TECHNICAL BRIEF

# Understanding Wildfires

Wildfires are unplanned and unwanted fires that uncontrollably burn areas with combustible vegetation. Wildfires are active, year-round, throughout the world. In general, fires in wildland, can create many environmental benefits, such as improving wildlife habitat, promoting certain vegetation growth, and reducing fuel source for severe wildfires. However, danger begins when fires turn into an uncontrollable wildfire where it threatens lives, communities, and natural and cultural resources. Wildfires are a force of nature that can be impossible to prevent and as difficult to control as hurricanes, tornadoes, and floods.[1] Wildfires can start from lightning, an unauthorized human activity, or an escaped prescribed fire project.[2]

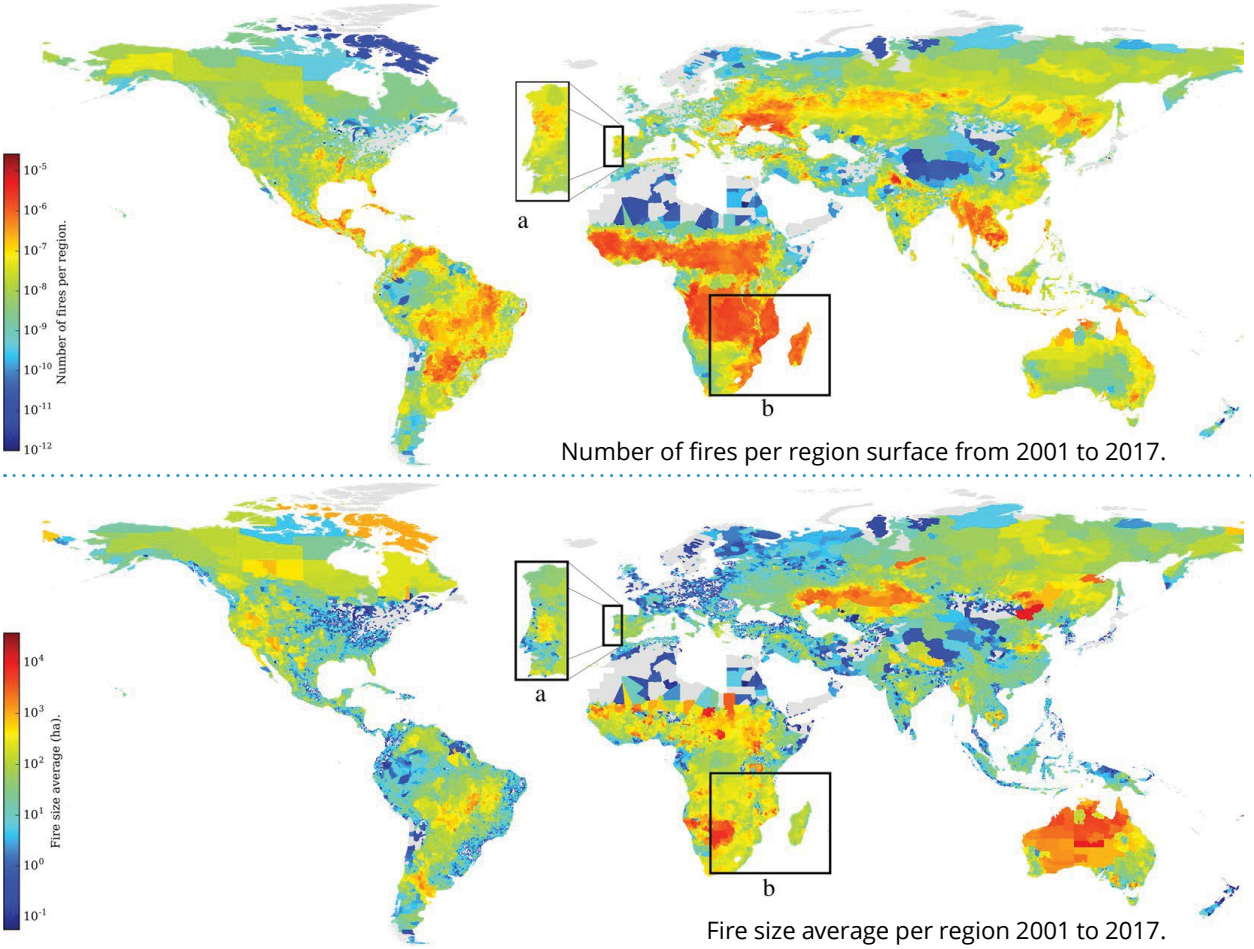


**Figure 1: Global fire activity, fires (top) and fire size (in hectares, bottom) from Artes et al.[3]**

The forest service within the U.S. Department of Agriculture manages 193 million acres of the National Forest system, and the Department of the Interior manages 400 million acres of national parks, wildland preserves, and Indian reservations.[2] Many fires occur in relatively undeveloped areas with little impact to human development or communities, however, fire departments across the U.S. are increasingly being called to respond to wildland urban interface (WUI) fires.[4] WUI is the zone of transition between unoccupied land and human development, the zone where structures and other human development intermingle with undeveloped wildland or vegetative fuels. One out of every three homes, more than 46 million residences in 70,000 communities across the U.S., are at risk for WUI fires.[4,5] Growth in WUI pose two problems related to wildfires: 1) there will be more wildfires due to human ignitions, and 2) wildfires that occur will pose a greater risk to lives and homes, they will be hard to fight, and difficult to allow for prescribed burn and natural fires to burn and reduce fuel builtup.[5]

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## Wildfire Statistics

Wildfires are unpredictable, meaning the annual fire count and the acres burned are considered random or by chance (Figure 2.) The National Interagency Fire Center (NIFC) has compiled annual wildland fire statistics for federal and state agencies since 1983, and key statistics and findings are below:

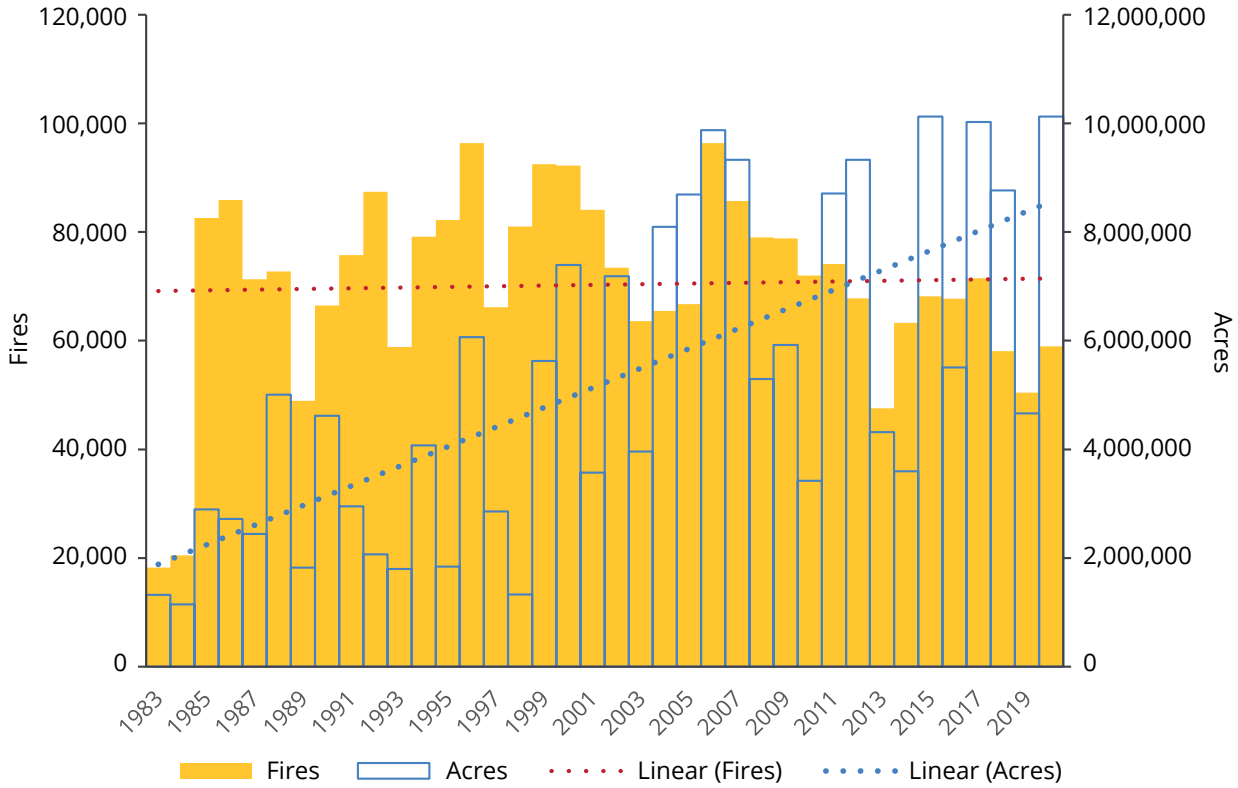


**Figure 2: Annual wildfires and acres burned since 1983. Data from the National Interagency Fire Center.**

- Over the past 10 years (2011-2020), there was an average of 62,769 wildfires annually and an average of 7.5 million acres impacted annually.[6]
- Over the past 30 years, the number of fires has been relatively consistent (Figure 2 fires trend line), however, the acres burned (Figure 2 acres trendline) have been increasing.
- Over the last five years, on average, Forest Service and DOI agencies, combined, spent $2.3 billion in wildfire suppression cost.[6]
- In 2020, more than 58,950 wildfires burned 10.1 million acres, the most acreage impacted in a year.[6]
- Most wildfires are human-caused (88% on average from 2015 to 2019,) although the wildfires caused by lightning tend to be larger and burn more acreage (55% of the average acreage burned from 2015 to 2019 was ignited by lightning.)[2]

## Wildfires by Region

- More wildfires occur in the East (including the central states,) but the wildfires in the West are larger and burn more acreage.[2]
- In 2020, nearly 40% of acres burned were in California.[2]
- Six of the largest California wildfires occurred in 2020.[7]
- Among the top reasons for wildfires in California in 2020 were severe drought and heat. In August 2020, the Northern side of the state saw a massive thunderstorm that delivered very little rain and more than 11,000 lightning strikes, which ignited approximately 300 blazes including the August Complex wildfire.[8]
- In 2019, more than 29,600 fires burned 0.6 million acres in the East, compared with nearly 21,000 wildfires that burned 4.1 million acres in the West.[2]
- The acreage burned in Alaska in 2019 (2.5 million acres) accounts for more than half the acreage burned in the West (Figure 3.)[2]

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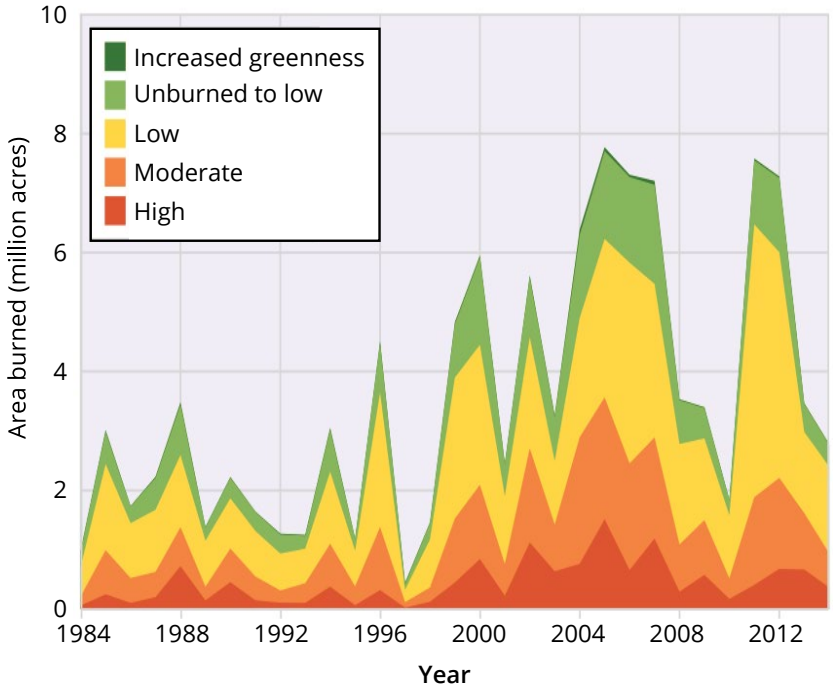


Data source: MTBS (Monitoring Trends in Burn Severity). 2016. MTBS data summaries. www.mtbs.gov/data/search.html

**Figure 3: Damage caused by wildfires in the U.S. (1984-2014) obtained from U.S. EPA[9]**

## Climate and Consequences of Wildfires

- Predicting which fires will end up extensive and very damaging is challenging and depends on a multitude of factors, such as weather and geography.
- The number of wildfires is expected to grow with the increasing global average temperature and extreme weather events resulting in more heatwaves and droughts.[10] This leads to tinder-dry conditions and stress on power grids.
- The increase in Western U.S. wildfire has been attributed to warming temperatures through winter snowpack and summer evaporation, and also can be attributed to a decline in summer precipitation.[11]
- In the U.S., nine out of 10 years with the largest acreage burned have occurred since 2000. This period coincides with many of the warmest years on record nationwide.[9]
- Acreage burned does not indicate the severity of the wildfire or the degree of impact to the forest, soils, or any other ecological effects. The burned land suffering severe damage has increased from 1984 to 2014.[9]
- Wildfires emit significant amounts of air pollutants: particulates smaller than 2.5 microns that can be inhaled to our lungs and to our bloodstream for those in nanoscale, and gaseous chemicals associated with combustion including carbon monoxide, methane, nitrogen oxides, hydrogen cyanide, nitrates, formaldehyde and other aldehydes, benzenes, xylenes, and toluene.[12]
- Wildfire smoke exposure is associated with respiratory morbidity and all-cause mortality.[13]

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