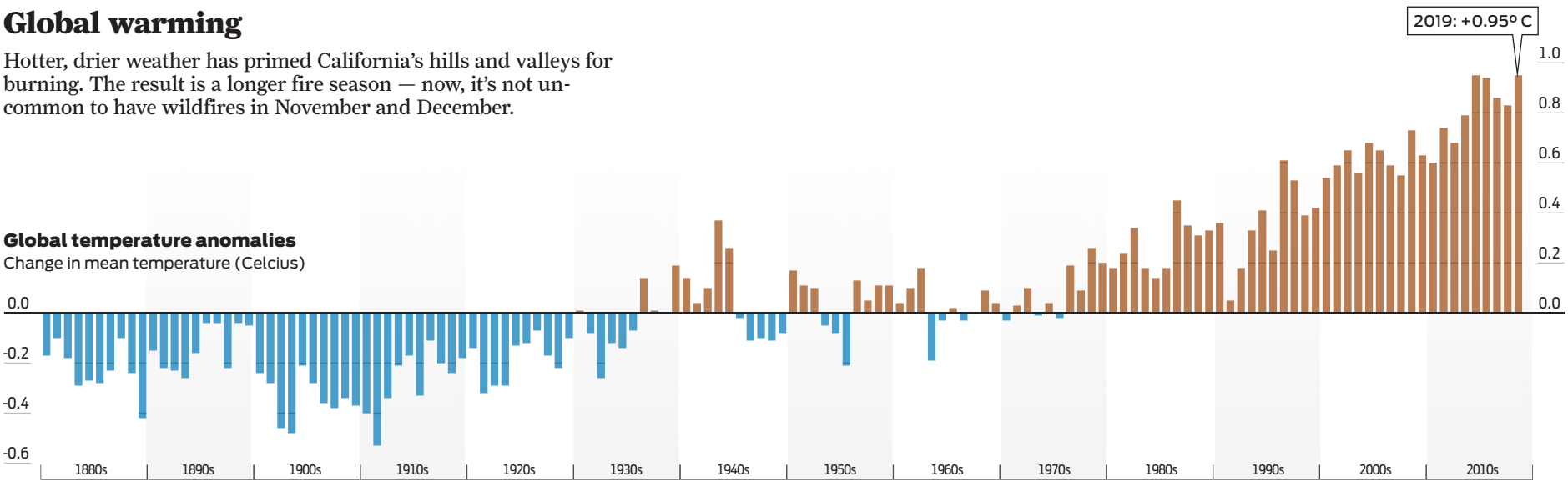
Why California continues to burn

By Kurtis Alexander and John Blanchard

There's little doubt that wildfires are worsening in California. Seven of the state's 10 most destructive fires have occurred over the past five years. Five of the 10 biggest fires have occurred this decade. No single factor is driving the trend, and fire experts continue to debate the principal reasons. But it's clear that many circumstances have converged to create a deteriorating situation. Here are some drivers of the problem.

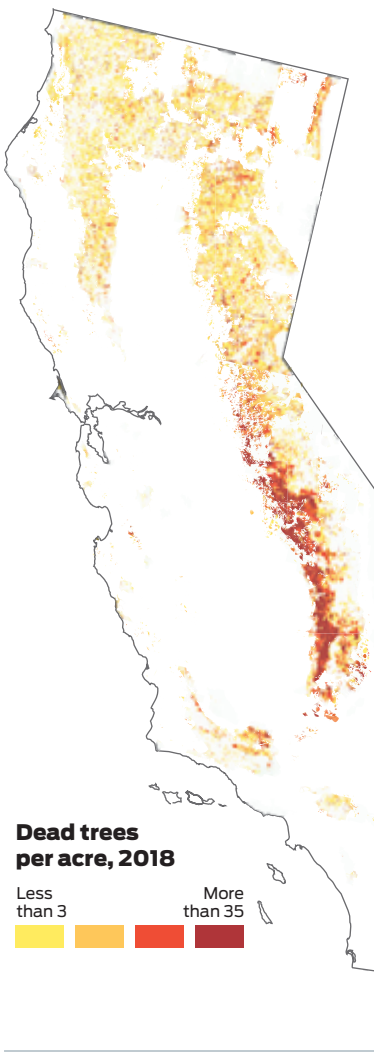
Global warming

Hotter, drier weather has primed California's hills and valleys for burning. The result is a longer fire season — now, it's not uncommon to have wildfires in November and December.

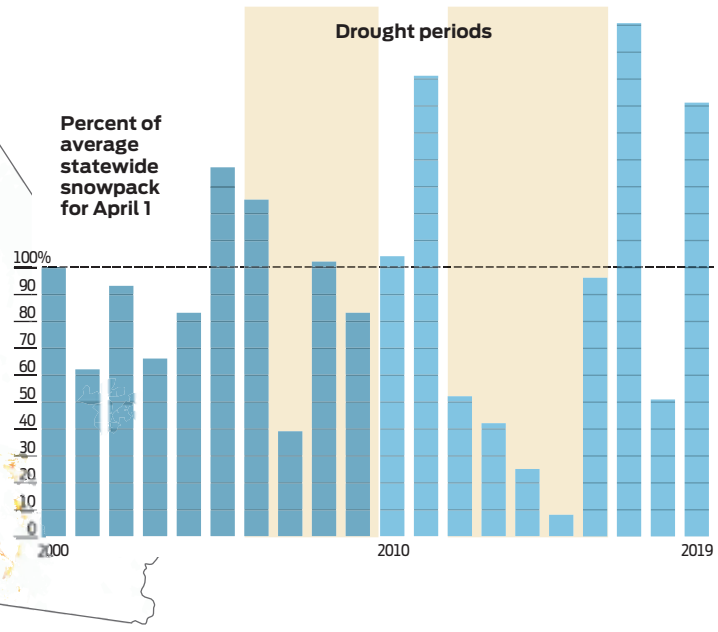


Drought

California's landscape hasn't fully recovered from this decade's five-year drought, and dead and dying trees remain ready kindling for fire. With climate change, future dry spells are expected to become only more intense. Bark beetles have thrived in drought years and hastened tree mortality.

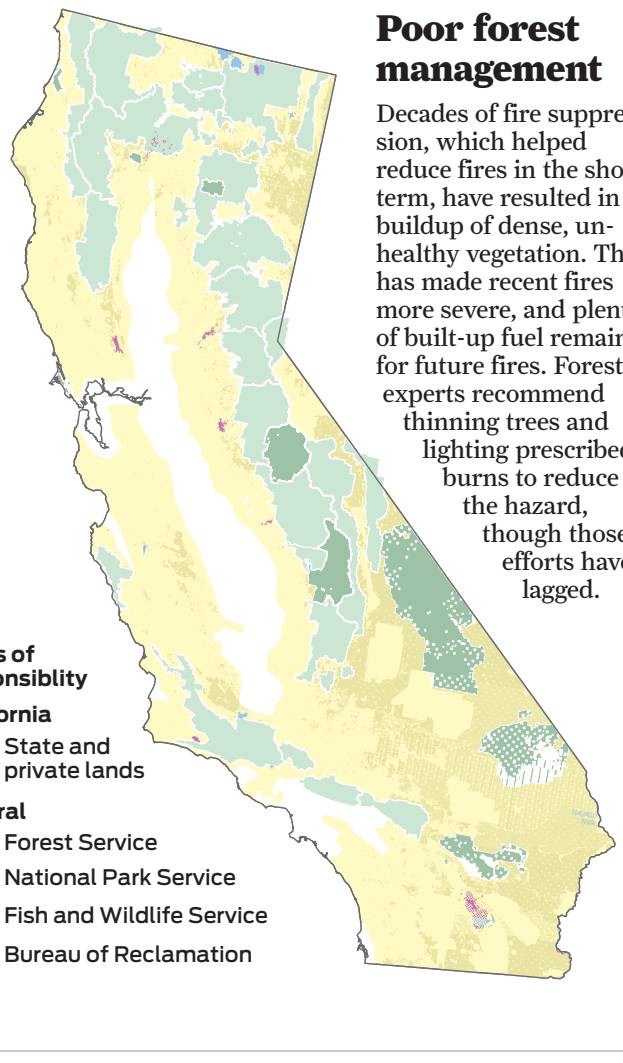


Bark boring beetle (Actual size)



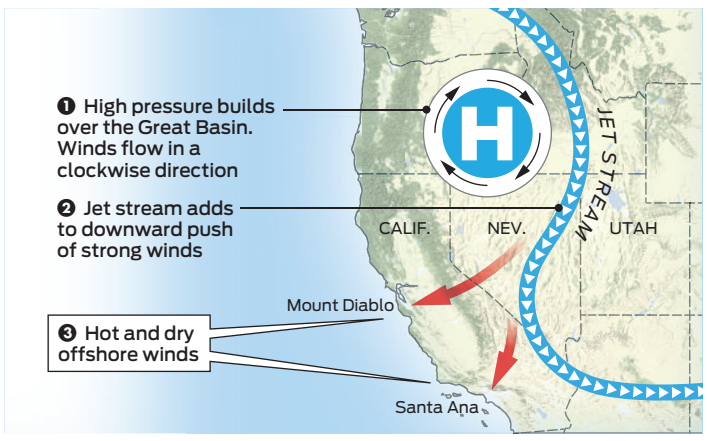
Poor forest management

Decades of fire suppression, which helped reduce fires in the short term, have resulted in a buildup of dense, unhealthy vegetation. This has made recent fires more severe, and plenty of built-up fuel remains for future fires. Forestry experts recommend thinning trees and lighting prescribed burns to reduce the hazard, though those efforts have lagged.



Offshore winds

There have always been occasional blasts of warm winds — known as Diablo winds — during fall and winter in Northern California. These gusts can approach hurricane strength. As the state's fire season has extended into late fall, Diablo winds are becoming more likely to blow during wildfires.

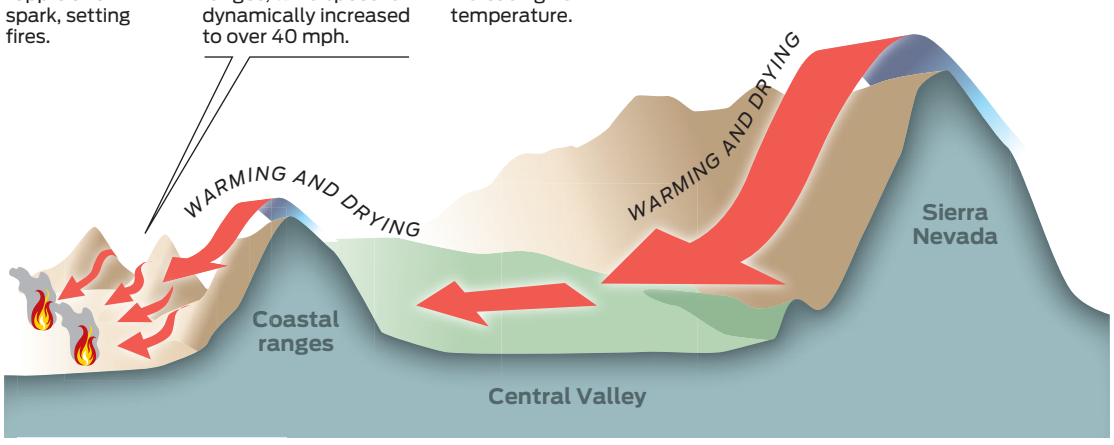


❼ The excessive wind can cause power lines to topple and spark, setting fires.

❻ Squeezing through canyons and gaps of the coastal mountain ranges, wind speed is dynamically increased to over 40 mph.

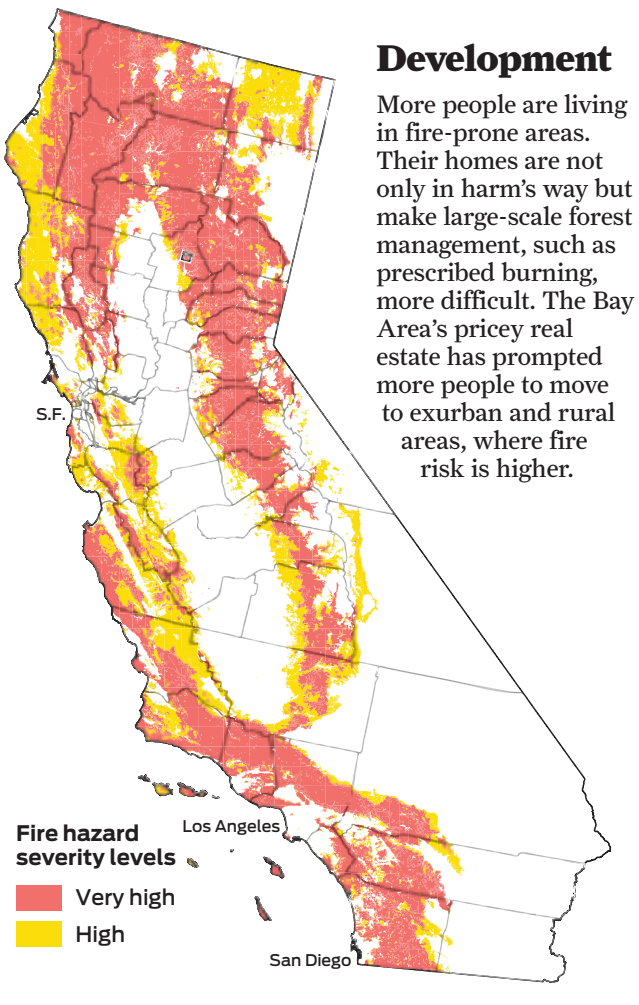
❺ Winds come into contact with warm Central Valley air, increasing its temperature.

❹ High-pressure wind cascades over the Sierra Nevada. The air is compressed, increasing temperature and reducing humidity.



Development

More people are living in fire-prone areas. Their homes are not only in harm's way but make large-scale forest management, such as prescribed burning, more difficult. The Bay Area's pricey real estate has prompted more people to move to exurban and rural areas, where fire risk is higher.



Vulnerable homes

Most homes in California are not designed to withstand fire. Building codes developed in 2008 require new homes to incorporate protective features, but most of the state's housing stock was built long before the rules took effect. Retrofitting can be very expensive.

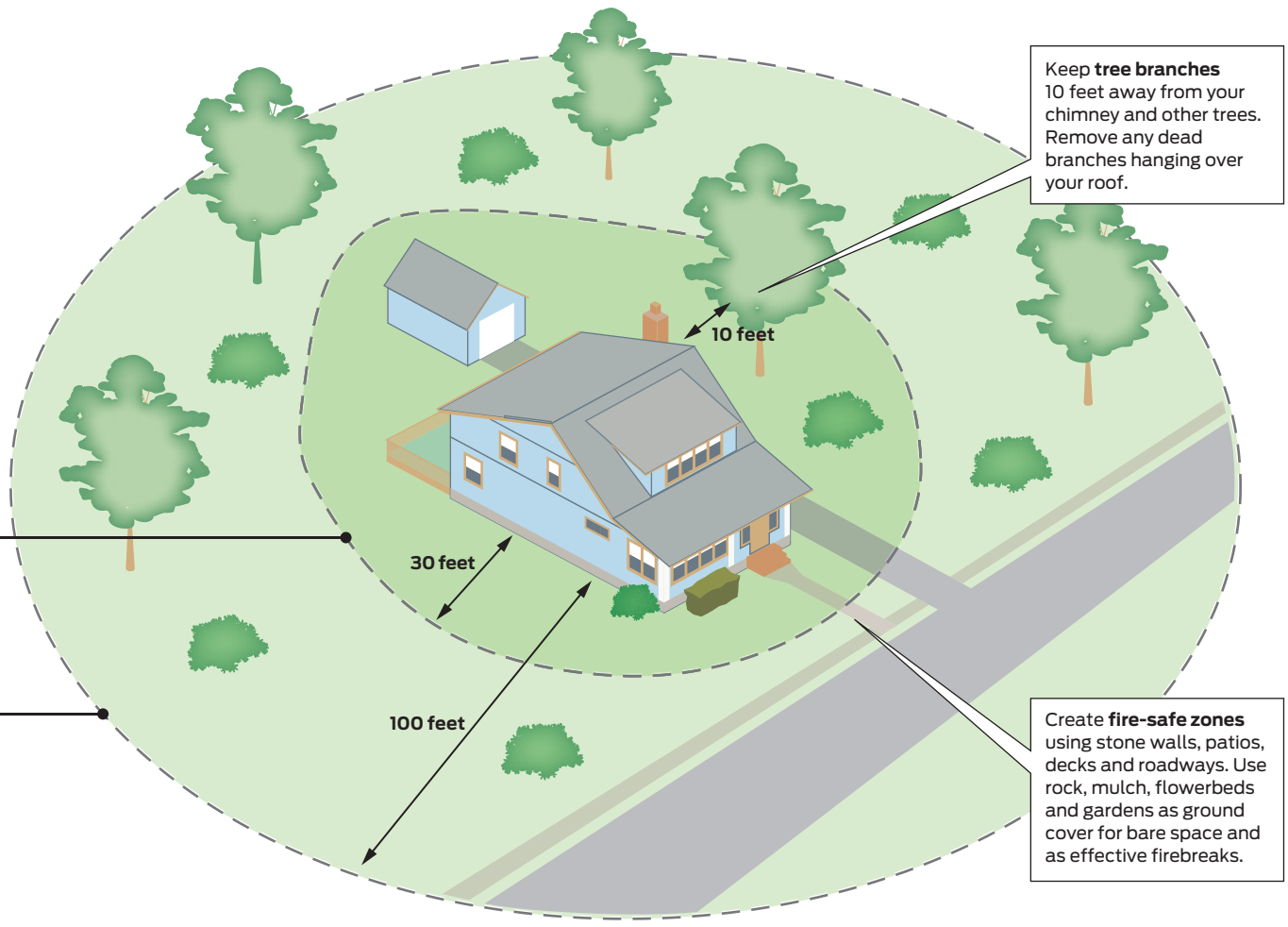
How to create a defensible zone

ZONE 1

Clear dead leaves and plants from within **30 feet** of the home. Trim tree limbs to at least 6 feet above the ground. Clear all dead limbs, leaves and other vegetation from the roof and rain gutters.

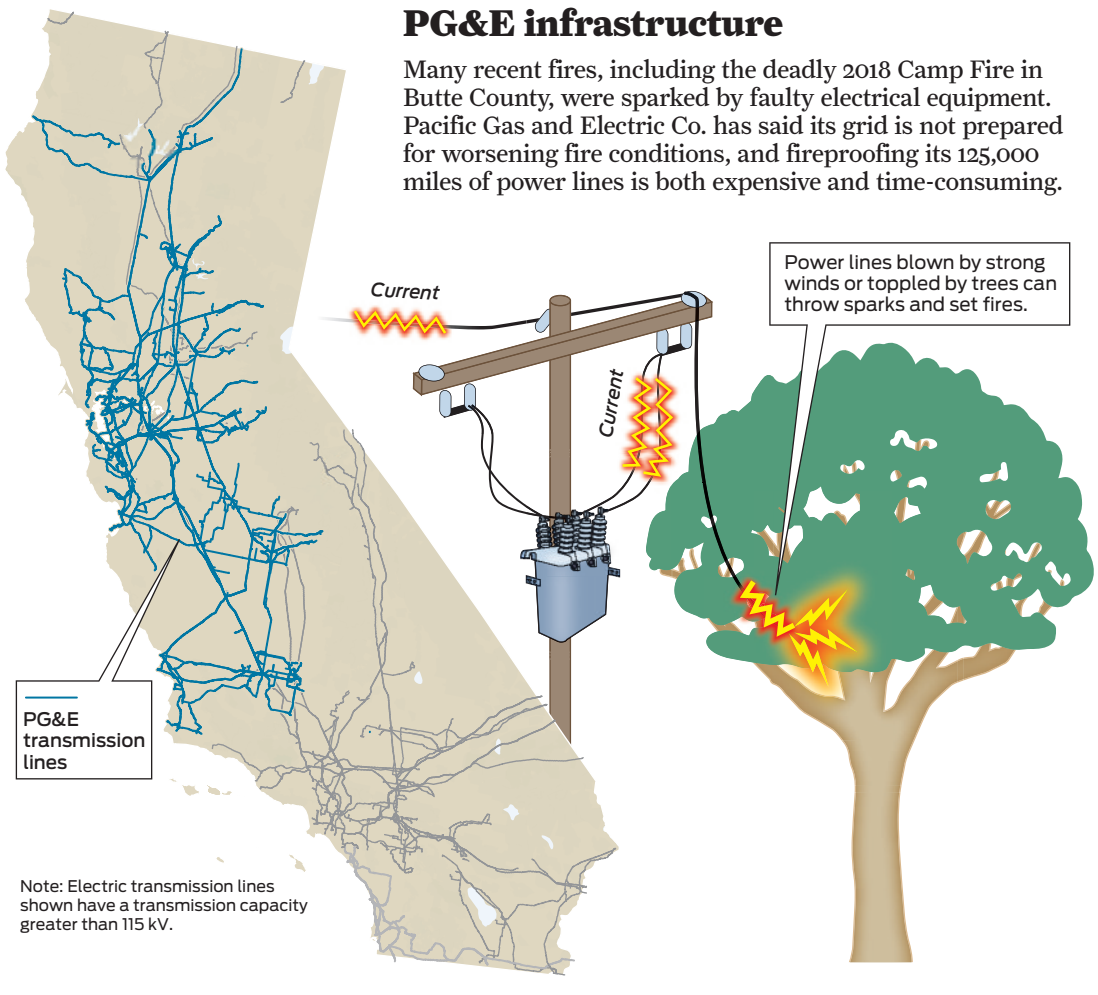
ZONE 2

In the area within **100 feet** from the home, cut grass to a maximum height of 4 inches. Allow ample space between trees and shrubs so flames won't jump easily between them. Consult a landscape specialist to learn how wide that space should be — it varies from yard to yard.



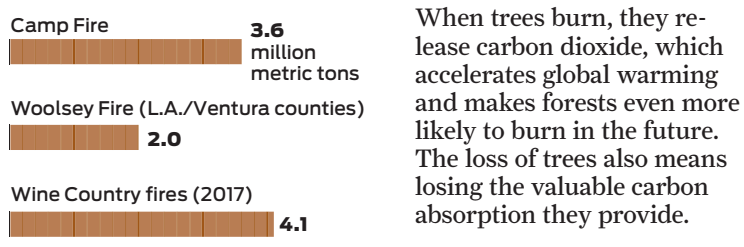
PG&E infrastructure

Many recent fires, including the deadly 2018 Camp Fire in Butte County, were sparked by faulty electrical equipment. Pacific Gas and Electric Co. has said its grid is not prepared for worsening fire conditions, and fireproofing its 125,000 miles of power lines is both expensive and time-consuming.



Note: Electric transmission lines shown have a transmission capacity greater than 115 kV.

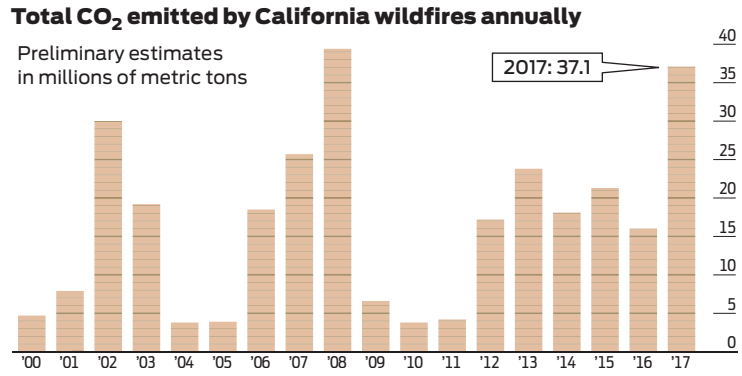
Rough estimates of carbon dioxide emitted by wildfires



Carbon from burning trees

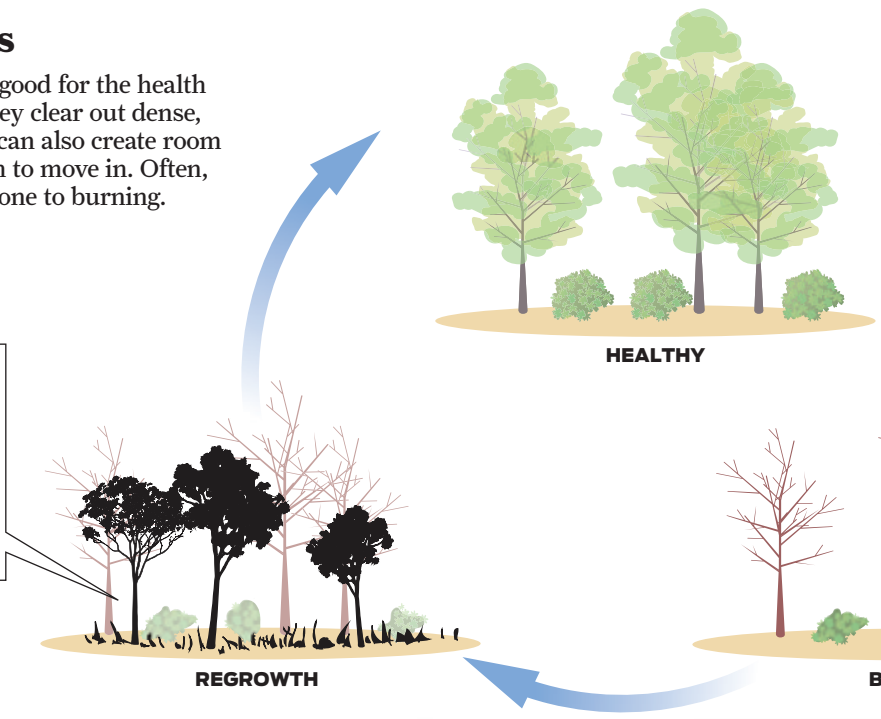
When trees burn, they release carbon dioxide, which accelerates global warming and makes forests even more likely to burn in the future. The loss of trees also means losing the valuable carbon absorption they provide.

Total CO_2 emitted by California wildfires annually



Regrowth of weeds

While wildfires are generally good for the health of California's wildlands — they clear out dense, debilitated vegetation — they can also create room for invasive grasses and brush to move in. Often, these newcomers are more prone to burning.



Invasive species grow in burned areas

Grasses: Wild oats, rye grasses, iant reed, pampas grass, crimson fountaingrass

Plants: Mustard, filarees, fennel and thistles

Trees: Saltcedar, acacias and eucalyptus

Sources: U.S. Department of Agriculture, California Department of Water Resources, National Oceanic and Atmospheric Administration, U.S. Forest Service, National Weather Service, Cal Fire, California Department of Insurance, California Energy Commission, Cal-Atlas, California Air Resources Board

Acres burned in California wildfires