Climate Change and Wildfires in the United States

"We've got to start confronting climate change with the same level of effort and resources and intensity that we do to fight wildland fires." - *Chris O'Brien, Colorado firefighter of 25 years (The Story Group)*

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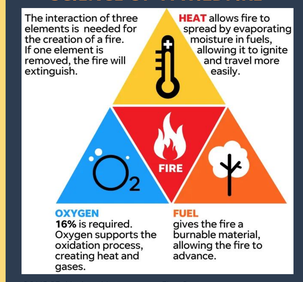
Background & Research Objective

Wildfires are a climate change indicator. As **FIGURE 1** illustrates, wildfire events and level of destruction has been steadily increasing over time. 2015 is recorded as being the most active wildfire year with 10,125,149 impacted acres (NICC).

As shown in the Science of Fire graphic, the three key elements needed for a fire are heat, oxygen and fuel. Removing even one of these elements inhibits the fire. Fuel characteristics greatly influences fire behavior. This is seen in the drought stressed trees that lack spring moisture and are a result of higher than normal temperatures over extended periods. In general, climate change plays a big role in fire behavior. Wildfires today move faster, are more destructive and volatile.

SCIENCE OF A WILDFIRE

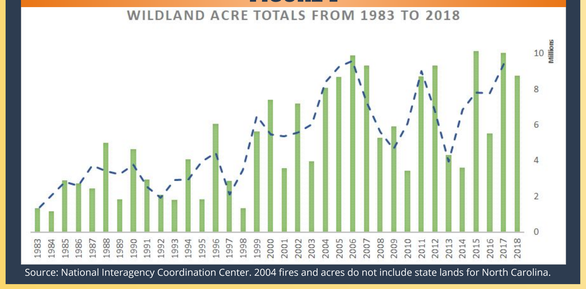


SOURCE: National Interagency Fire Center

California, a very populated state with a long dry season, has been making headlines in recent years. It has been identified as the state most at risk for wildfires. California has developed the perfect fire environment with all three fire elements present. Long, dry summers have increased over time. This has transformed vegetation into the ideal fuel. Then during the fall, strong gusts known as the Santa Ana winds bring dry air from the Great Basin area of the West into Southern California and circulates across the landscape to provide the oxygen (NG). As such, California serves as the focal case for this research.

RESEARCH OBJECTIVE This analysis will **explore the relationship between climate change and wildfires in the US**, with specific interest in California. Utilizing population density, vegetation density and median household income, the research attempts to reason how wildfires can be mitigated for two identified causes, human and nature. Additionally, the research looks to identify the most vulnerable and at-risk populations, regionally and at the census tract level.

FIGURE 1



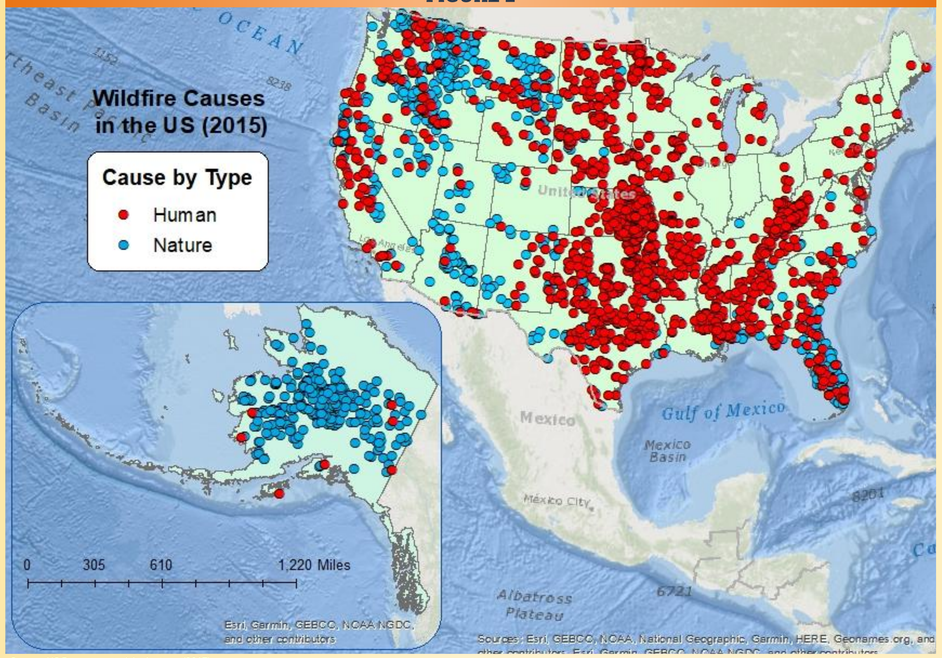
Source: National Interagency Coordination Center. 2004 fires and acres do not include state lands for North Carolina.

Limitations

This analysis is limited in scope in that it briefly looks at the national wildfire situation. It also generalizes vulnerability to median household income and nature-caused wildfire exposure. Opportunities for additional analysis include mapping annual fire suppression costs, average home insurance rates, and the relationship between population, tourism and cause. Additional socioeconomic data such as race and age would also strengthen the vulnerable population narrative.

Data & Methodology

FIGURE 2



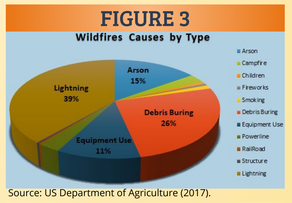
Source: US Department of Agriculture (2017).

The Environmental Protection Agency (EPA) classifies wildfires as natural disasters. However, only 10-15% occur on their own; human actions account for the other 85-90% (NIFC). This research begins by looking at how wildfire incident types, human-caused and natured-caused, are dispersed nationally and at a state level. Human-caused refers to fires sourced directly by individuals through acts of arson, campfires, fireworks, smoking, debris burning, equipment use, and children. Individuals also cause fires indirectly through the following means: downed power lines, railroads, and structures. Nature-caused refers to fires that are a result of lightning; it could be argued that lightning has also been impacted by climate change and therefore has increased in frequency. As mentioned, human-caused fires exceed nature-caused fires. FIGURE 2 uses point location data on wildfire incidents for the US in 2015. It shows that most of the human-caused fires occured in the central region of the country: Texas, Oklahoma, Kansas, Mississippi, etc. These regions also recorded little to no nature-caused wildfires.

The northwest region had the most nature-caused fires incidents. This includes Washington, Idaho, Oregon, northern California, and Montana. Alaska and Florida also recorded a high number of nature-caused wildfires.

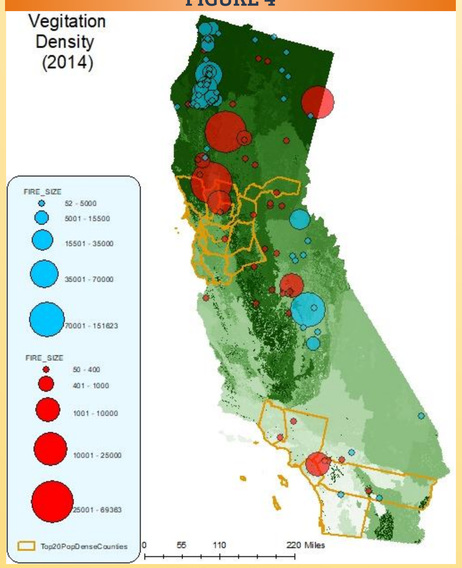
The data in the figure represents 2,752 wildfire incidents that ranged from 50 acres to 321,918 acres. Of those incidents, 39% were caused by lightning, 26% by debris burning, and 15% were a result of arson as depicted in FIGURE 3.

FIGURE 3



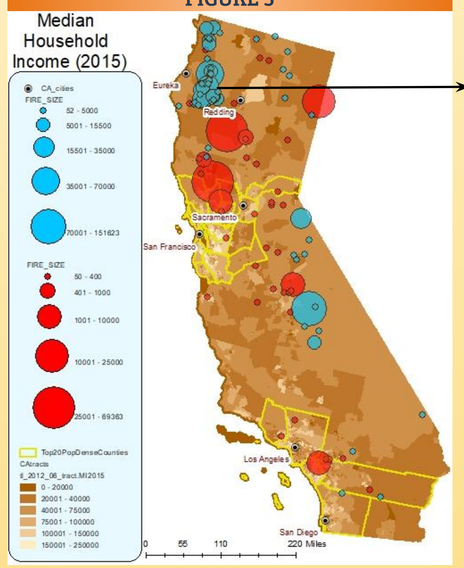
Source: US Department of Agriculture (2017).

FIGURE 4



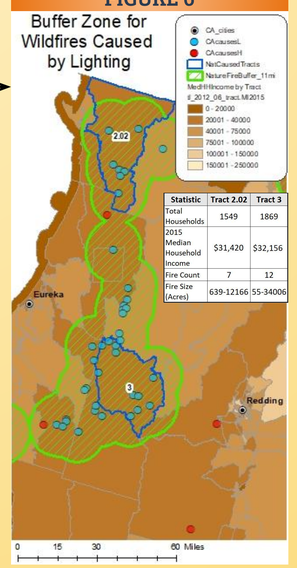
Source: US Census Bureau's TIGER website for county level population data, California Department of Forestry and Fire protection..

FIGURE 5



Source: American Fact Finder for 2015 median household income.

FIGURE 6



Statistic	Tract 2.02	Tract 3
Total Households	1549	1869
2015 Median Household Income	$31,420	$32,156
Fire Count	7	12
Fire Size (Acres)	639-12166	55-34006

Source: American Fact Finder for 2015 median household income.

Findings

As **FIGURE 4** illustrates, human-caused fires predominantly occurred near densely populated regions. Nature-caused fires were clustered in the northern region which is not only less populated but more densely forested. Nature-caused fires were also sprawled across the eastern half of the state. The figure also shows that the largest fires were human-caused and located north of the capital of Sacramento.

The average median household income for the state of California in 2015 was $65,074. Not surprising, **FIGURE 5** shows that the most densely populated regions are coastal and/or are made up of high median household incomes tracts. **FIGURE 6** looks at the northern region where nature-caused wildfires are predominate. A wildfire clearance buffer of 11 miles (7138 acres) is shown and represents the average size of a nature-caused wildfires in 2015. The analysis finds that Census Tract 3 is completely within the wildfire clearance buffer. A look into its socioeconomic factors reveal that this reasonably populated tract has a median household income of $32,156, which is well below the state average, suggesting that there could be an economic barrier for people living in these vegetated and wildfire prone areas. Census Tract 2.2 shows similar statistics. People might also be leaving cities and encroaching into the forested and wildlands of California and placing the region at a higher risk of wildfires. The cost of living in cities might be a deterrent for these vulnerable populations.

Policy Implications

California has fire restrictions in place to mitigate wildfires: 1) residents in some counties are required to have a vegetation and brush-free buffer zone around their home, 2) power is shut down to avoid downed power lines sparks during high wildstorms and 3) campfire and debris burning permits are required. Human-caused wildfire analysis could look into the compliance and effectiveness of these existing measures.

In 2015, federal firefighting costs for wildfire suppression reached $2,130,543,000 and increased to $3,143,256,000 in 2018 (NIFC). Much of the country's resources go to **reactive** measures, like fighting wildfires. Given the change in this new environment (dry, arid, and drought stricken), we will have to change the way we live in it. This entails population relocation and zoning changes, which will impact low income groups the most. Additionally, half of the greenhouse effect is caused by CO2 and an acre of new forest can remove an average 2.5 tons of carbon annually (USFN). Since, the biggest threat to this ecosystem comes from wildfires, more **proactive** measures are needed to lower carbon emissions. This includes investing in green spaces and adopting clean energy measures.

Data Resources & References

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