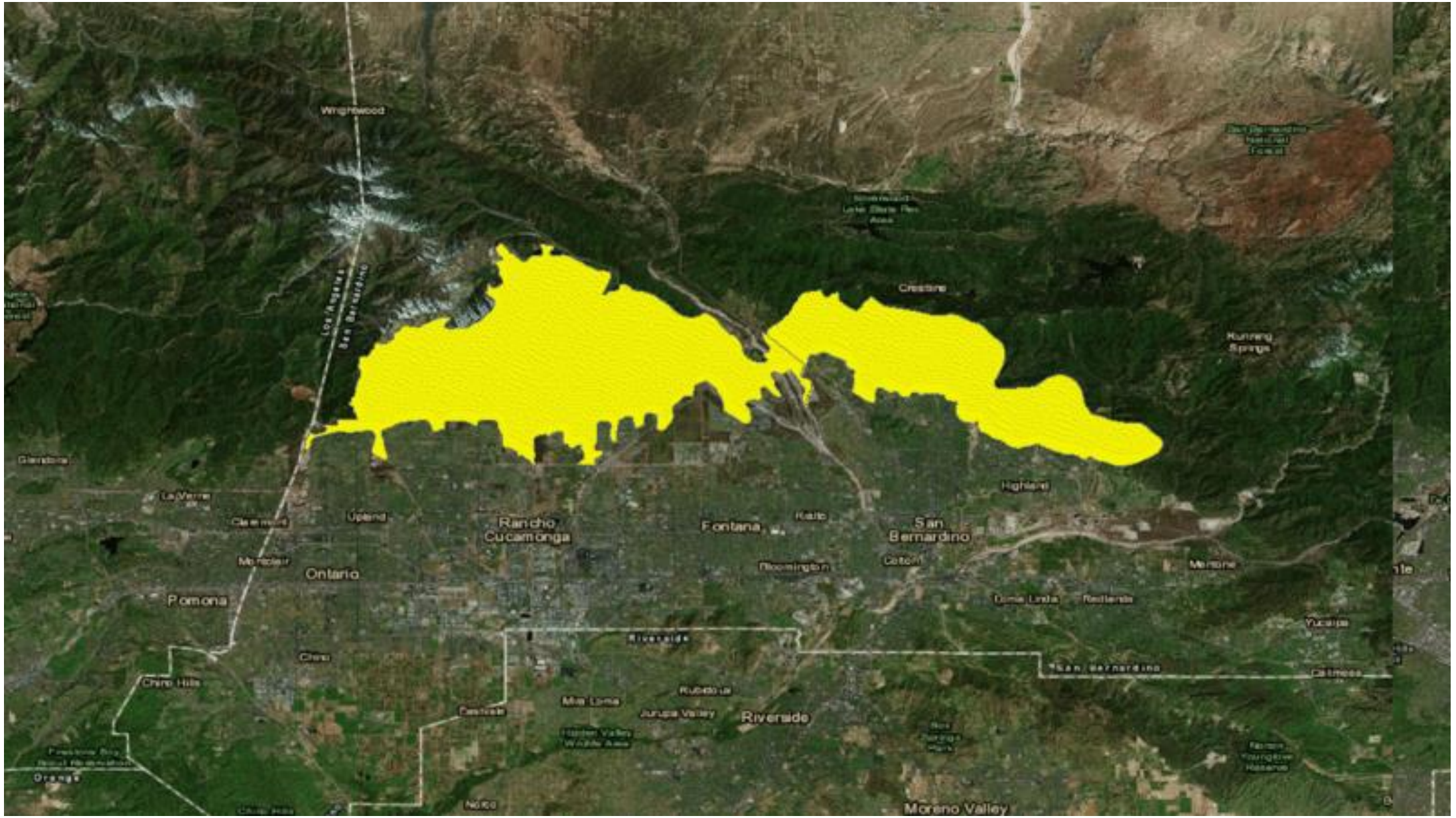
Precipitation vs ENSO
- El Nino favors winter rain
- La Nina favors winter drought

Which meteorological factors influence wildfire growth?

- First , identify time of greatest wildfire growth
- Create a composite (average) weather chart for these times

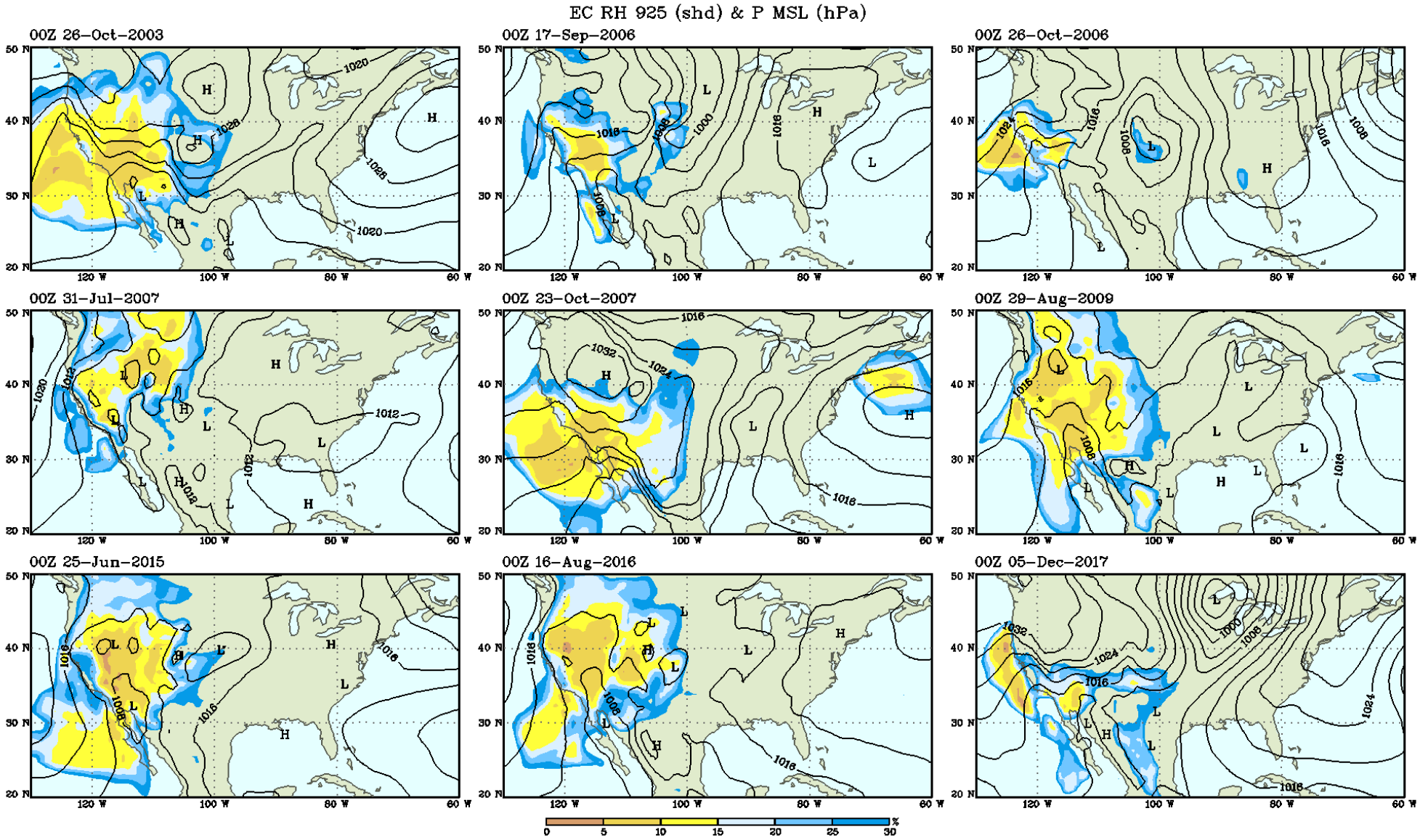


Fire Progression Map (ArcGIS)

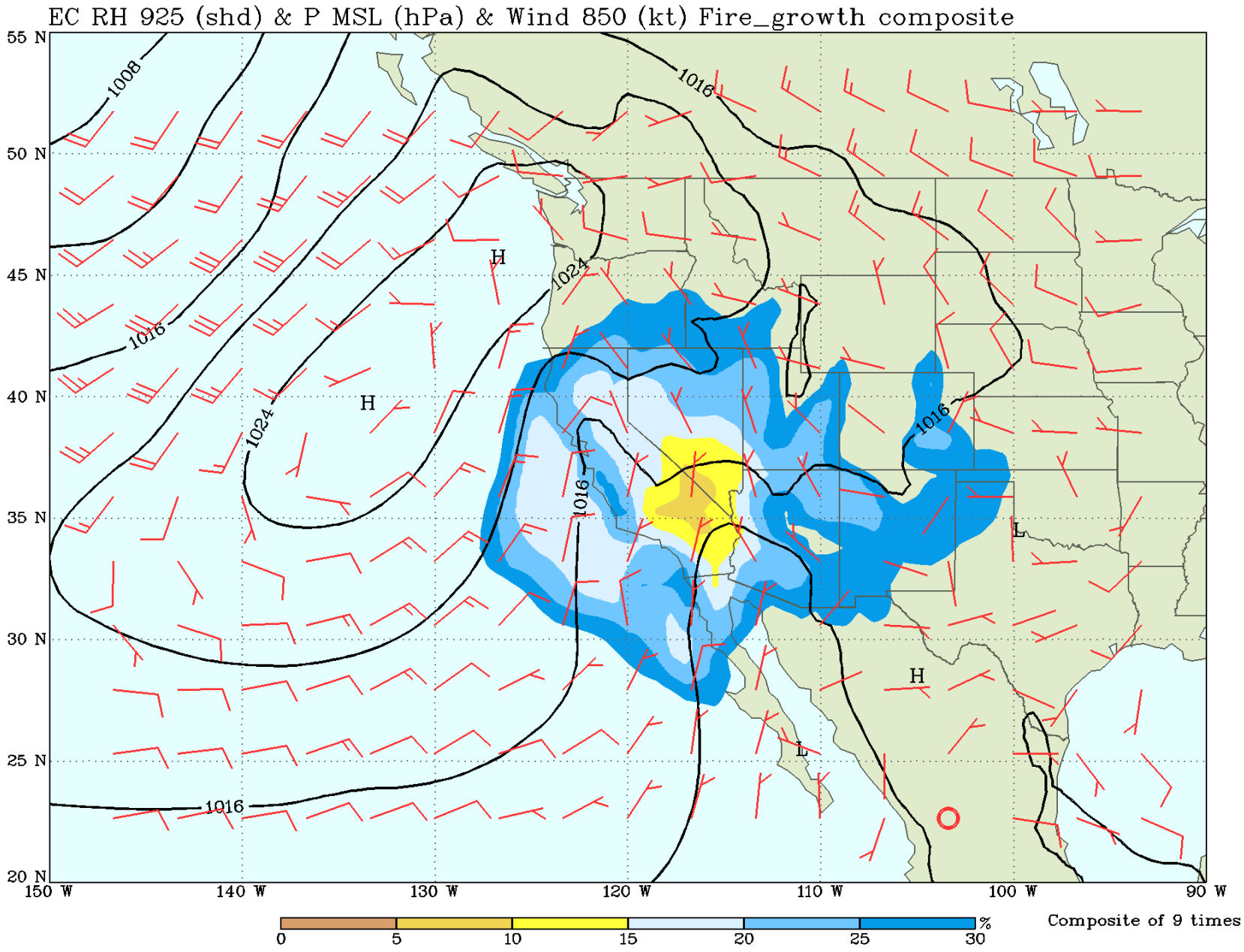


Weather Charts at Time of max Growth for Nine Major Wildfires

- Composited weather for 9 major wildfires during the greatest rate of wildfire growth.



Composite of the Nine Wildfires



- NE Santa Ana winds & low RH dominate over Southern California at time of maximum fire growth

Summary and Conclusions

- Wildfires are in increasing in size.
- Wildfire numbers have been decreasing for the last 10 years.
- High winds, high temperatures, and low RH contribute to wildfire incidence and growth.
- Santa Ana conditions are the cause for the largest wildfires in Southern CA.

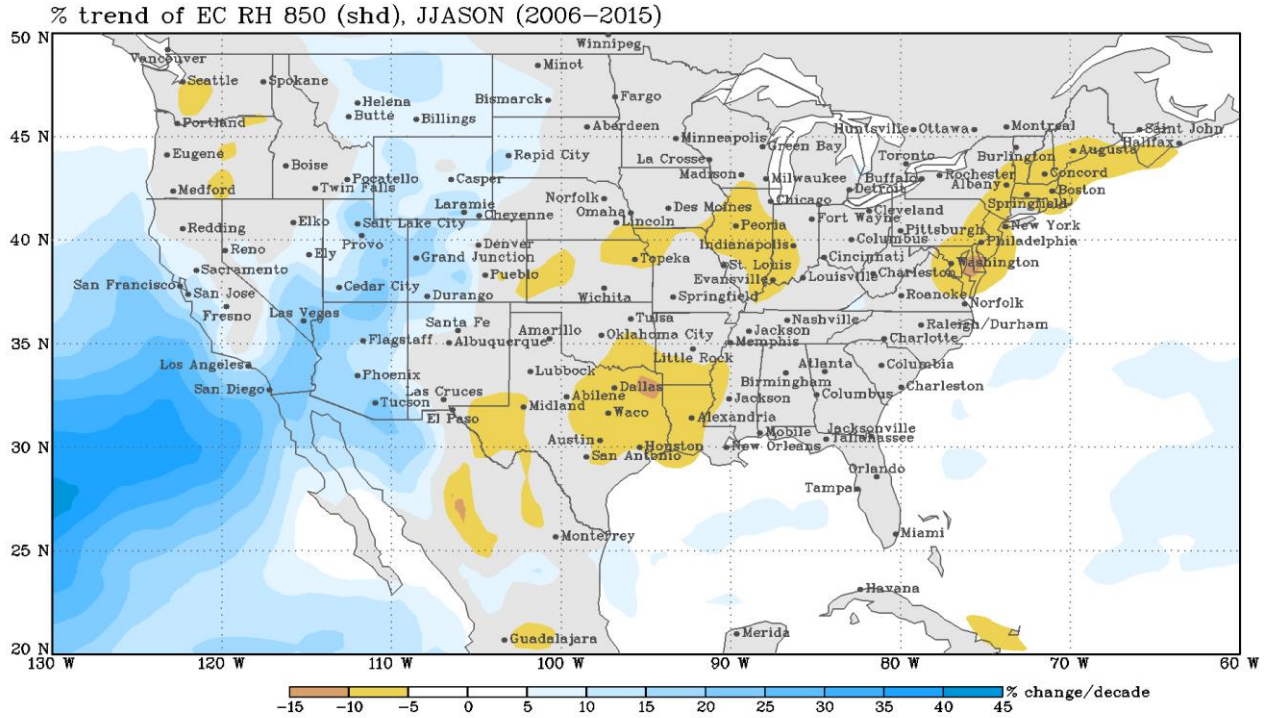
Questions?

Prediction for Upcoming Fire Season

- It’s La Nina
- It’s been drier than normal, especially in AZ.
- Official wildfire outlook by National Interagency Fire Center (NIFC)

Reason for Decreasing Wildfires in the Last Decade

Relative Humidity



Precipitable Water