CLIMATE CHANGE & FIRE

Climate change is increasing the size, frequency, intensity and seasonality of wildfires. Climate scientists have already identified the telltale climate fingerprints on some of the biggest blazes of the past decade:

- Climate change has already increased the frequency of fire weather — hot, dry, and windy — in much of the U.S. (Abatzoglou, Williams, and Barbero 2018).
- Climate change has doubled the area burned in the Western United States (Abatzoglou and Williams 2016).
- The fire season has increased by more than two months in the Western United States, largely due to climate change Westerling et al. 2006).

All fire needs to burn is an ignition source and plenty of fuel. While climate change might not ignite the fire, it is giving fires the chance to turn into catastrophic blazes by creating warmer temperatures, increasing the amount of fuel (dried vegetation) available, and reducing water availability by earlier snowmelt and higher evaporation. These infernos have dire consequences – from respiratory illness to loss of life and property, many communities are not equipped to deal with this new era of mega fires.

"What we're seeing in California right now is more destructive, larger fires burning at rates that we have historically never seen."

- Jonathan Cox, Assistant Chief with San Mateo County Fire Department / CAL FIRE (Fritz 2018)

REGIONAL SPOTLIGHT

- In the Western US, climate change has increased the risk of fire weather fivefold (Tett et al. 2018) and has doubled how much land has burned (Abatzoglou and Williams 2016). In the Western US, wildfire frequency has quadrupled since the 1980s, and fire season has increased by 78 days, changes which are largely linked to warmer temperatures and earlier snowmelt (Westerling et al. 2006). Both warmer temperatures and earlier snowmelt for this region has been attributed to climate change (Bonfils et al. 2008; Hidalgo et al. 2009).
- In California, climate change has increased fire risk (Yoon et al. 2015). The combination of climate change and human practices such as urbanization have increased the frequency of wildfires, particularly along the southern coast and the southwestern Sierras (Mann et al. 2016). Increased aridity, in summer and, to and extent, fall, has increased fire activity in forested areas (Williams et al. 2019). In urban areas in coastal Southern California, the interacting effects between urbanization and climate change have reduced summertime cloud cover, which warms and dries the surface, leading to an increase in burned area (Williams et al. 2018). In California, 15 out of the 20 largest fires since the 1930s have occurred since 2000 (CalFire 2019).
- In Alaska, climate change has increased the risk of severe fire seasons by 34%-60% (Partain et al. 2016). Additionally, there is evidence that lightning strike frequency increases by 12% per degree Celsius (Romps et al. 2014). In interior Alaskan boreal forests, lightning strike frequency is the main driver of fires (Veraverbeke et al. 2017).

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HOW DOES CLIMATE CHANGE AFFECT WILDFIRE?

Fires are integral to a natural, thriving ecosystem. However, climate change-fueled fires can have disastrous consequences. Climate change is exacerbating droughts and leading to extreme fire-weather conditions with high temperatures, low humidity, and low vegetation moisture. In these conditions, fires not only occur more frequently, but burn more intensely over larger areas.

1. Climate change has significantly increased air and land temperatures in the US. These higher temperatures can make droughts worse. Warmer winters also mean less snowpack or earlier snowmelt (land ice and snow cover decline; snowpack decline; snow melting earlier and/or faster), while warmer summers mean higher evapotranspiration – further increasing land surface temperature and drying out already parched soil and plants. It's also changed seasons, increasing the length of the fire season. These conditions, along with high winds, can lead to record-breaking wildfires. In some cases, the extreme heat and dryness can cause explosive fires that burn hundreds or thousands of acres in just a few days.

2. Climate change is also changing certain precipitation patterns - making some areas drier than before. Precipitation in the Southwest is heavily influenced by El Nino; there is some evidence that climate change may be making El Nino (and La Nina) more extreme. Precipitation in California is also heavily regulated by temperatures in the Pacific Ocean; warmer sea surface temperatures driven by climate change can block rain from reaching the state.

3. Warmer and drier conditions significantly weaken certain tree types, rendering them less resistant to bark beetle. As bark beetles burrow into conifers, they kill the tree. When a fire ignites, then, there is ample fuel.

WHAT ABOUT OTHER HUMAN ACTIVITIES?

Climate change on its own doesn't create wildfire-driven disasters – it is the combination of climate change and human land-use and forest management which can make fires more severe, and the exposure to and vulnerability of populations to that fire. There has been more building near forests, or in woodland-urban-interfaces (WUIs), which increases how exposed communities are to wildfires – as happened with the 2018 Camp Fire. Additionally, while affluent communities tend to live in greater risk zones, communities of color and low-income communities are particularly vulnerable to fire due to lack of access to insurance, emergency fire response, and fuel removal (Davies et al. 2018). In ponderosa pine forests, the historical use of fire suppression has led to a buildup of fuels, increasing both the risk of severe fire and the exposure of communities to those fires. Couple these activities and trends with hotter and drier conditions due to human-caused climate change, and you have a recipe for disaster.

Yet human land-use practices alone cannot explain the devastating infernos of the past decade – these would not be possible without human-driven climate change.

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For more information, visit climatesignals.org/climate-change-fire

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