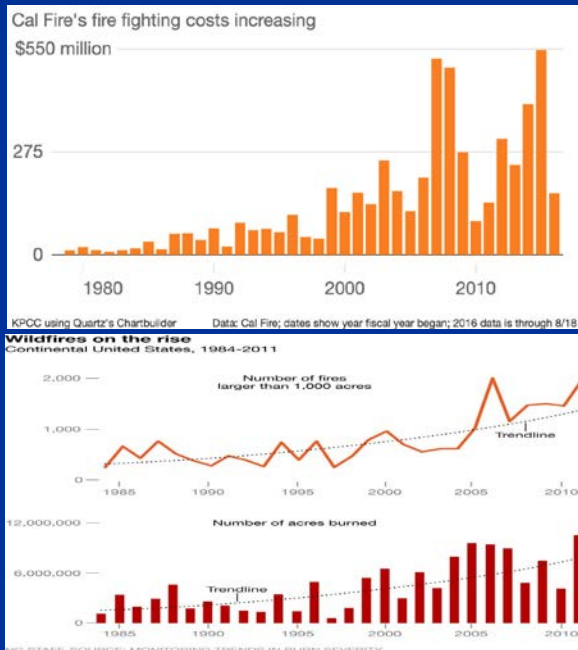


Santa Ana Winds, Wildfires and Climate Change: Understanding Complex System Interactions using Bigdata and AI

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The cost to combat wildfires in California
has tripled over the last decade.



<https://www.fire.ca.gov/stats-events/>

Santa Ana Winds =
Bone Dry conditions
Potential of fires.



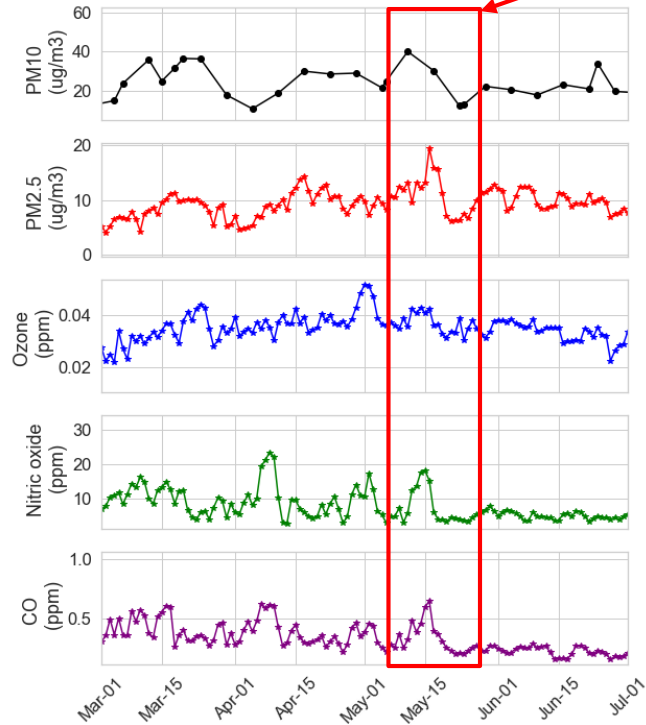
<https://visibleearth.nasa.gov/images/69172/>



<https://www.Wikipedia.sanataana>

Figure 2(a-e). Chemical composition of the Atmosphere during wildfires

Mar-June 2014, San Diego, CA.



2014 Wildfires in San Diego = Increase in Particulate matter and toxic gases in the atmosphere

Burned 110 Km²
Cost ~ 90 million USD +
40 million property damages +
10 million health related cost

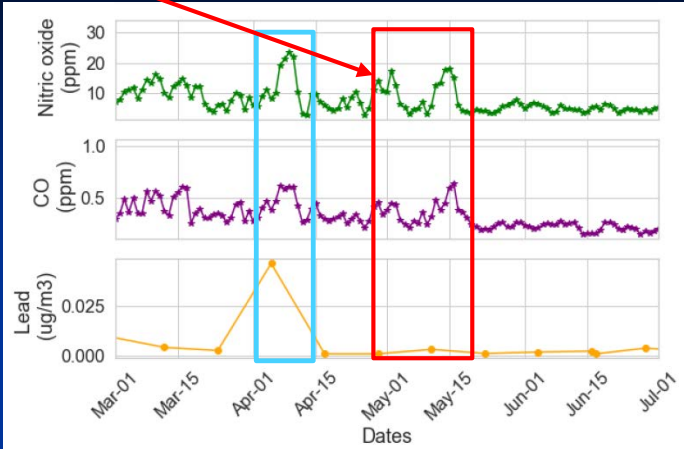
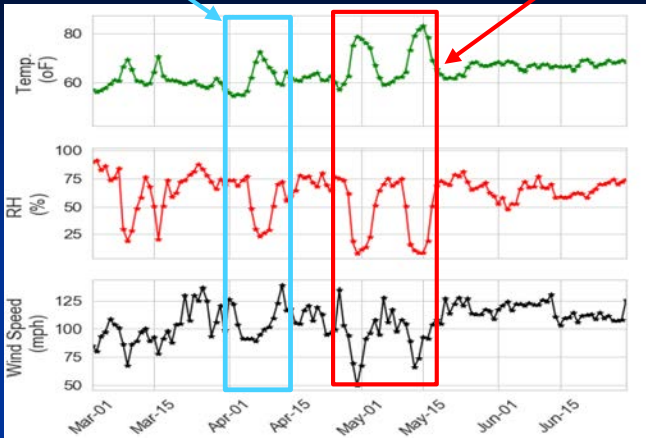


Santa Ana Winds

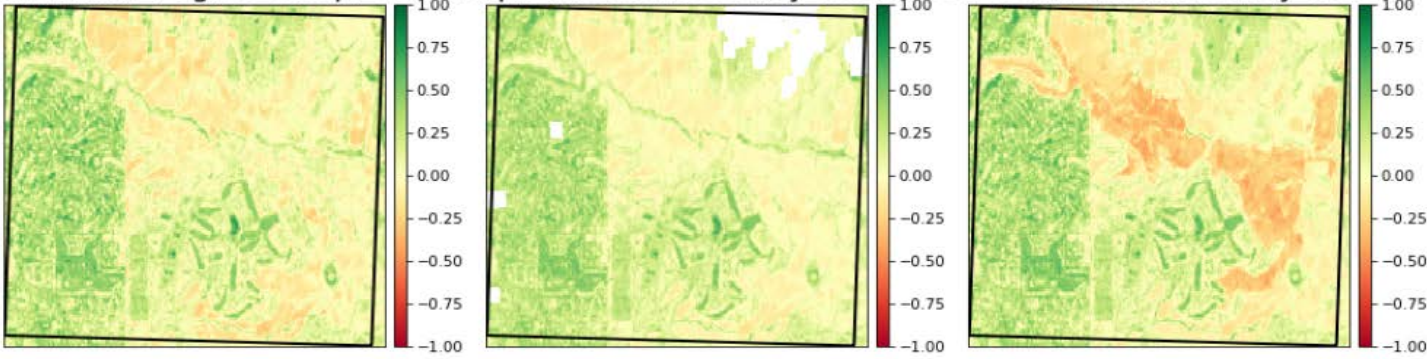
Wildfires

Preliminary analysis indicates:
Potential to predict wildfires based on the

- 1. vegetation spectral analysis
- 2. Land conditions
- 3. Atmospheric conditions



A. Santa Ana begins 07 Apr 2014 B. prefire NBR, 09 May 2014 C. Postfire NBR, 25 May 2014



Atmosphere-Biosphere Linkage

CIR Landsat data (IR bands)

Multispectral Remote Sensing Data, Landsat-8 , DNBR
Difference in Normalized Burn Ratio

Fig. 10. Landsat Derived dNBR 09 June vs 25 May 2014
Tomahawk Fire, San Diego, CA.

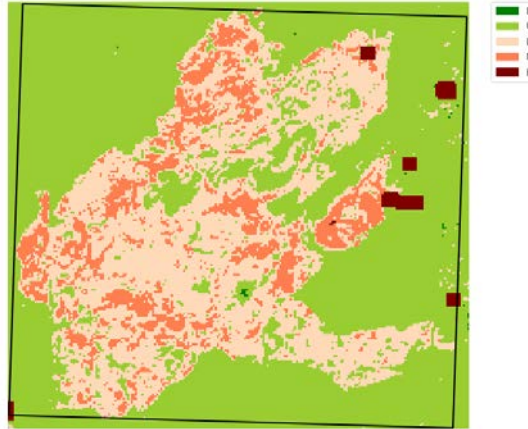
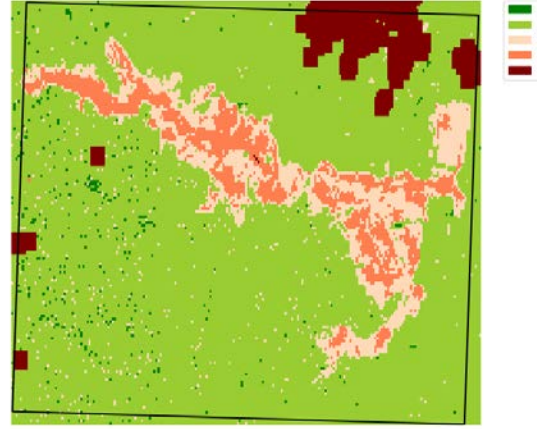
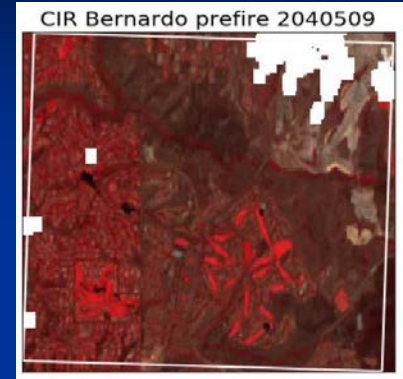


Fig. 9. Landsat Derived dNBR n 09 June vs 25 May 2014
Bernardo Fire San Diego, CA.



Tomahawk Fire,
Burned area calculation:
Class 4,5 ~ 5 km²
Class 4,5,6 ~ 91 Km²
Reported CalFire = 70Km²

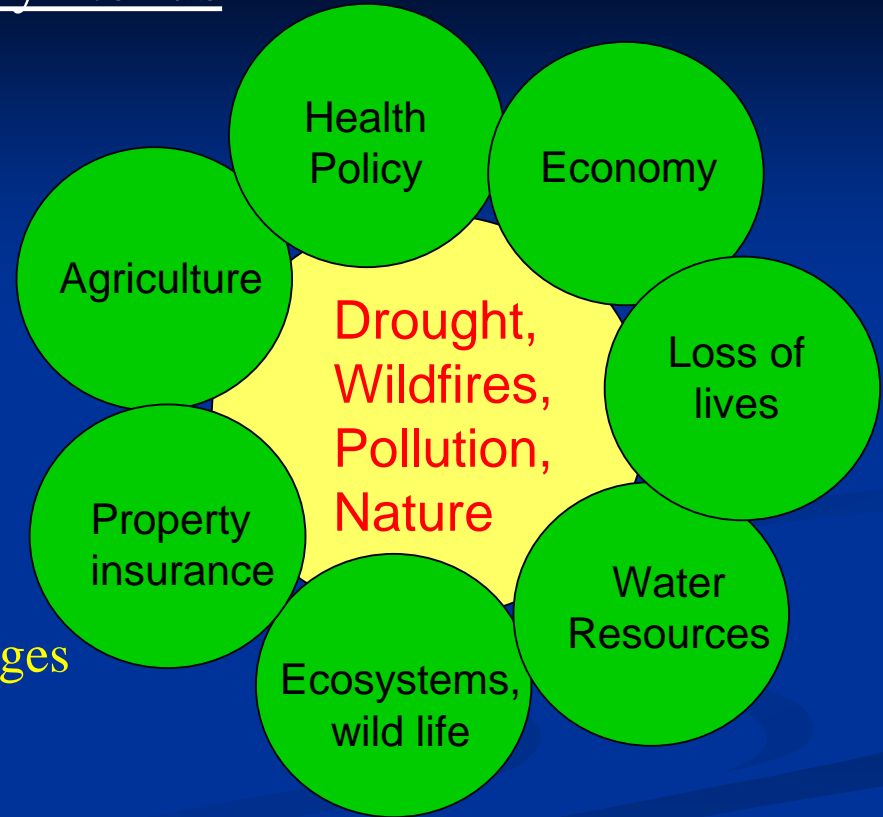
Bernardo Fire
Burned area calculation:
Class 4,5 ~ 3.1Km²
Class 4,5,6 ~ 9.5 Km²
Reported CalFire = 6.3Km²



California's Science and Policy Nexus

Exciting scientific research with multiple implications for environmental issues, policy formulation, various stake holder, insurances and businesses.

California droughts decrease crop yield,
Cause wildfires, health and property damages
\$ billions/ trillions of dollars
Can be saved.



Drought, Agriculture, Wildfires, Air Pollution

Kids health matter



Potential to predict wildfires using atmospheric chemistry, satellite data.

Bigdata and supervised Machine Learning Algorithms to detect anomalies.

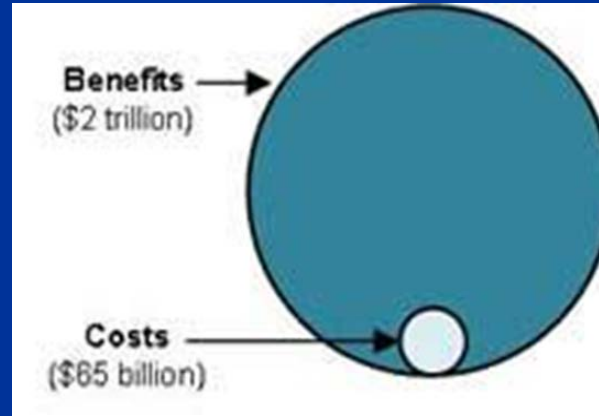


U.S. drought monitor: California

Intensity:
Abnormally Dry
Moderate Drought
Severe Drought
Extreme Drought
Exceptional Drought



Source: National Drought Mitigation Center



<https://www.c2es.org/content/wildfires-and-climate-change/>
<https://www.c2es.org/content/drought-and-climate-change/>

<https://www.epa.gov/clean-air-act-overview/benefits-and-costs-clean-air-act-1990-2020-second-prospective-study>

Please join me to further investigate:

“Secret lives of molecules in the air”

“Perseverance of plants against pollution and climate change”.

The ultimately goal is to:

assess risk and develop policies to mitigate damages.

Special Thanks to my instructors for the inspiration

Prof. Leah Wasser

Prof. Jenny Palomino

And my amazing/ geeky class fellows for help with the GIS.