April 2024

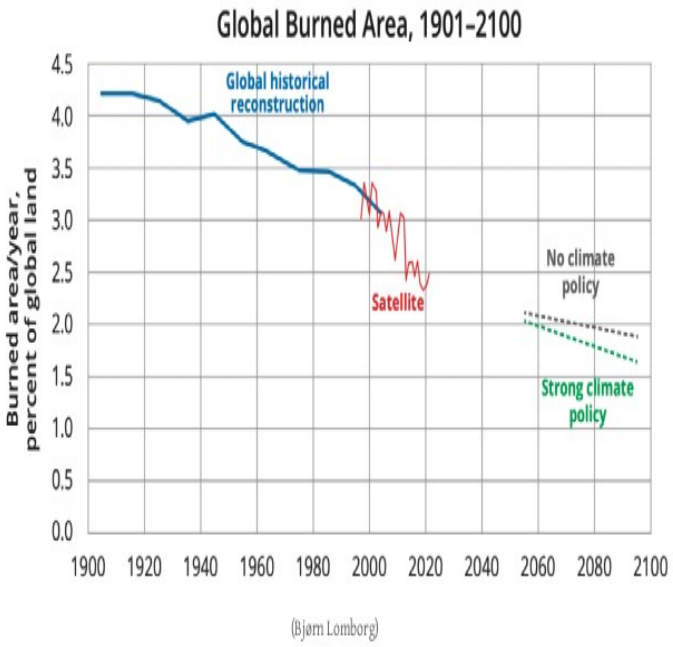
CliSciPol

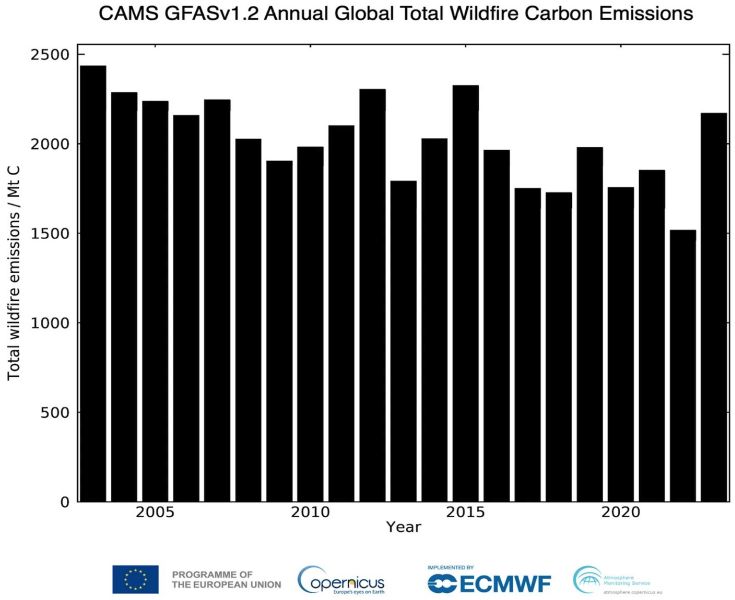
Climate Science and Policy for Nonscientists

One picture is worth a thousand words.

WILDFIRES—TRENDS, CAUSATION, ADAPTATION

This dataset shows global area burned per year declining and predicts this decline to continue. The most recent 30 years of data is high quality from satellites. AR6 states that, "at the global scale, the total burned area has been decreasing between 1998 and 2015 due to human activities mostly related to changes in land use," (WGI p.1600), but also states that wildfire does "not show a clear long-term trend for the world as a whole because of increases and decreases in different regions." (WGII p.244). Wildfires are increasing in frequency in some regions, such as California, and remain a serious threat in some regions, such as Hawaii.





Wildfires emit substantial amounts of CO2. The extent of vegetation burned can be determined by measuring total CO2 emissions from such burning. This dataset for the last 20 years shows such emissions are slightly declining, which indicates that the quantity of vegetation burned is declining.

The IPCC concludes that in some regions there will be an increase in "fire weather" (AR6 p. 25, 109), which is defined as "conditions conducive to triggering and sustaining wildfires." (AR6 p.2229). AR6 finds that fire weather, as a "climatic impact-driver," has not yet emerged and is not expected to emerge by 2100. (AR6 p.1856). AR6 also makes clear that an increase in fire weather does not necessarily mean an increase in wildfires. (See quotes in image). The contribution of climate change to wildfires is uncertain. AR6 only claims that some wildfires can be "partly attributed" to climate change. (AR6 WGII p.54)

AR6 COMMENTS ON THE RELATIONSHIP BETWEEN FIREWEATHER AND WILDFIRES

"The relationship between temperature and dryness, and wildfire, varied with ecosystem type, and the fire-climate relationship was nonstationary and vegetation-dependent." (AR6 p.1600)

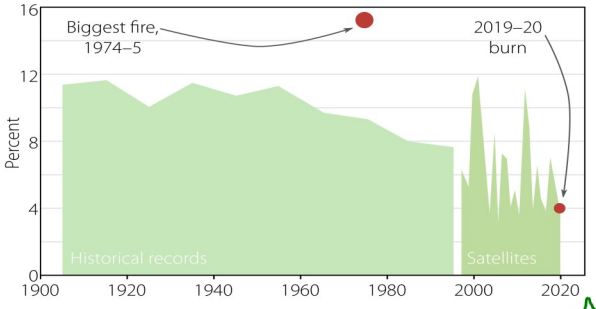
"Fire weather does not include the presence or absence of fuel load. Note: distinct from wildfire occurrence and area burned." (AR6 p.1776)

"Wildfires highly depend on land use and appropriate management." (AR6 p.1817)

One paper cited notes "the difficulty in establishing the link between past climate and wildfire trends due to human activities and vegetation changes." (AR6 p.1838)

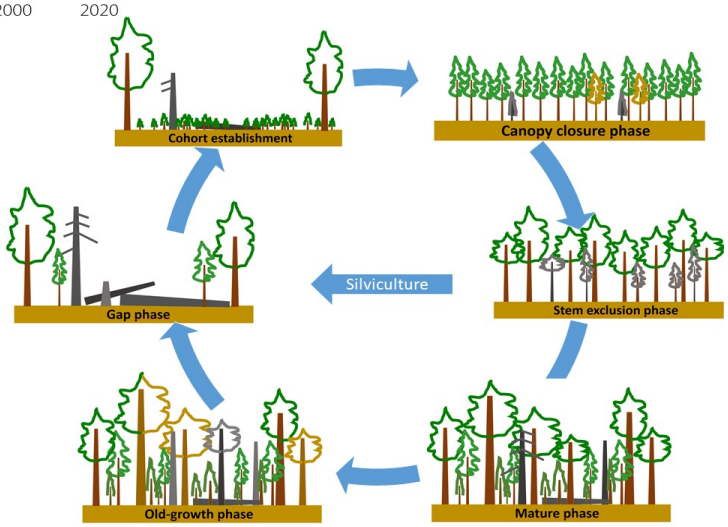
"Fires are not only a natural process but are also affected by deforestation and other human influences." (AR6 p.1850)

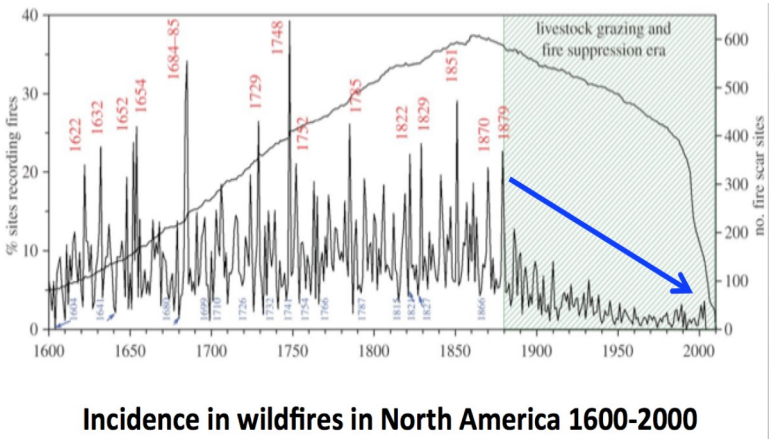
Figure 24: Australian area burned by wildfires, 1900–2020.
Percentage of total land area of 769 million hectares; estimates by decade 1900–2000, satellite measurements 1997–2020 with linear best trend. Source: Bjørn Lomborg.[64]



For example Australia has a hot, dry climate, which has been getting hotter. Australia has had a serious problem with wildfires for many years. But the area burned per year has been declining with significant variation recently from year to year.

Wildfires are part of the natural life cycle of forests, a "natural and essential part of many forest, woodland and grassland ecosystems," and "Many forests and grasslands naturally require fire for ecosystem health." (AR6 WGII p. 247). An average acre of forest can sustain only about 80 healthy trees, but trees continue to seed themselves. Forests become too dense and choke themselves. Trees dry out, become diseased, die, and become vulnerable to fire, which then clears the land and allows a new forest to be born.

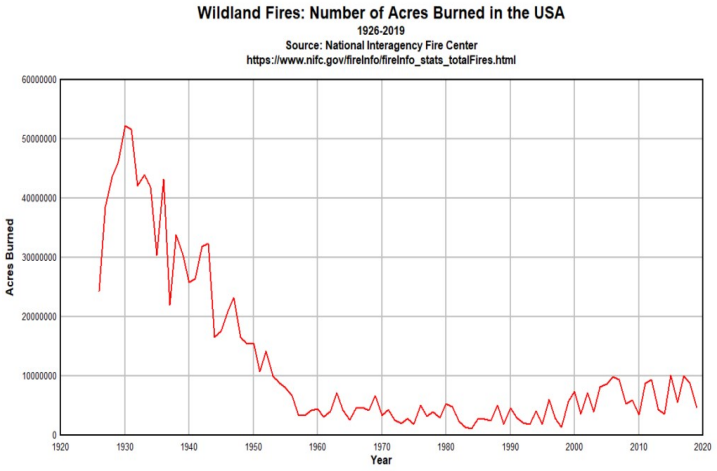




Incidence in wildfires in North America 1600-2000

Reconstructions indicate that wildfires in North America were much more common in the 1700s and 1800s than since 1900. When forests are cut down for farming and for grazing, the incidence of wildfires tends to be reduced.

Since 1900 area burned in the US was high from 1925 to around 1950. After peaking around 1930, it declined through 1984, and, since then, has trended upward, although still much less than in the 1925-1950 period.



The New York Times.

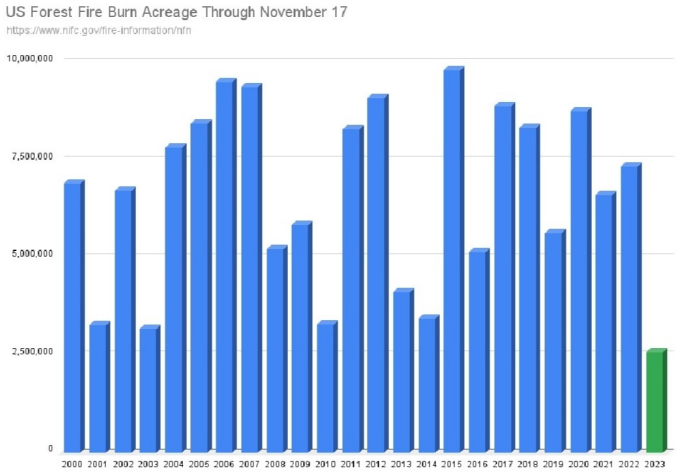
FRIDAY, SEPTEMBER 21, 1945

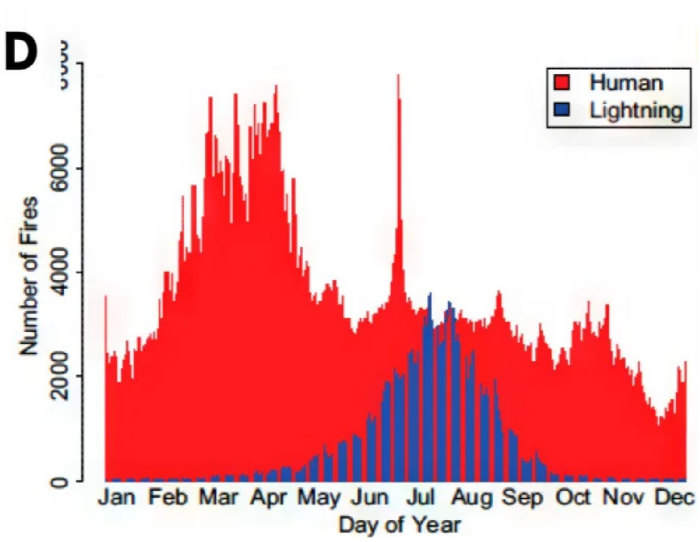
Forest Fires Rage in California

SAN FRANCISCO, Sept. 20 (AP) — Flames of twenty-five forest fires swept through forest and range lands of northern California today, adding to the estimated $3,000,000 damage done by 6,500 separate blazes in the State this year. All logging operations were ordered shut down and every available man and piece of equipment went to the fire lines. Between 30,000 and 40,000 acres of virgin redwood and fire tracts were reported burned in Mendocino

Wildfires have long been a serious problem in the US West. The "Big Burn" in 1910 in Idaho and Montana wiped out 7 towns and killed 87. The attached New York Times article describes wildfires in California in 1945 when there were "6,500 separate blazes." California has a long history of disastrous wildfires dating back centuries.

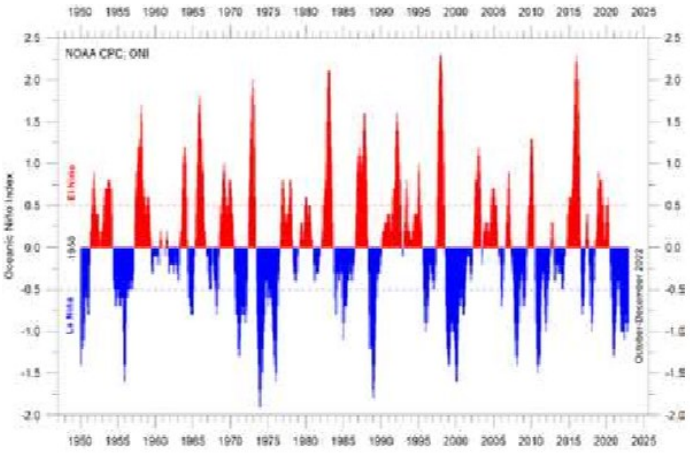
Since 2000, there has been significant variation in US area burned from year to year with 2023 being a low-burn year despite the Maui Wildfire, which, although very deadly, was relatively small in area.

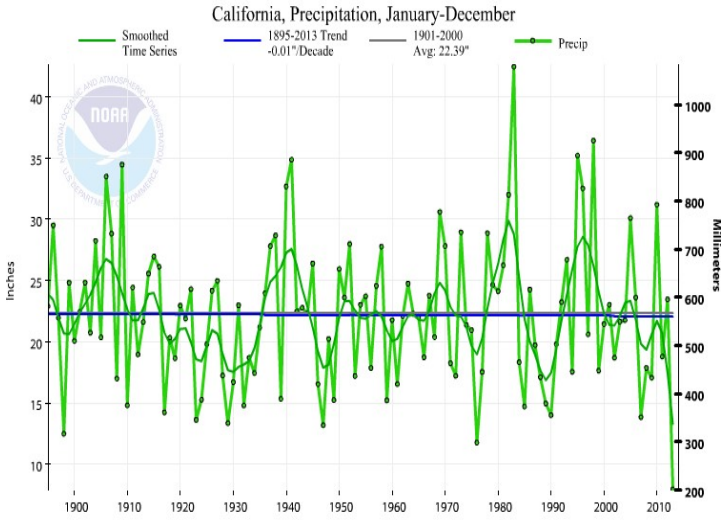




Very hot, very dry, areas tend to be deserts with no wildfire problems, because there is very little fuel and few people to ignite fires. Globally over 80% of all wildfires are ignited by people. The figure for the US is 84%. (See image).

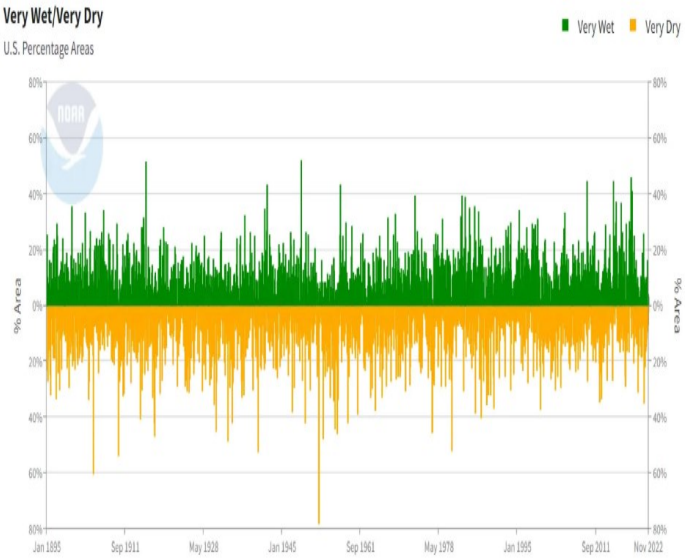
High risk regions tend to be regions where rain and dryness alternate. The rain produces growth, but then dryness causes the growth to die, creating ideal fuel for fires. The variation can be in terms of a number of years, as with the El Nino cycle (AR6 WGII p.245), or the variation can be seasonal, e.g. a wet spring followed by a dry summer.

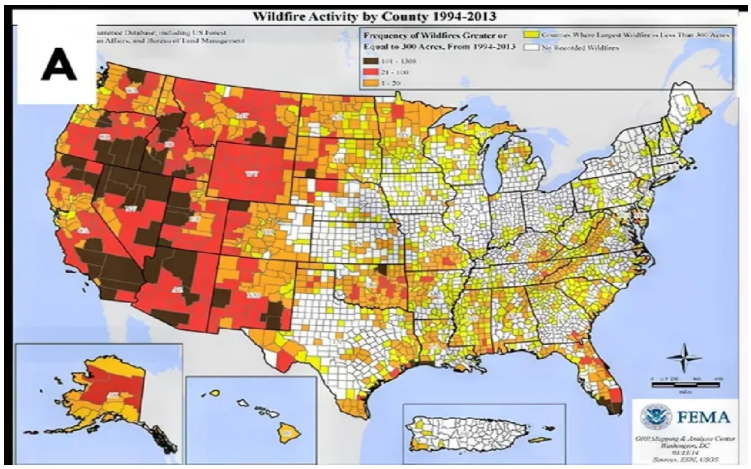




Precipitation and drought in California have been highly variable due to the El Nino cycle, which has nothing to do with climate change, but which exacerbates the wildfire problem.

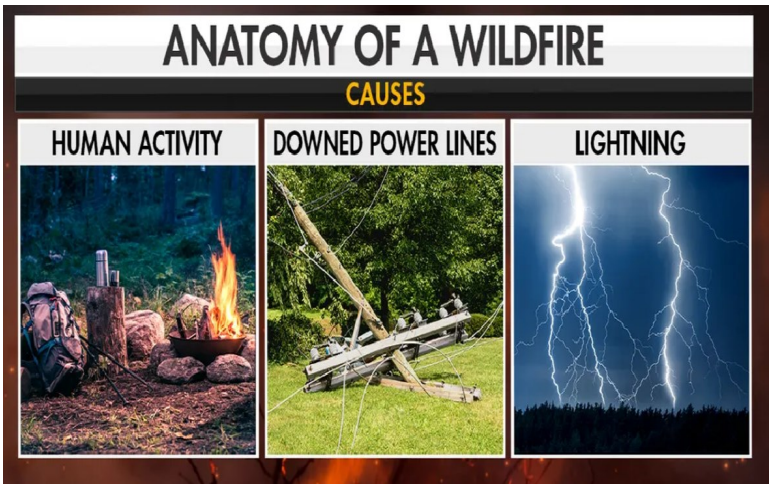
Since 1895, the continental US has shown no trend in the percentage of land either very wet or very dry, but there has been significant variability from year to year.

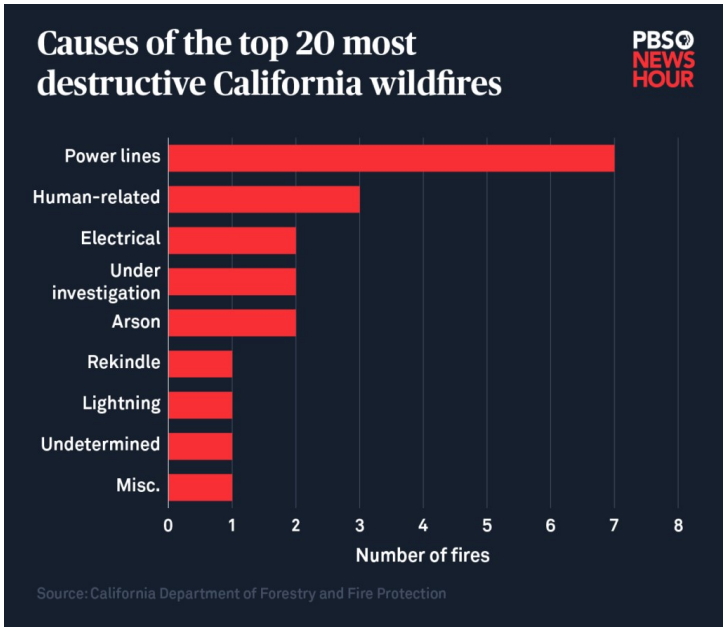




The wildfire problem in the US is a West Coast problem, a regional problem, and particularly a California problem in terms of the impact on the human population.

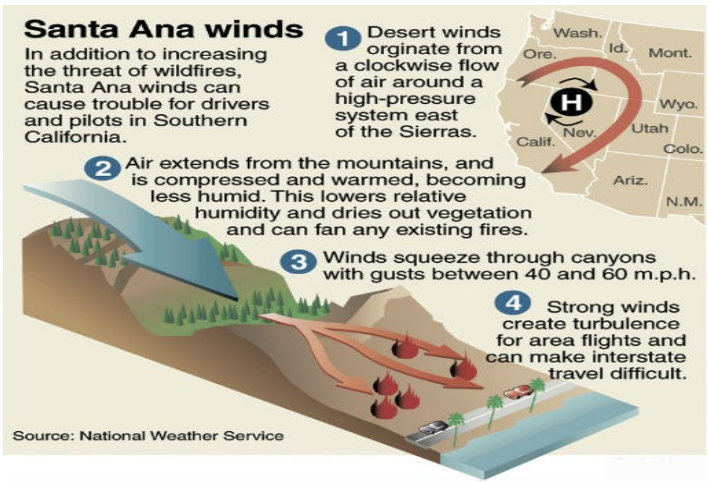
Much effort has gone into identifying the causes of wildfires. Downed power lines have caused numerous wildfires in California and caused the 2023 Maui/Lahaina wildfire.





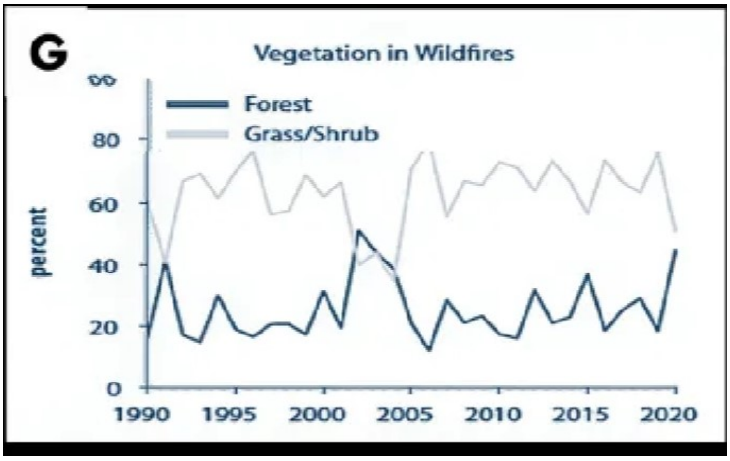
The California Department of Forestry and Fire Protection has summarized the causes of the 20 most destructive California wildfires, and has not attributed a singe one to climate change.

Two different types of fires are distinguished: (1) Wind-driven fires on coastal shrub land or chaparral (typical of Southern California where the Wildland-Urban Interface is expanding significantly, and (2) traditional fires in forests (typical of Northern mountainous California where there are relatively few people. Chapparal is “scrubland,” where the ground cover is shrubs, bushes, and small trees usually less than about 8 feet tall.



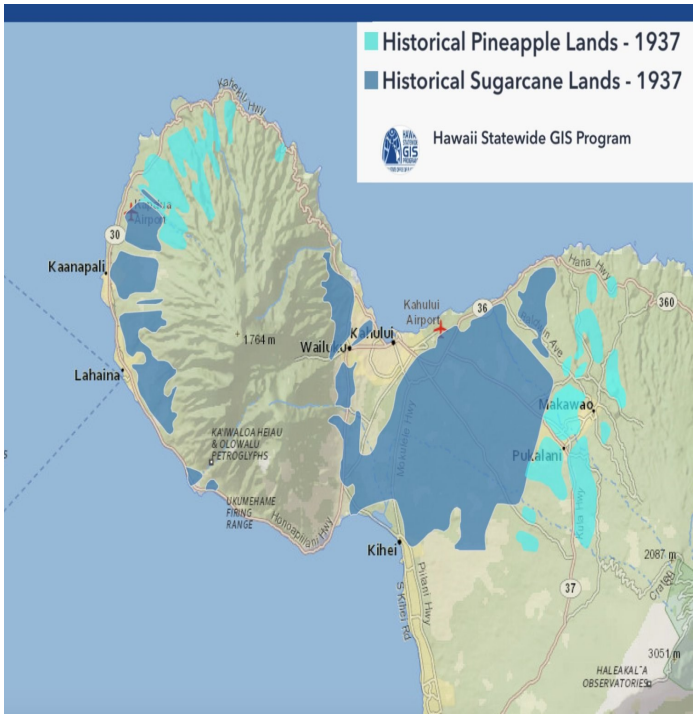
In Southern California the Santa Ana Winds can fan and drive scrubland fires towards residential areas along the coast making them very destructive and hard to control.

Invasive grass species are significantly increasing wildfire risks in California, Hawaii, and other regions. The image is of cheatgrass, which came from Eurasia, and which is taking over large areas in Southern California. In the US it grows rapidly in the spring and then dries out and dies by June, creating a dense carpet of highly flammable fuel. It makes fires more frequent, larger, and sometimes hotter. Grasses recover faster after burns, and so they tend to replace native vegetation.



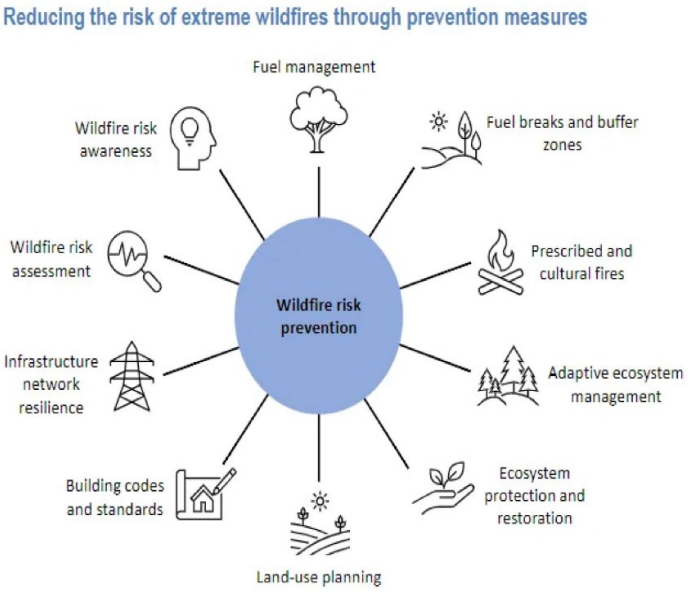
Grass/shrub fires are more common in the US than the traditional forest fires.

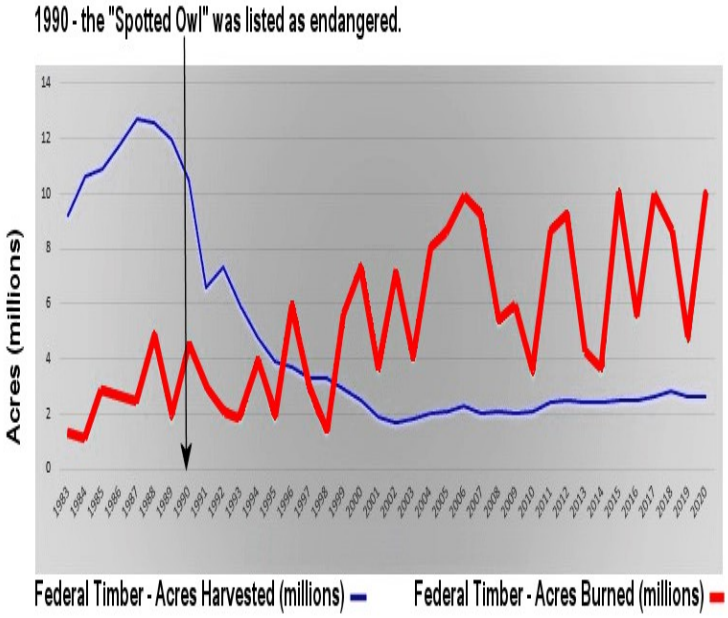
In Hawaii land traditionally used for growing crops has been abandoned with the result that these areas have become unmanaged grasslands, creating a significant fire hazard. Lahina was located downwind (West) from traditional pineapplelands that had become such unmanaged grasslands. When the tradewinds are strong, they can knock down power lines causing fires, which is how the Maui fire started. The tradewinds then blew the fire into Lahaina, an example of an urban fire caused by a wildfire striking an urban area at the Wildland-Urban Interface. Professor Clay Trauernicht at the University of Hawaii has called such fires in Hawaii the "inevitable outcome" of the neglect of unmanaged, nonnative grassland that are covering abandoned farmland.



In Southern California much development is occurring in, or adjacent to, wildland that is known to be high risk for fires. As the Wildland-Urban Interface grows, the risks to lives, homes, and other buildings grows.

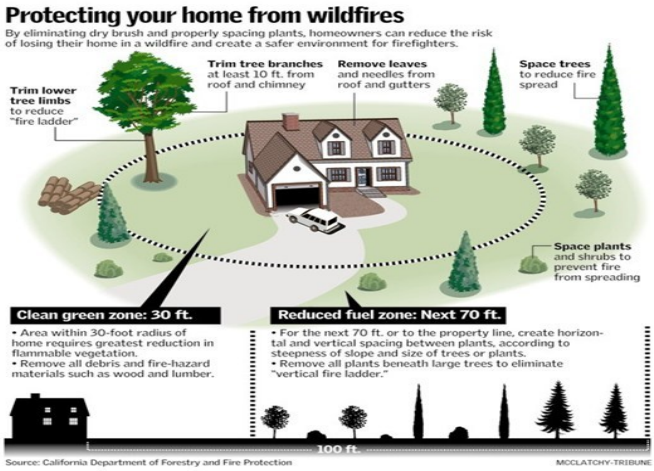
Wildfire risk reduction measures have been well-known but are not being used as much as they should, particularly in California. A key risk reduction measure over the years has been selective logging, where older trees are harvested before they die. This improves forest health, reduces the fuel load, and generates money that can be used for other risk reduction measures. Controlled and planned burns (typically conducted in the fall) are also important measures to reduce fuel load in areas where it has built up. But logging and such burns are restricted on US government land and in California.





48% of California is owned by the federal government. Environmentalists have caused a substantial reduction in logging, selective burns, and other fuel management programs on federal land, particularly since 1990 when the spotted owl was listed as an endangered species. It is now believed that the spotted owl was (and is) threatened, not by logging or other human activity, but by an invasive species, the barred owl,. Most wildfires in the US occur on government land, not privately-owned land, which is actively managed to preserve the health of the forests and to reduce fire risk.

In high risk areas zoning codes and building codes need to be adapted to address the fire risk.



AR6 COMMENTS ON CAUSATION, ATTRIBUTION, AND MITIGATION

"Governments in many temperate-zone countries implement policies to suppress fire, even natural ones, producing unnatural accumulations of fuel in the form of coarse woody debris and high densities of small trees." (AR6 WGII p. 243)

While burned area has increased in some regions, "published research has not yet attributed the increases to anthropogenic climate change." (AR6 WGII p.244, 246).

In the regions where area burned and frequency of fires are increasing, "analyses have not yet shown if climate change is more important than other factors." (AR6 WGII, p.247)

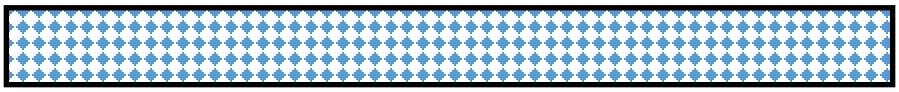
"In ecosystems in which a natural fire regime has been suppressed, restoration practices such as prescribed fires, thinning trees and allowing some wildfire where it benefits the ecosystem can be introduced to reduce increasing risks from severe wildfires." (AR6 WGII p.287)

In AR6 there are repeated acknowledgments that government is part of the wildfire problem, that the role of climate change is uncertain, and that forest management practices are important to reduce risk.

CONCLUSION

While wildfires are trending down globally, they remain a major and growing problem in some regions, such as California and Hawaii, and much needs to be done to reduce the risk.

1. Dr. John Keeley, who has spent 40 years researching wildfires, concludes, "We don't see any relationship between past climates and the amount of area burned in any given year."
2. Sharon Udasin suggests, "Deploying low-intensity burns could reduce the initial risk of catastrophic wildfires by more than 60% in California."
3. Dr Patrick Brown says, "Changes in forest management practices could completely negate the detrimental impacts of climate change on wildfires."
4. Professor Scott Stephens, a professor of forest science at U Cal Berkeley, opines, "20-25% of wildfire damage comes from climate change and 75% from the way we manage lands and develop our landscape."



Works Cited

Intergovernmental Panel on Climate Change Assessment Report 6, Working Group I, The Physical Science Basis (2021) (AR6 WGI)

Intergovernmental Panel on Climate Change Assessment Report 6, Working Group II, Impacts, Adaptation and Vulnerability (2022) (AR6 WGII)