Background & Research Objective

Wildfires are a climate change indicator. As FIGURE 1 illustrates, wildfires 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 influence fire behavior. This is seen in the drought stressed trees that lack enough moisture and are a result of higher than normal temperatures over extended periods. Additionally, climate change plays a big role in fire behavior. Wildfires today move faster, are more destructive and volatile.

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 gales 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 (O2). 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 a focus on California. In California, we study vegetation density and median household income, the research attempts to reason how wildfires can be mitigated for two identified causes: human and natural. Additionally, the research looks to identify the most vulnerable and at-risk populations, regionally and at the census tract level.

Data & Methodology

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 nature-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, which 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 occurred 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 2,792 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.

Policy Implications

California has fire restrictions in place to mitigate wildfires. 1) residents in some counties are required to have a vegetation and firebreak around a home. A buffer zone is created, 2) fire suppression costs, average home insurance rates, and the relationship between population and wildfires 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 $1,130,548,000, and increased to $1,143,256,000 in 2016 (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 CO2 and CO2 and nitrogen oxides (NOx). 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.

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 wildfires. Opportunities for additional analysis include mapping annual fire suppression costs, average home insurance rates, and the relationship between population and wildfires are required. Additionally, collecting additional socioeconomic data such as race and age would also strengthen the vulnerable population narrative.

Data Resources & References

6. Mayra Garcia. MGA 60710 Geographical Information Systems
7. Chris O’Brien, Colorado firefighter of 25 years (The Story Group)