

Geography 458/558

Bryan Garcia

Justin Hieng

Steven Gin

Alexander Park

Trace Mendez

Wildfire Hazards

Wildfires are uncontrolled fires that occur in the wilderness or countryside. They are also known as forest fires, brush fires, or grass fires. They are categorized by their ability to spread rapidly, consuming both natural and manmade materials in their path. Wildfires are often driven by a combination of factors, including dry weather, strong winds, and availability of fuel in the form of dry vegetation and flammable materials both manmade and natural. The intensity and spread of wildfires depend on several factors, including weather conditions, the type of vegetation involved, the topography and geography of the area, and human activities such as campfires, discarded cigarettes, or arson, as well as natural occurrences like lightning strikes. Wildfires can have both destructive and beneficial effects on the environment. They can lead to the loss of property, the loss of human life, and can damage the ecosystem it is burning. However, they also play a crucial role in certain ecosystems by clearing dead and decaying matter, promoting new growth and maintaining ecological balances.

According to data from 2000 to 2017 collected by the United States Forest Service, around 85% of wildfires are caused by human activity. Sources of anthropogenic wildfires include discarded cigarettes, campfires, debris burn piles, railways and sparks from train brakes, arson, pyrotechnics such as fireworks, and power lines from utility companies. One reason for the majority of wildfires being caused by human activity is the growth in global population as well as the density and distribution of people. There are simply more people in areas that are prone to wildfires and more natural land is being converted to satisfy commercial use. Urban sprawl has created the need for

electricity to be transferred via transmission lines across countries. Urbanisation has also increased the risk to humans from wildfires since more people are living in areas prone to wildfires. Data from the California Department of Forestry and Fire Protection reports that 95% of the top 20 most destructive wildfires in California were caused by human activity. The most common source of these 20 fires was power lines.

When high-voltage power lines touch tree branches or dry grass, electricity can be transferred from the power line to the terrain which can ignite fires and spread rapidly. High winds can also cause power lines to sag and knock down structures that support them, leading to downed lines. Power lines were the source of the 2018 Camp Fire in California, which is the most destructive fire in California history. A Pacific Gas & Electric power line in Butte County sparked a small fire on the morning of November 8th, 2018 and quickly spread. Between the 9th and 17th of November, an average of 13,000 acres were burned per day. This fire also caused a collapse in the nearby emergency alert systems which led to casualties. Cell towers were unable to function properly, understaffed 9-1-1 dispatchers were overwhelmed by thousands of calls, and emergency alerts failed to reach a majority of the nearby residents.

It would be impossible to talk about California wildfires without acknowledging our recent drought history and climate change. Besides this year and last year, we have not had much rainfall due to a lot of factors, including climate change. This created a buildup of dry, chaparral vegetation that fueled the Camp Fire. Activities such as logging also contribute to the probability of a wildfire igniting and the intensity of burn. When trees are cleared, small kindling is left which acts as tinder for wildfires, allowing them to spread rapidly and vigorously.

Hazards Relating to The Ecosystem, Human Life, Economic Impacts, and Psychological Effects:

Wildfires are a formidable natural phenomenon, and are increasingly being influenced by the density and activities of human populations, particularly in areas where infrastructure such as power lines are prevalent. These power lines, often stretched across vast and remote landscapes, have emerged as a significant factor in the ignition of numerous wildfires. In coastal regions, where natural

occurrences like lightning strikes are less frequent, it's the activities of humans that predominantly ignite wildfires. This shift in ignition sources from natural to human made is a concerning trend, reflecting the growing impact of human settlement and activity on the environment. Human actions extend beyond just starting fires. Practices such as overgrazing and making alterations to the natural environment, lead to a cascade of additional hazards. These include landslides, which can devastate communities and ecosystems alike, and droughts, which create a tinderbox for future fires and disrupt water supplies. In areas close to the wilderness or fire prone landscapes, the risks are further increased. Human activities in these zones, including seemingly harmless actions like setting up campfires or carelessly discarding cigarettes, significantly amplify the chances of a wildfire ignition. Such behaviours not only put human life's in jeffa-order, but also threaten the surrounding environment, leading to the destruction of habitats and the loss of biodiversity. The proximity of human settlements to these itch risks areas, combined with the increasing frequency of human induced ignitions, paints a concerning picture. This relationship is a critical area of focus for both wildfire prevention and environmental conservation, as the decisions we make and the actions we take have far reaching implications for both our communities and the natural world around us.

Wildfires present a multi faceted challenge, impacting various aspects of our environment and society. First and foremost are the environmental hazards: wildfires disrupt natural ecosystems, altering habitats and biodiversity. This disruption not only affects wildlife but also poses significant challenges in fire management due to the unpredictable nature of fire patterns. From an economic perspective, the impact is profound as well. Wildfires place a considerable strain on the insurance sector, influencing policies and decisions related to building and land use. This, in turn, affects community planning and development. Wildfires pose a significant risk to humans, as the proximity to fire prone areas inherently increases the risk to human life. Human activities themselves often contribute to the ignition of these fires, creating a cyclic hazard where human presence and actions amplify the risk of wildfires. This interplay between human proximity and activity is a critical area of focus in wildfires prevention strategies. Finally, the psychological impact on communities affected by wildfires cannot be overstated. These events often lead a lasting imprint of trauma and emotional distress, affecting individuals and communities long after the physical flames have been extinguished.

The psychological toll includes everything from immediate stress to long term mental health challenges, underscoring the need for comprehensive support systems for affected populations.

Social Vulnerability Impact

After discussing the 2018 power line fire, the discussion of hazards relating to California, type of insurance are discussed. Another factor discussed involves psychological factors such as trauma. This in turn can result in lower vulnerability to wildfires because place of habitation can change. The amount of vulnerability to wildfires changes on four main factors: disability, minority, socioeconomic status, transportation issues. The amount of people in higher vulnerability places has also increased around the world. This is because of lower prices, and other factors that play a role in raising or lowering one's vulnerability. Sadly it seems people are moving to higher vulnerability places due to lower prices, amazing views. With that in mind the number of people with social vulnerability to wildfires is lower than other states including Washington and Oregon. The number of people in higher vulnerability accounts to 37,000 people, vulnerability can also change due to smoke caused from wildfires.

The damages and impacts of smoke inhalation result in higher emissions of pollution into the atmosphere resulting in lowering life expectancy up to a year. The amount of pollution emitted due to wildfire was an astonishing 1.2 million tons. In regards to smoke inhalation, the damages include respiratory failure, asthma attacks, trouble breathing. The social vulnerability index shows how California has lower SVI than Oregon and Washington however. Another factor that influences a person's social vulnerability is access to political, economic resources that would support a community and lower certain impacts. Also mentioned in recent studies was that the amount of residents 65 or older were in areas with higher vulnerability. This is a problem because most senior citizens, people living in mobile homes don't have the economical power to protect themselves, buy the insurance needed for protection. The need for insurance in certain areas is higher, however combating certain areas can lower the need. By combating certain areas the chance for lower vulnerability is implemented however data for these topics has not been looked at. . In the end people are moving into higher vulnerability places which is why combating and wildfire readiness is an important topic.

How we respond or combat wildfires

Wildfires can impact our lives, but they can be responded to and we can combat them. A way that we can combat wildfires is with suppression and a confinement strategy. Suppression helps to manage a wildfire or stop the movement or extinguish a wildfire. A confinement strategy helps to contain wildfires so they don't spread out more. Wildfires don't need to be put out if they have beneficial effects and if they don't pose a risk. These types of wildfires can be monitored and allowed to spread. When responding to wildfires, they should be responded to safely and effectively. We can manage wildfires by reducing their fuels and help to restore ecosystems. To prepare for wildfires we can look at current weather conditions and warnings. An example of this is that we should avoid hot, dry, and windy weather conditions when making a fire. Also, we should look out for early warnings of wildfires. If we see a wildfire we can report it and we should find shelter to keep ourselves safe. Some important things to consider with wildfires is that we can take protective measures against them, so that we can reduce damages to property and lessen how much they spread. It is also important that we have evacuation kits ready and we should move combustible items away from where they pose a greater risk.

There is a way that we can respond to wildfires when it comes to our property, we should fireproof our property. Fireproofing involves lessening the flammable materials we have so we can slow down fires. Fireproofing your property involves hardening your home, making a defensible space, using fire prevention tools, and reducing fire dangers. Hardening your home means using fire-resistant building materials and having a fire-safe design which includes both the indoors and outdoors of your property. Making a defensible space means that you should create a defensible space around your property and you should use fire-resistant plants. Using fire prevention tools means that you should know how to properly use the fire prevention tools you have on hand. Finally, reducing fire dangers means that you should exercise extra caution with cigarettes, e-cigarettes, and lithium batteries.

2020 August Complex Fires:

The August Complex Fires of 2020 started on August 17 with a dry thunderstorm starting at least 13 fires. The Complex fire would last until November 12th when the Forest Service reported that the containment of the fires was at 100%. As the thunderstorm in mid-August kept going, it only made the conditions of said started fires worse. It is estimated that by 5 pm EDT. Aided by winds and dry conditions, eventually, the 13 fires grew into 20 fires. One of the main fires of the complex, the Doe fire would already have grown to 550 acres. By August 20th, the fires had increased to 35 and the total would be 63,030 acres. On August 24 two additional fires had started, leading to the total fires being 37 and the overall acres to 177,750. The Doe fire eventually absorbed 2 other fires and was seen as the major fire as it was 153,083. By August 27th, the complex was overall 200,467 and the Doe fire was about 162,326 and only 31 percent was contained. In October the total acres burned was 1,002,097 which would make the August complex fire the first “giga fire”. The rainy weather being delayed due to the droughts that have been ongoing for a couple of years in California led to unfavorable conditions that prolonged the fire until November. On November 12th, the Forest Service reported that the August fire had finally reached 100% containment.

Management was a difficult part of this fire as it spanned many counties and was in different jurisdictions. Some of the fire was in areas of the California Department of Forestry and Fire Protection (CAL FIRE) and the other parts of the fire were under the jurisdiction of the National Forest Service (NFS). Not only did the fire get managed by these two organizations but the fire was also going to hit tribal lands which complicated things further as they needed to discuss with the tribes themselves. These factors would only lead to making the August Complex Fires much harder to control as many different organizations would need to work together to get it under control.

While the fire was mainly in a pretty remote area, there were still many casualties that civilians had to bear. Although no civilian lives were taken, at least 1 firefighter died 2 were

severely injured and 935 structures were destroyed (Los Angeles Times, 2020). The fires overall would cost more than 319 million dollars in damages. All this led to a discussion in fire management specifically within fuel management. Since the fires there have been many reductions within the areas that are susceptible to wildfires, one of these approaches that has seen success would be the removal of basal area reduction treatments. These treatments would get rid of basal and in areas in which they got rid of it, it would show lower areas of burn.

Works Cited

Arash Modaresi Rad *et al.* Social vulnerability of the people exposed to wildfires in the U.S. West Coast states.*Sci.Adv.*9,eadh4615(2023).DOI:[10.1126/sciadv.adh4615](https://doi.org/10.1126/sciadv.adh4615)

Chakraborty, Tridib, and Jordana Composto. “California in Flames: A Literature Review on the Causes and Effects of Wildfires.” *Journal of Student Research*, 4 Dec. 2023, www.jsr.org/hs/index.php/path/article/view/2653.

Darling R, Hansen K, Aguilera R, Basu R, Benmarhnia T, Letellier N. The Burden of Wildfire Smoke on Respiratory Health in California at the Zip Code Level:Uncovering the Disproportionate Impacts of Differential Fine ParticleComposition. *Geohealth*. 2023 Oct 19;7(10):e2023GH000884. doi:10.1029/2023GH000884. PMID: 37869264; PMCID: PMC10586090.

National Interagency Fire Center. “Wildfire Investigation.” *Welcome to the Nation’s Logistical Support Center*, www.nifc.gov/fire-information/fire-prevention-education-mitigation/wildfire-investigation. Accessed 6 Dec. 2023.

Mendocino National Forest - Home. Forest Service National Website. (n.d.).

<https://www.fs.usda.gov/detail/mendocino/home/?cid=FSEPRD860382>

CAL FIRE - Forest Health Program. (2022, August 23). *August complex*. ArcGIS

StoryMaps. <https://storymaps.arcgis.com/stories/1a0a88e7872e48919831793fd496b814>

Los Angeles Times. (2020, September 10). *Massive august fire now largest in*

California history, at 471,000 acres and counting. Los Angeles Times.

<https://www.latimes.com/california/story/2020-09-10/massive-august-fire-now-largest-in-california-history-at-471-000-acres-and-counting>

August complex wildfire and the Round Valley Indian Reservation in Northern

California. RHHub Emergency Preparedness Toolkit. (n.d.).

<https://www.ruralhealthinfo.org/toolkits/emergency-preparedness/case-studies/natural-disasters/round-valley-indian-reservation>