Wildfire, Smoke & Social Media

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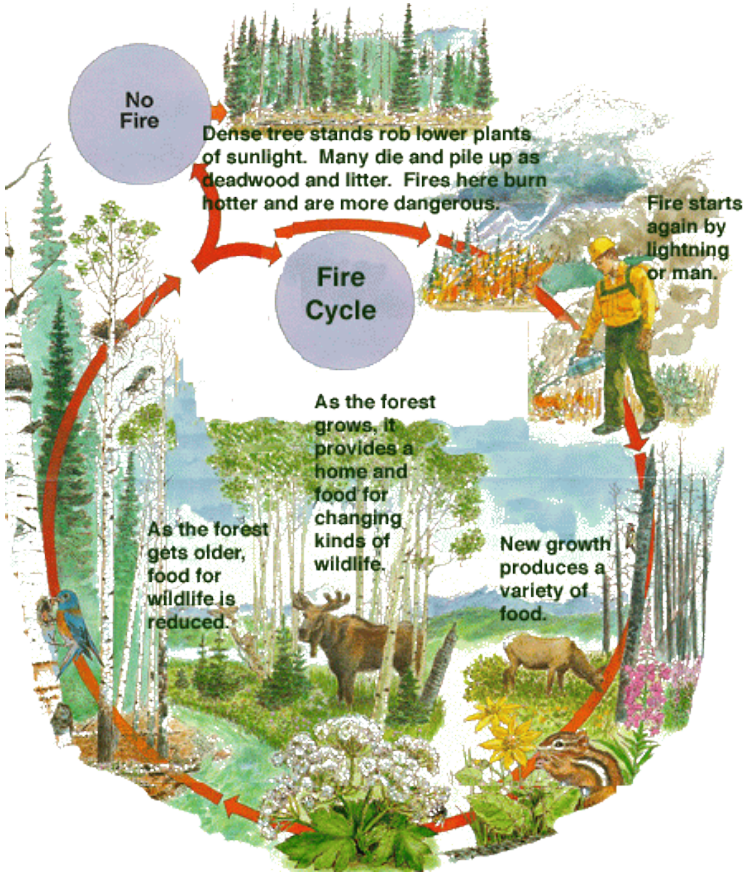
Climate Change
Health
Ecology


Climate Change
Health
Ecology

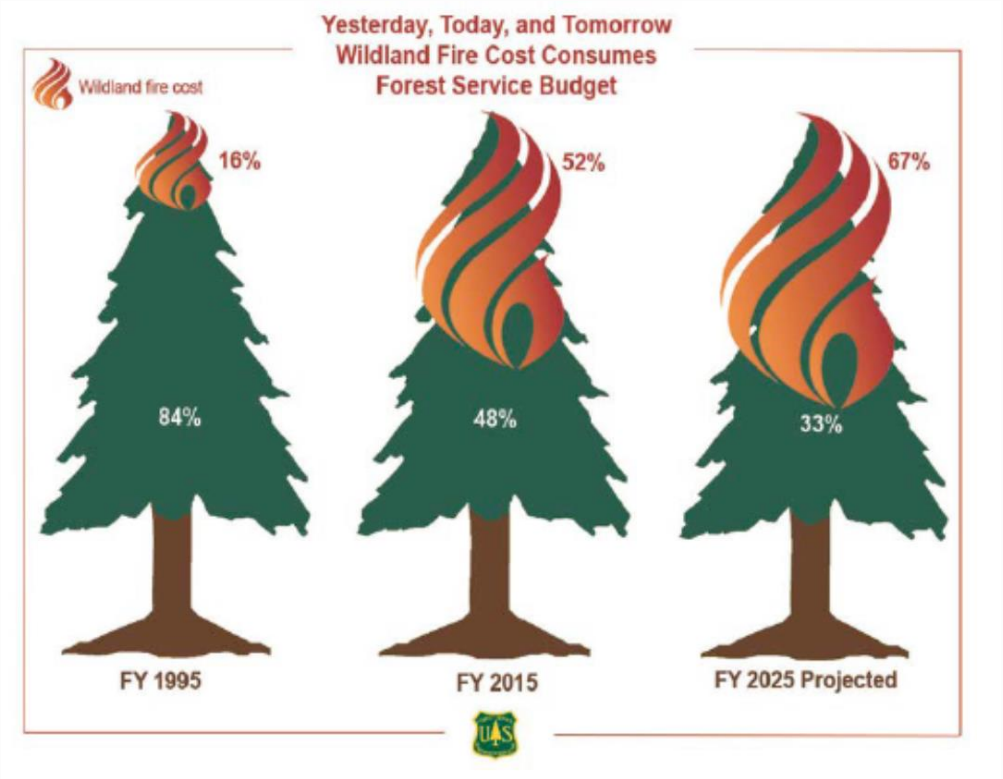
Fire Ecology

- Fire is a constant/necessary component in many ecosystems
  - Fosters regrowth
  - Creates pasture and grazelands
  - Critical for seed germination
  - Increased biodiversity
  - Soil health
  - Kills pests
  - Safety barriers

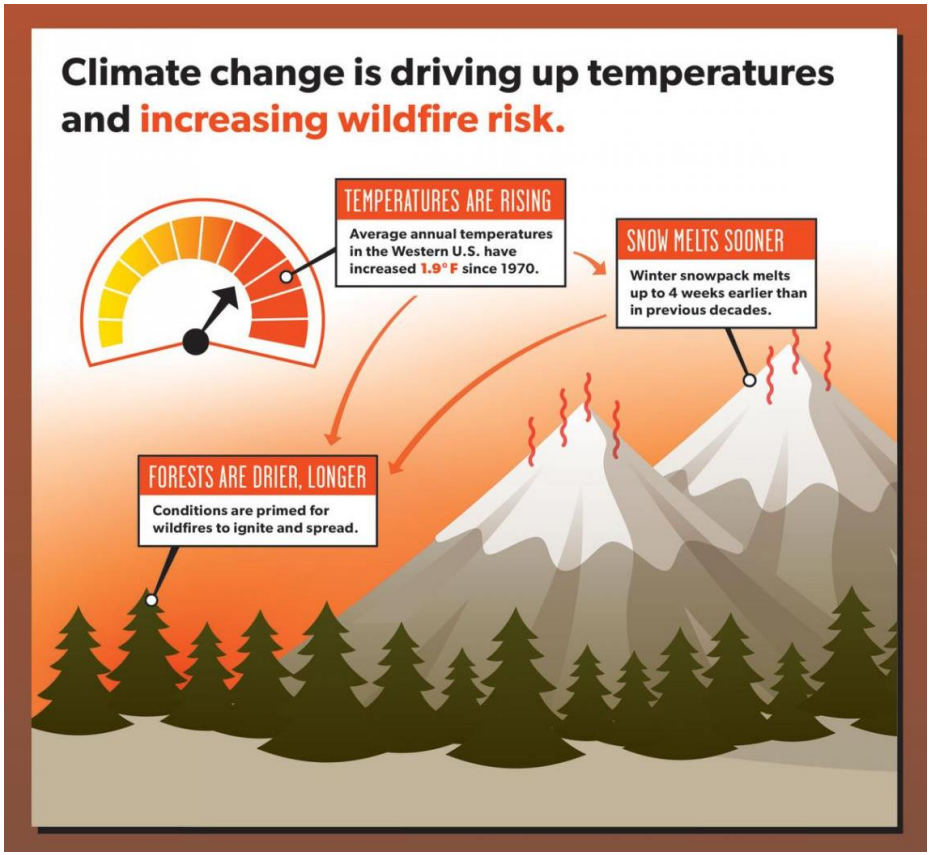
- Without fire:
  - Increase fuel
  - Hotter, more severe fires
  - More destruction

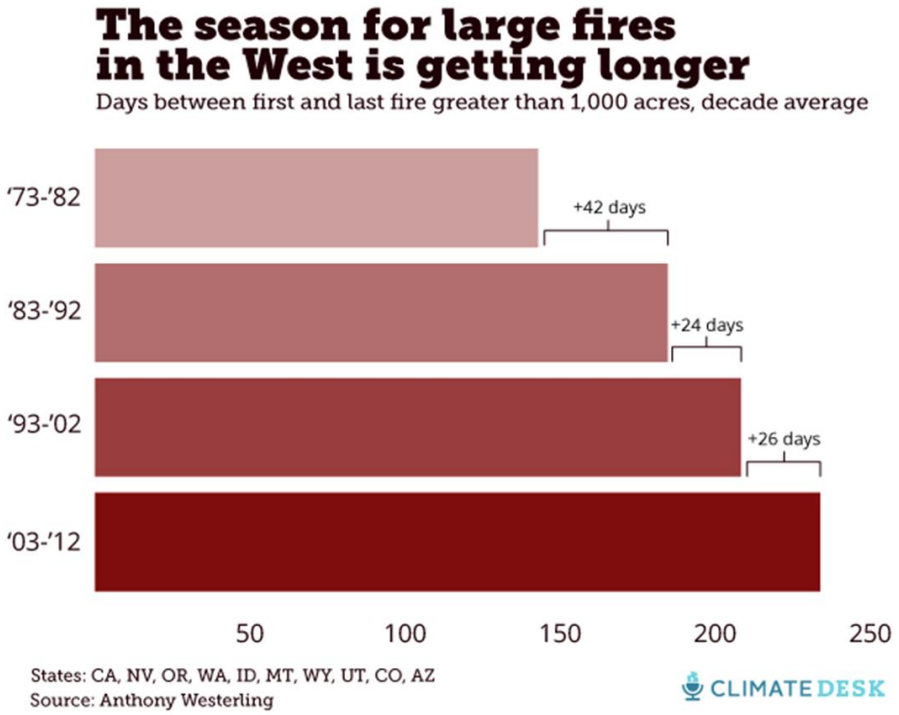



SMOKEY
ONLY YOU


Yesterday, Today, and Tomorrow
Wildland Fire Cost Consumes
Forest Service Budget
Wildland fire cost
16%
84%
FY 1995
52%
48%
FY 2015
67%
33%
FY 2025 Projected

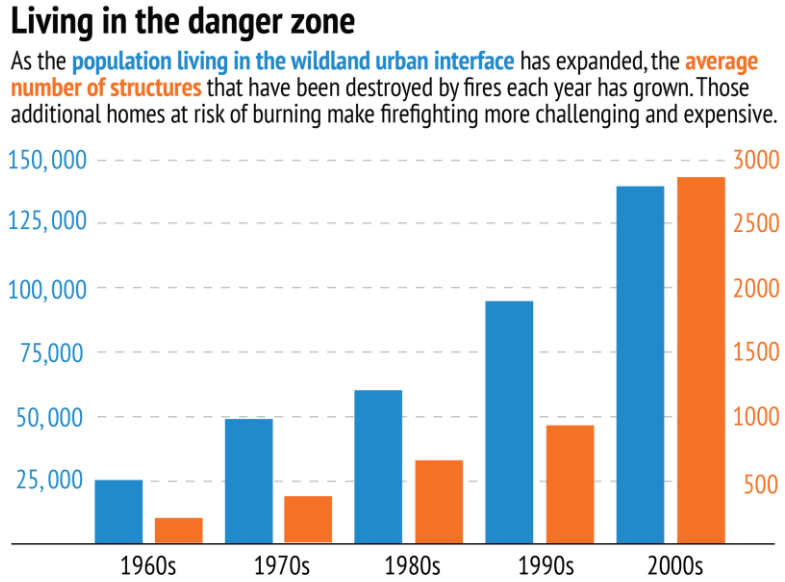

Climate Change
Health
Ecology





~ 10 million acres is the new norm

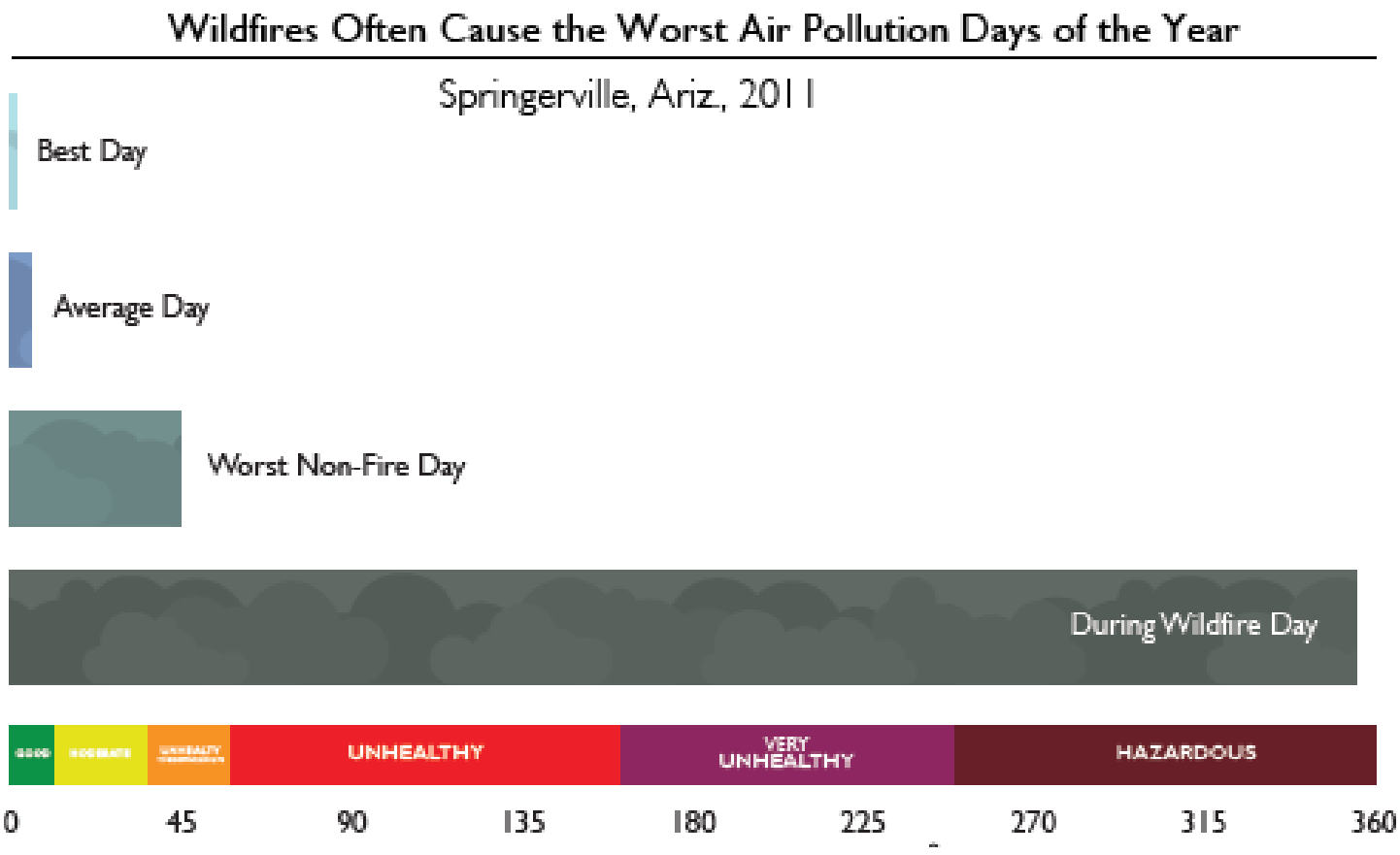

Climate Change
Health
Ecology



Reno, August 2013, During Rim Fire

-Smoke from wildfires creates haze for hundreds of miles, releases particulate matter

- NRDC analysis shows that about two-thirds of the United States (212 million people) lived in counties affected by smoke conditions


Wildfires Often Cause the Worst Air Pollution Days of the Year
Springerville, Ariz., 2011
Best Day
Average Day
Worst Non-Fire Day
During Wildfire Day
UNHEALTHY
VERY UNHEALTHY
HAZARDOUS
0
45
90
135
180
225
270
315
360

Why is smoke dangerous?

Smoke releases microscopic particulate matter (PM2.5)

Wildfire smoke has been shown to cause:

- Respiratory illnesses (asthma, coughing, wheezing, COPD)
- Cardiovascular outcomes (heart attacks, chest pain symptoms)
- Other health effects including:
  - Lower birth weight
  - Higher inflammation
  - Bone marrow content
  - Physical strength

Air quality warning extended; residents encouraged to stay indoors

Wildfire smoke leads to air quality alert

Updated: 4:54 PM EST Nov 15, 2016

Pediatrician: Take precautions to protect children with asthma from wildfire smoke

Liv Osby , losby@gannett.com 11:32 a.m. EST November 15, 2016

Another code red smog alert amid hazy skies

Lauren Foreman - The Atlanta Journal-Constitution
10:20 a.m. Wednesday, Nov. 16, 2016 | Filed in Metro Atlanta / State news

Wildfire smoke engulfs Chattanooga, endangering health of residents

Chronic asthma sufferers are advised to remain indoors

November 15th, 2016 | by Steve Johnson | in Local Regional News | Read Time: 3 mins.

FEATURED

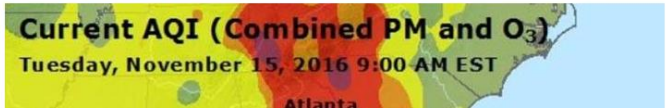
Smoke from wildfires casts pall over Georgians' health

By Andy Miller

Georgia Health News Nov 15, 2016 (0)

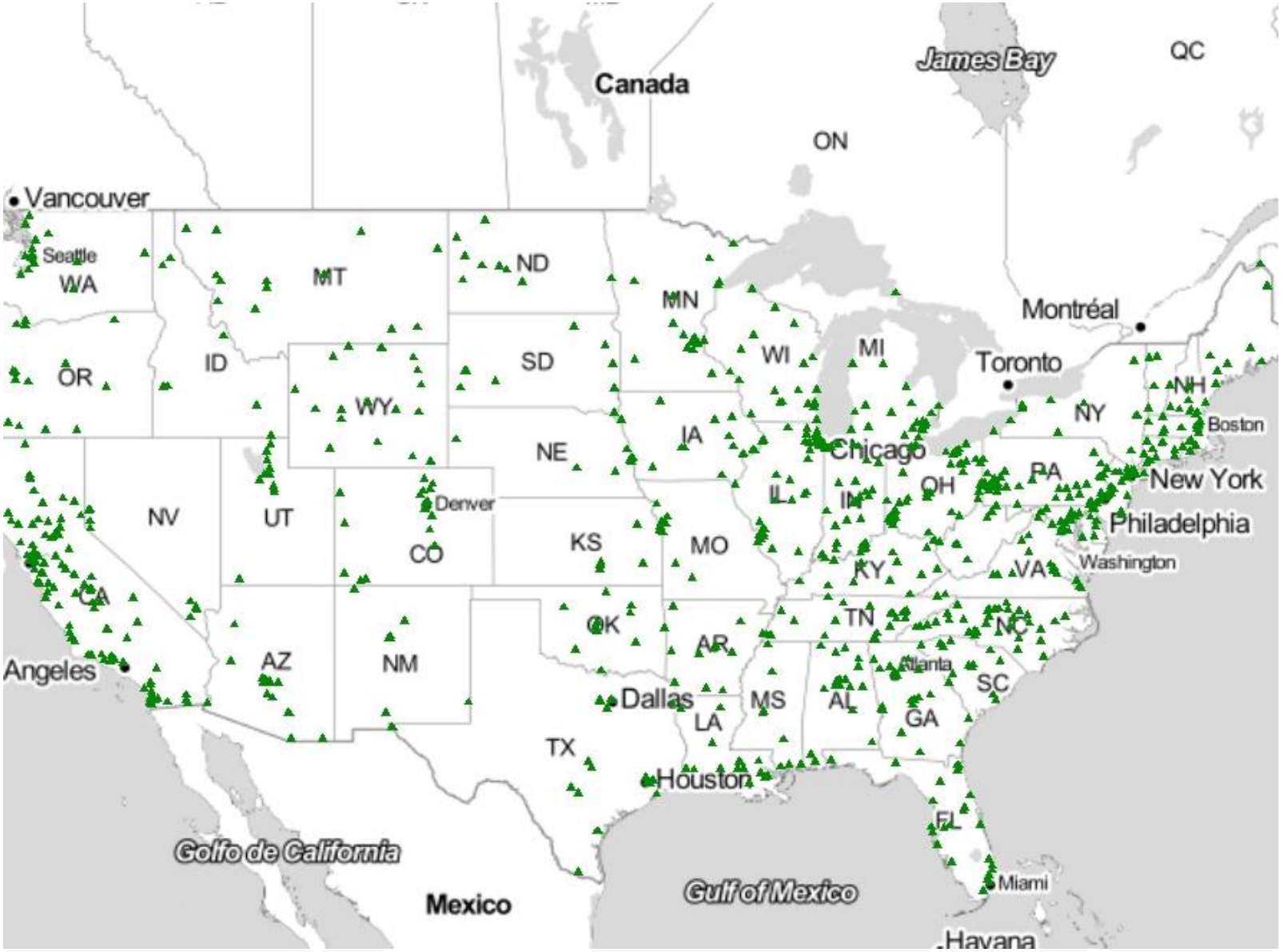
LOCAL NOVEMBER 15, 2016 10:01 AM

Unhealthy air quality forcing some Middle Georgians to stay inside due to heavy smoke



Current Problem:

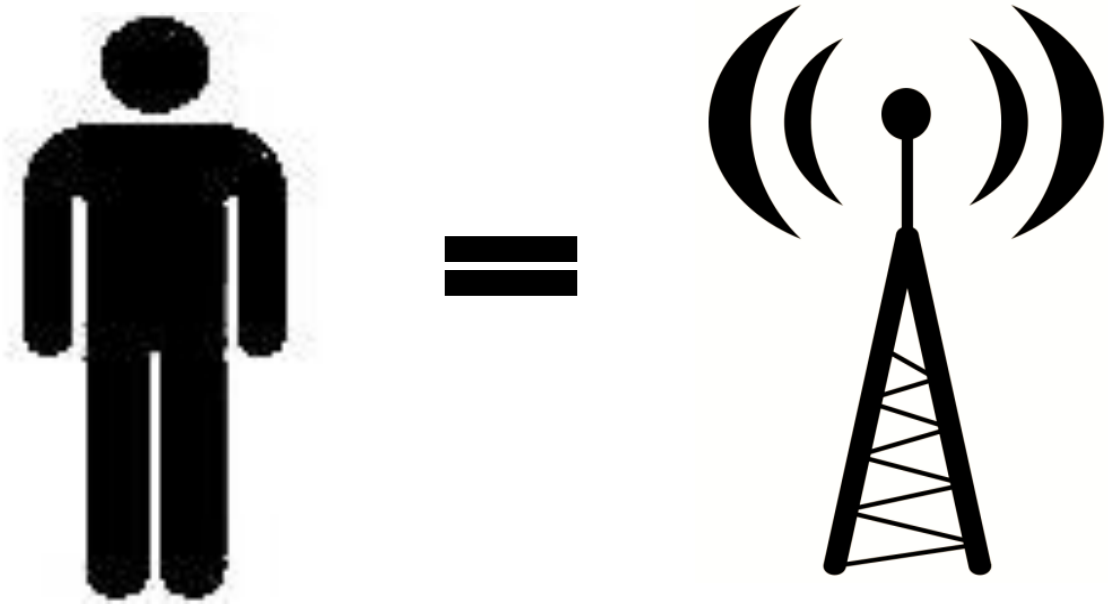
Accurate measurements of air quality impacts are often unavailable due to sparseness in monitoring center locations



ALL EPA MONITORING STATIONS

Possible Solution:

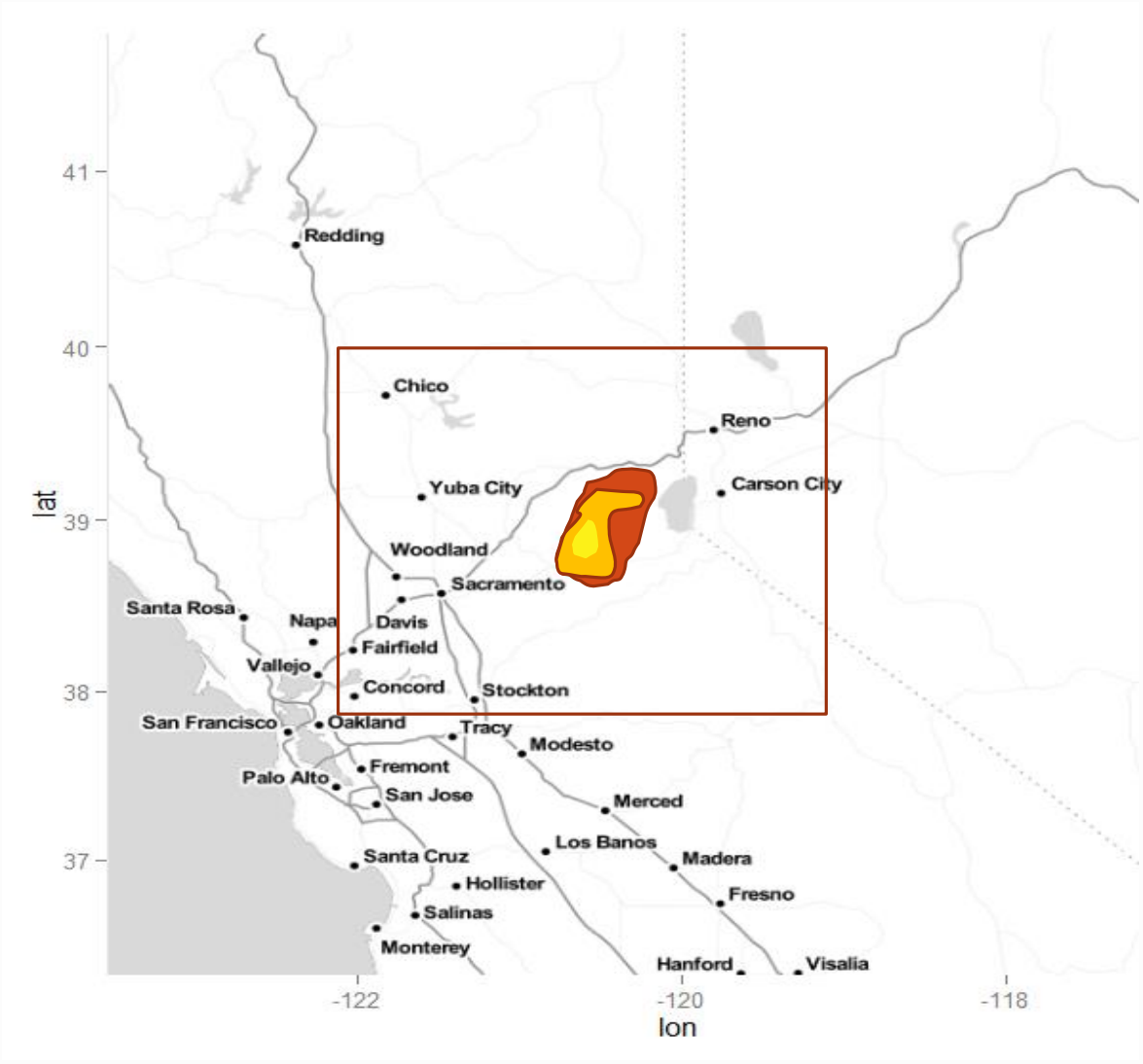
Can we estimate air quality without physical monitoring by using other, already available, information sources?



~30 minutes of Twitter geocoded data

- Any way of leveraging more widely available, dynamic data?
  - Social media data
- Twitter data has been applied in meaningful ways to address many societal issues
  - Health problems
  - Earthquake prediction
  - Traffic management

King Fire



Northern California wildfire between September 13th and October 15th

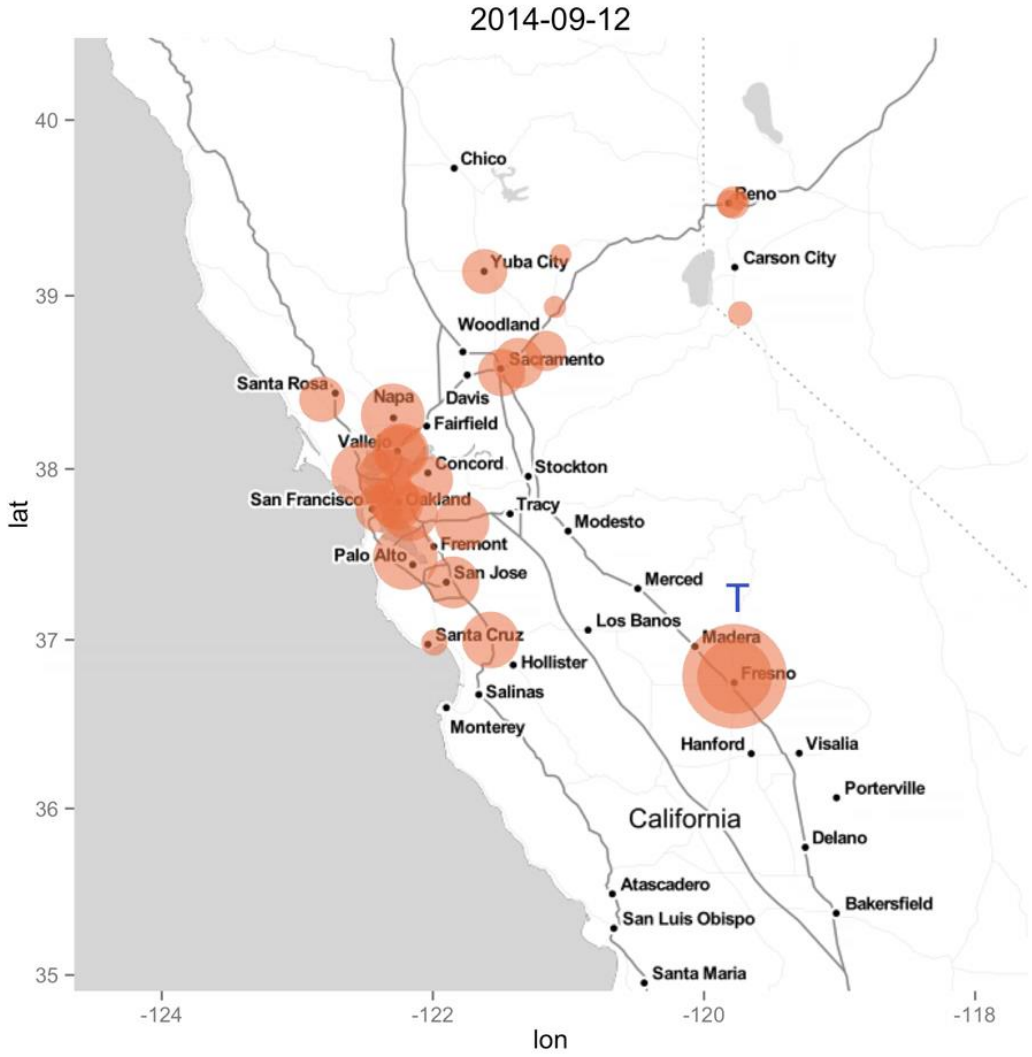
~ 97,000 acres of land

Collected ~15K tweets that related to the King Fire between September and October, 2014

Assessed correspondence with Air Quality Data from the EPA

Sachdeva, S., McCaffrey, S., & Locke, D. (2016). Social media approaches to modeling wildfire smoke dispersion: spatiotemporal and social scientific investigations. *Information, Communication & Society*, 1-16.

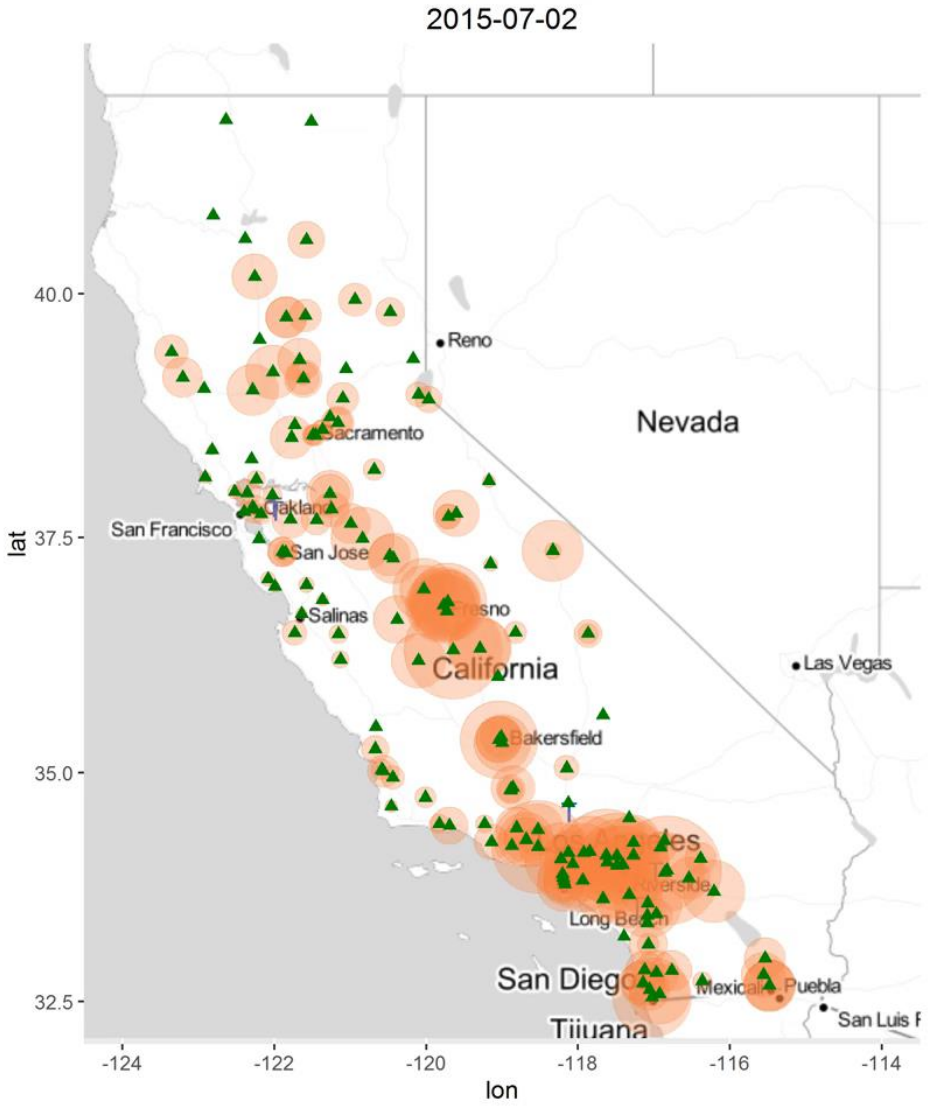
Spatio-temporal Model: Air Quality & Frequency of Tweets



23% of daily variation in PM2.5 can be explained by the number of tweets relating to the King Fire

Sachdeva, S., McCaffrey, S., & Locke, D. (2016). Social media approaches to modeling wildfire smoke dispersion: spatiotemporal and social scientific investigations. *Information, Communication & Society*, 1-16.

Expanding to Statewide Fires – 2015 Data



8,745 fires burned a total area of 893,362 acres

~40,000 tweets about wildfires

Similar relationship between frequency of tweets about wildfires and PM2.5 levels

Begin to see where there are gaps in monitoring station data.

- Not as much of a concern in California, but useful in more other remote places

Combining Social Science with Spatio-temporal Modeling

- In addition to geographic information, tweets give real-time insight into how people *encounter*, *adapt* and *manage* wildfire and smoke risk

- Used topic modeling approach to understand semantic content embedded in social media conversations about wildfire

Examples of Tweets

“my eyes are burning smelling smoke and i am coughing too...staying inside”

“cough-cough. hazy skies over merced caused by wind change and rough fire smoke.”

“over last 72 hours er visits from cough up 90% other resp. er visits up 411% according to fresno cty dept of public health roughfire”

“thank you butte fire you just reduced my life expectancy by about 3 years. <cough> <gag> <wheeze> lotsasmoke”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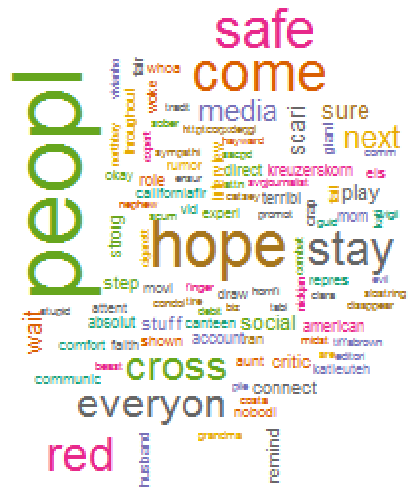
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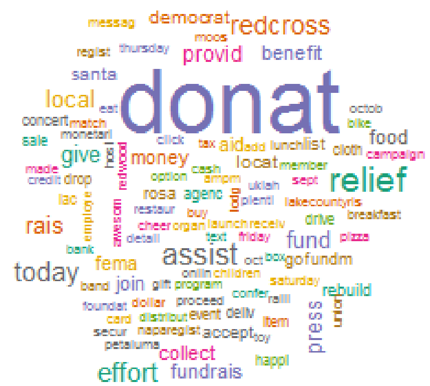
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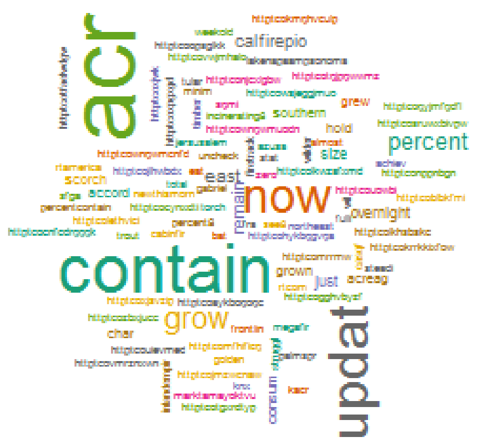
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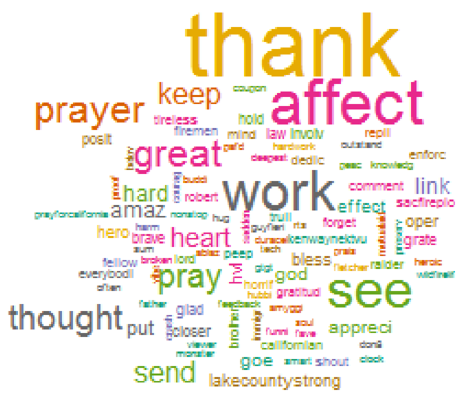
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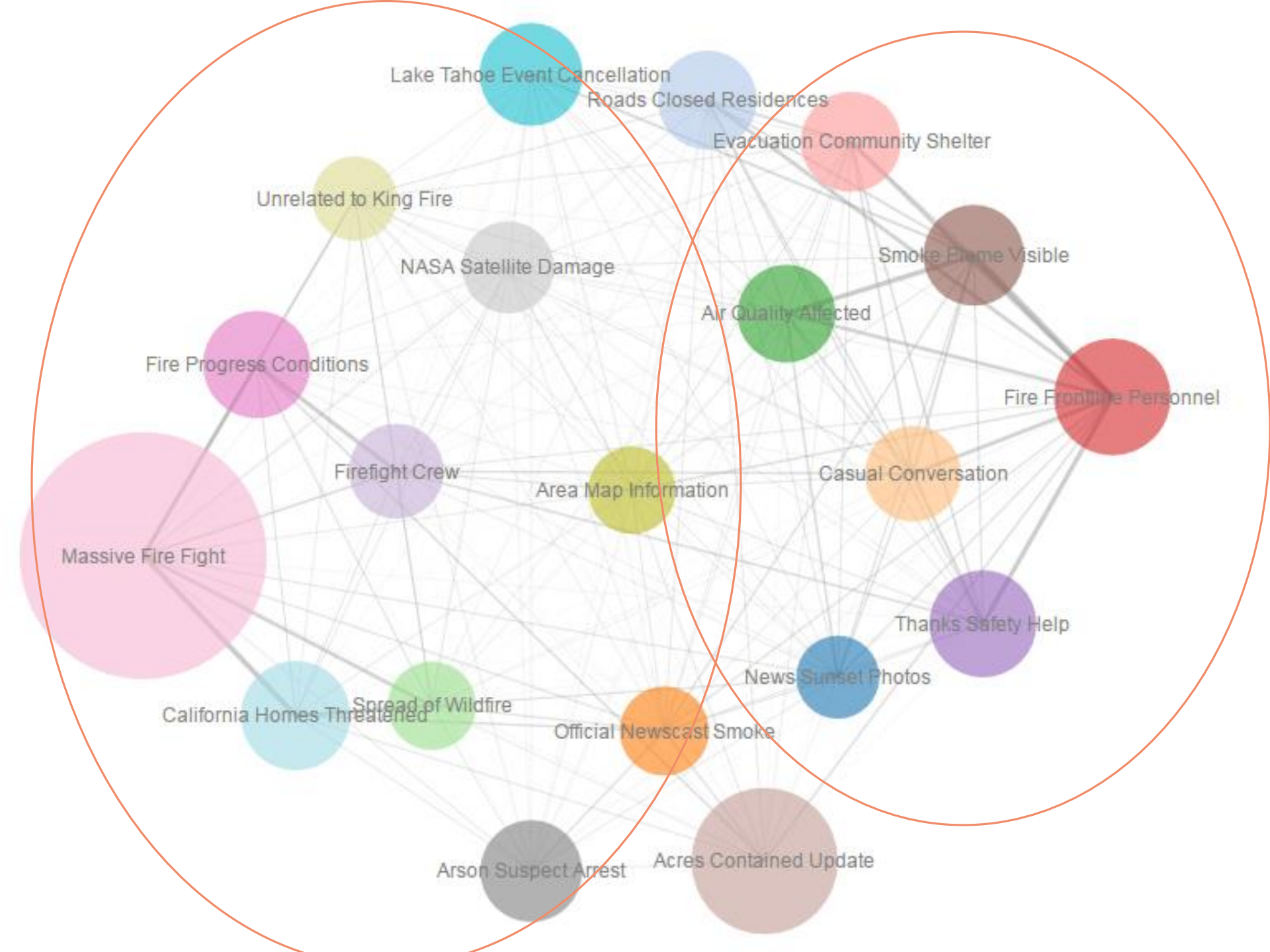
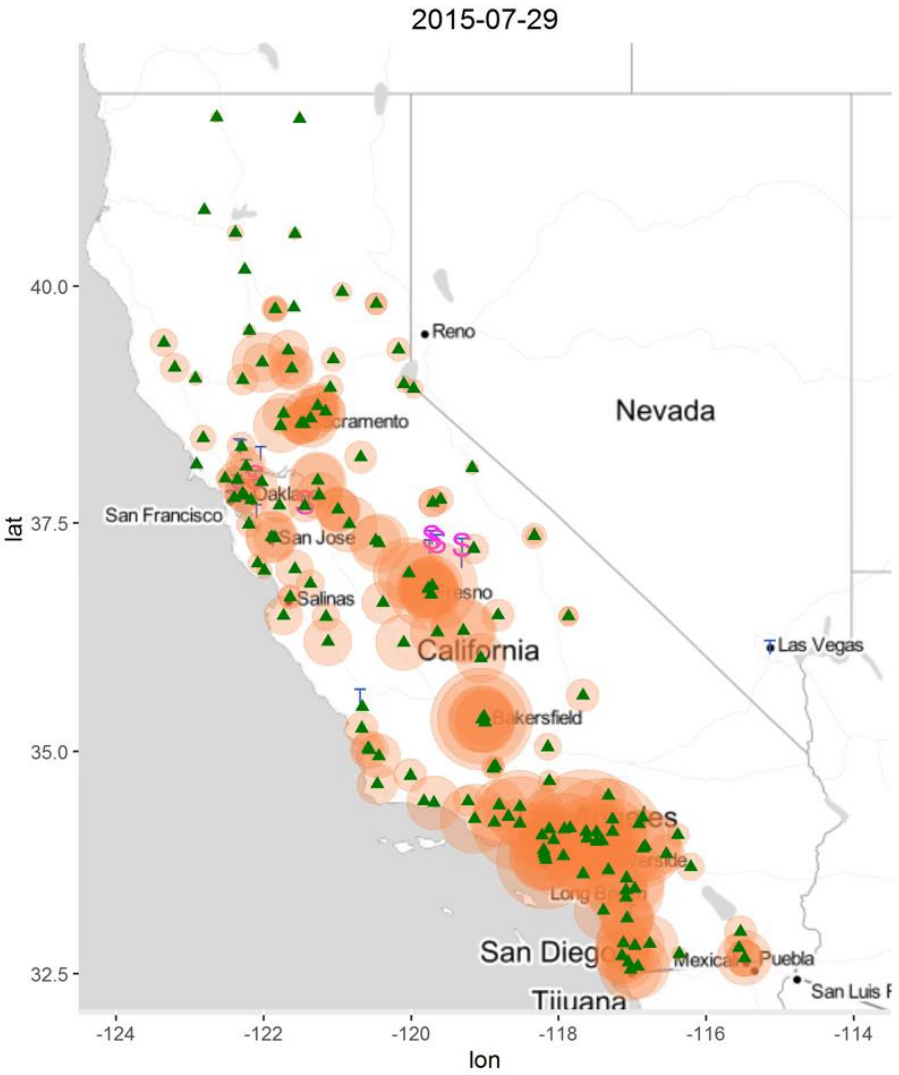

Lake Tahoe Event Cancellation
Roads Closed Residences
Evacuation Community Shelter
Unrelated to King Fire
NASA Satellite Damage
Smoke Plume Visible
Air Quality Affected
Fire Progress Conditions
Fire Frontline Personnel
Firefight Crew
Area Map Information
Casual Conversation
Massive Fire Fight
Thanks Safety Help
News Sunset Photos
California Homes Threatened
Spread of Wildfire
Official Newscast Smoke
Arson Suspect Arrest
Acres Contained Update

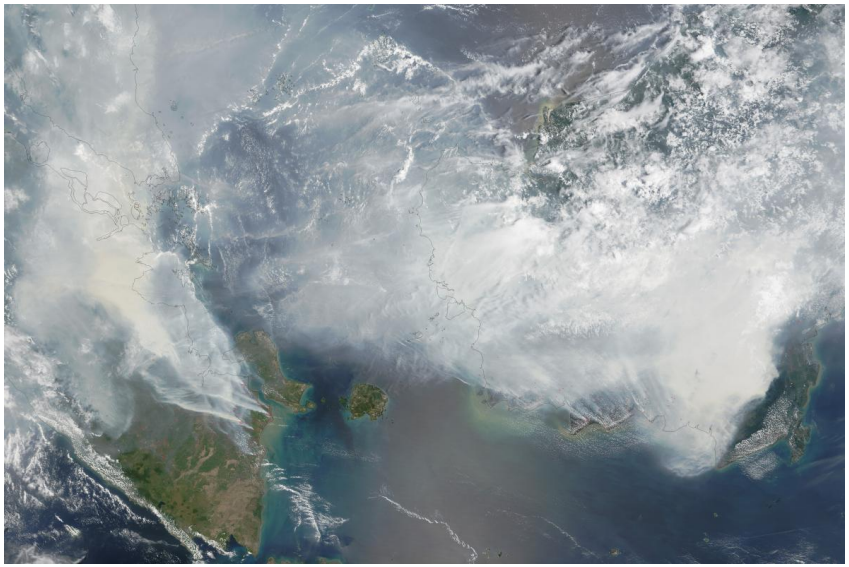
Expanding to Statewide Fires – 2015 Data



- Tweets that discussed smoke more often were better predictors of air quality than others

- Novel approach of combining the content of people's tweets with the location, yields greater insight into areas of concern

Fires beyond the US



- Indonesian wildfires in 2015 have burned 6.5million acres

- Estimates suggest that 100,000 premature deaths could be caused by respiratory effects from wildfire smoke

- Wildfires are not a strict ecological component within tropical rainforests
  - Result from slash and burn practice of deforestation, conversion to farmland

- Our model could be essential in these regions