CALIFORNIA
AIR RESOURCES BOARD

# Frequently Asked Questions: Wildfire Emissions.

## Fire is part of Earth's carbon cycle; combustion of fossil fuels is not.

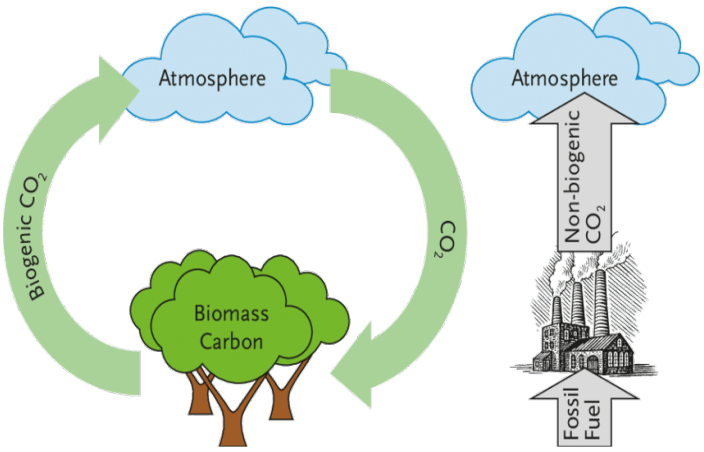
## Do wildfires contribute to climate change?

Yes. Wildfires release carbon dioxide ($CO_2$) emissions and other greenhouse gases (GHG) that contribute to climate change. It is challenging to determine how much wildfire emissions alter the GHG concentrations in the atmosphere and contribute to anthropogenic climate change because wildfire emissions are part of the terrestrial carbon cycle.

## Why does California's Air Resources Board (CARB) focus on reducing GHG emissions from transportation and other sources when wildfires keep happening across the State?

Since the passage of AB 32, CARB has focused on reducing fossil fuel combustion emissions and other anthropogenic emissions because they are accumulating in the atmosphere at an unprecedented pace. Fossil-fuel combustion releases ancient carbon stored underground for millions of years that the atmosphere has not seen in any recent carbon cycle.

Figure 1. Terrestrial Carbon Cycle vs Fossil-Fuel Combustion




Source: National Council for Air and Stream Improvement

Earth's terrestrial carbon cycle transfers carbon between the land, ocean, and atmosphere. As part of the terrestrial carbon cycle, fire, plant respiration and decomposition are balanced by plant growth and other processes that take place over decades or centuries. When in balance, these biogenic $CO_2$ emissions from fire and other sources are offset by biogenic $CO_2$ sequestration, resulting in relatively minimal change in the total concentration of atmospheric $CO_2$ that drives climate change. Emissions from fossil-fuel combustion are contributing to putting this cycle out of balance. They are also contributing to a negative feedback loop for California's forests and lands: as $CO_2$ emission accumulate in the atmosphere and California experiences more warming, extreme heat events, droughts, and invasive species, the risk and intensity of fires also increases, which in turn push the terrestrial carbon cycle further out of balance.

Because of this effect, CARB works to understand and track both the total GHG emissions from anthropogenic sources, like the combustion of fossil-fuels, and the total carbon flux (or *net* change in carbon on the landscape) from terrestrial carbon.

## Does CARB track GHG emissions from wildfires?

Yes. CARB estimates GHG and criteria pollutant emissions from wildfires. CARB also works with other State agencies to develop an ecosystem carbon inventory for natural and working lands. *This inventory quantifies the carbon stored in the State's forests, soils, and other natural lands*. Looking year-over-year at the data in the inventory, we can see clear trends of carbon-loss in California's natural and working lands, with most of those losses coming from wildfires.

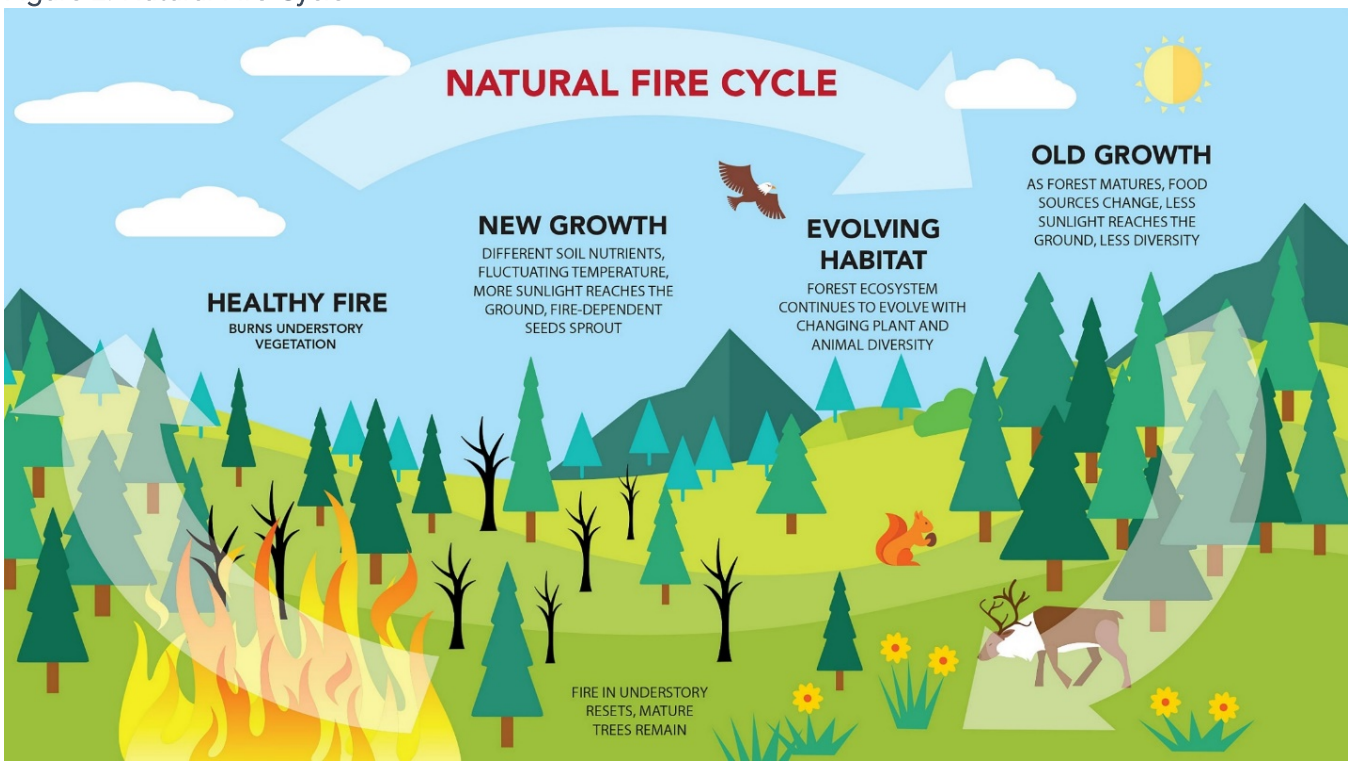
In recent years the frequency and magnitude of wildfires have been prolific across California. In an effort to contextualize the GHG emissions from wildfires, *CARB recently published an estimate of the wildfire emissions from 2000-2019*.

Using preliminary fire footprint information, CARB has also released a draft estimate of 2020 wildfire GHG emissions, which was the worst fire year on record (by acres burned) for the State of California. The emissions estimate, 112 million metric tons of $CO_2$ ($MMTCO_2$), is equivalent to the amount of carbon contained in the structural lumber of 6.3 million average California homes, or over 75 percent of all homes in California. This number is expected to be updated when final data become available in mid-2021.

## Should it be our goal to eliminate all wildfires in the State?

No. Fire is a natural and critical ecological function for maintaining healthy and resilient forests, and supports several ecosystem functions such as facilitating germination of seeds, replenishing soil nutrients, stimulate tree growth, and reducing fuels

Figure 2. Natural Fire Cycle




*Source: www.openspaceauthority.org*

## AB 32 requires CARB to develop a Scoping Plan to reduce GHG emissions in California. If wildfires are a source of GHG emissions, will CARB include wildfire emissions in the upcoming Scoping Plan?

Previously CARB has focused on limiting emissions from the burning of fossil fuels and limiting the release of high-GWP gases, like methane and hydrofluorocarbons. CARB is now turning its attention towards achieving carbon neutrality, which means balancing all sources of GHG emissions with carbon sinks by mid-century.

In 2018, the *Intergovernmental Panel on Climate Change (IPCC) issued a Special Report* that made it clear that limiting climate change to 1.5 degrees Celsius would require global carbon neutrality by 2045, and that carbon neutrality must include the sources and sinks from emissions from all sectors, including natural and working lands.

Use of fossil fuels created the climate and air quality problems we face, so our first priority will continue to be to minimize combustion of fossil fuels and reduce emissions as much as possible. This will not just reduce future global warming, but will also provide air quality and public health improvements for Californians, particularly those living in areas of high pollution exposure near traffic or other industrial sources. We also expect that California will need to develop and utilize carbon sinks via engineered carbon removal and natural and working lands to achieve carbon neutrality. Recent catastrophic wildfires, land conversion, and other disturbances that are largely driven by climate change and human activity, have turned our natural and working lands into a net source of emissions[1], which makes achieving carbon neutrality even more challenging. As part of the upcoming Scoping Plan effort, CARB will work to project the net flux (or change) of carbon on the State's natural and working lands between now and mid-century. This flux will include both changes in carbon sequestration as well as emissions from wildfires and other disturbances, consistent with recommendations from the IPCC on achieving carbon neutrality.

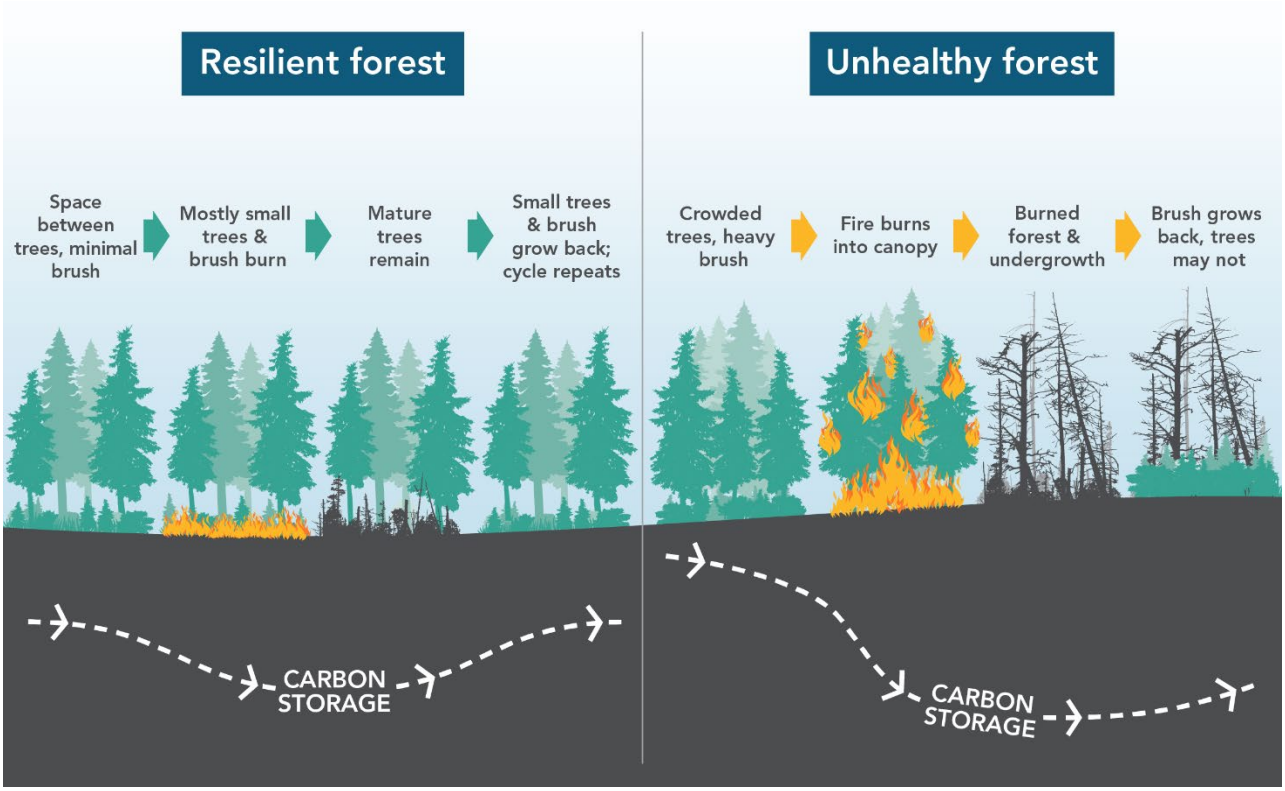
## What is the goal for natural and working lands in the upcoming Scoping Plan?

California state agencies are working together to better understand the natural and working lands carbon flux in a changing climate, how best to stabilize carbon in California's ecosystems, and approaches to setting targets for natural and working lands in support of carbon neutrality, consistent with the *Governor's Executive Order N-82-20*.

Achieving maximum carbon sequestration in natural and working lands will not be the objective for this work or for the Scoping Plan, because overstocked forests with high carbon sequestration can lead to future catastrophic wildfires, disease, pests, and ecosystem imbalances. The 2022 Scoping Plan will instead focus on what is needed for forests and other natural and working lands to be more resilient and healthy and to continue to provide water, air and biodiversity benefits to California, in addition to supporting carbon neutrality for the State.

[1]CARB. An Inventory of Ecosystem Carbon in California's Natural & Working Lands. 2018 Edition. Downloadable from *https://ww3.arb.ca.gov/cc/inventory/pubs/nwl_inventory.pdf*

Figure 3. Resilient Forests




## What is CARB currently doing to address air pollution and GHG emissions from wildfires?

- CARB supports air districts in monitoring smoke from wildfires, including particulate matter, which is the pollutant from wildfires primarily responsible for the poor air quality occurring from fires across California and the West Coast. California has a network of over 250 permanent air monitoring stations, operated by federal, State, and local agencies, as well as a number of portable monitors that can be deployed as part of the incident air monitoring program. This monitoring data is used in many of the air quality reporting services, like AirNow, that people are using to understand their local air quality and the real-time impacts from wildfires.
- CARB initiates research on the effects of wildfire on California, specifically focused on improving our understanding of the air pollution components, regional/local air quality impacts, health impacts, and other effects of wildfires.
- CARB works with other state agencies on strategies to reduce wildfire emissions. The California Natural Resources Agency (CNRA), and its boards and departments, is the State agency primarily responsible for taking actions to reduce wildfire risk and severity. CARB staff work closely with CNRA in a number of ways:
    - Through our California Climate Investments (CCI) program, we work with CNRA to identify forest management strategies that improve forest health, lead to long-term carbon sequestration, and reduce the risk of wildfire. We work with CNRA to assess the GHG benefits from these actions. Some of the projects funded through the CCI program include land conservation and management, fuels reduction, prescribed fire, advanced

technology biomass utilization, support for alternative wood products from forest residue, and others.
    - Through policy and technical coordination on forest carbon accounting.
    - By working with air districts and land managers to increase opportunities for prescribed fire, which is an important forest management tool.
    - We work to mitigate the effects of wildfire by supporting and encouraging prescribed burning across the state, when meteorological conditions are conducive to burning with minimal impact on air quality. With recent bills and Executive Orders signed, the amount of prescribed fire will be increasing.

## What are some of the health and environmental impacts of wildfires (in terms of air pollution and GHG emissions)?

### Health:

We are still continuing to grow our knowledge, but CARB is deploying our laboratory, research, and monitoring teams to better understand the health effects of these wildfires:

- Wildfires produce harmful complex mixtures of air pollutants, including particulate matter, toxic air contaminants, and carbon monoxide (CO).
- Smoke from structural fires, such as residential, commercial, and industrial fires, can contain dangerous toxins, including metals, CO, hydrogen cyanide and toxic volatile organic compounds.
- Smoke particles in soot, ash and dust can build up in our bodies and cause a number of immediate health problems even in healthy individuals, including burning eyes, runny noses, scratchy throat, irritated sinuses, and headaches. Wood smoke can cause lung irritation leading to cough and shortness of breath and the effects can be seen even after the smoke clears, although healthy people will recover more quickly.
- Research shows a strong association between exposure to small particulate matter (PM2.5) from wildfire smoke and increasing severity of asthma, other respiratory disease, such as COPD, inflammation or infections, including bronchitis and pneumonia, emergency department visits, and hospital admissions.
- Long-term exposure to PM2.5 is linked to a wide range of human health effects, such respiratory and heart related illnesses and hospitalizations, adverse brain effects, depression, memory loss, learning disorders, reduced lung function growth in children and premature death. Often these effects can be seen days after the smoke exposure.

### GHG:

- California's forests cover about 1/3 of the State. Approximately 85 percent of terrestrial carbon is stored in forests and shrublands.
- According to our inventory, our natural and working lands lost approx. 140 MMT of carbon between 2001 and 2014. This is equivalent to a loss of 510 MMT of $CO_2$ that was previously sequestered in California's lands as part of the terrestrial carbon cycle. As California seeks to address changing wildfire regimes, the severity of carbon losses from wildfires will have implications for ecosystems, biodiversity, the economy, public health, and more.
- The 2018 natural and working lands inventory was based on existing data and is the first comprehensive carbon inventory for the state. California is investing in advancement in measuring and monitoring carbon fluxes.

## Are certain groups (e.g., low-income populations or minorities) more impacted by the environmental and health consequences of wildfires than others?

Otherwise healthy individuals may experience symptoms in smoky conditions or after exposure, particularly those who work outdoors. However, some groups are more impacted by wildfire smoke – especially children, the elderly, pregnant women and people with heart or respiratory conditions. These sensitive groups are advised to limit outdoor activities, especially when the Air Quality Index (AQI) reaches 'Unhealthy for Sensitive Groups.'

Elevated pollution from other sources such as high ozone in the summer and pollution from living near traffic or other industrial sources will compound the effects of smoke exposure. People living near high traffic and other sources are often in low income communities of color and are known to be more sensitive to the impacts of pollution, including particulate matter pollution, which can be exacerbated by wildfires.

## Can we quantify the cost of health impacts of wildfires? In the short term and long term?

The impacts and health costs of the impacts of wildfire are an ongoing research area, but it is known that short term exposure to wildfire results in increased hospitalizations and emergency room visits. The long term impacts of wildfire are still being studied. Effects in wildland firefighters have shown reduced lung function and a possible increase in hypertension.

## What is the role of prescribed fire in reducing the intensity of wildfires?

Prescribed fire is a key tool to combating wildfires and developing healthy and resilient forests, as well as reducing the air quality impacts and GHG emissions associated with uncontrolled wildfires. As part of *California's Wildfire and Forest Action Plan,* California's Environmental Protection Agency (CalEPA), CNRA, and California's Department of Forestry and Fire Protection (CALFIRE) jointly recognized that the use of fire under safe conditions, is a versatile and cost-effective tool to reduce fuels buildup in forests and reduce the risk of catastrophic wildfires while increasing climate resilience. Fire is a critical ecological function for maintaining healthy and resilient forests, and controlled burns can support native plants, boost soil health and increase ecosystem function. CARB supports the use of prescribed fire, and anticipates its use will expand to help achieve the State's goal of treating 1,000,000 acres of forest and rangelands, as outlined in the shared stewardship agreement between the State of California (500,000 acres) and the United States Forest Service (500,000 acres).

## What are the air quality impacts of prescribed fire and what is CARB doing to support prescribed fire while minimizing public health impacts?

If not carefully managed, the smoke – a mixture of toxic particles and gases – can be a nuisance to residents and businesses, and can adversely impact community health. To minimize smoke impacts and protect public health, burners, CARB, and local air districts work together to conduct burning under favorable atmospheric conditions. Prescribed burning takes place after careful planning and under controlled conditions so that prescribed fire occurs on days/times when there will be minimal impact on air quality. Over the past two years, during the peak prescribed burn season (November-June), CARB has on average recommended over 90 percent of days as permissible or marginal burn days throughout

the state. In addition, CARB has a number of initiatives to support prescribed fire, minimize air quality impacts, and raise awareness of prescribed fire efforts:

- Providing resources and training to local districts to partner and expedite the burn application process for local air districts and land managers.
- Developing an online reporting hub for requesting and tracking burn permits and burn events.
- Working with local air districts to deploy portable emissions monitoring, which is designed to inform on the ground land managers on whether to continue a burn and to assess potential air quality impacts.
- Developing a mobile phone application to provide real time information about current prescribed fires, wildfires, smoke, and the AQI to inform the public about potential smoke impacts in their area.

## What is the role local air districts play to facilitate wildfire mitigation measures (or increased pace and scale of prescribed fire)?

Individual local air districts implement and enforce local rules and regulations, including the issuance of burn permits to local land managers for prescribed fire on the landscape. Following initial permitting, the local air district provides final burn authorization based on forecasted local meteorology and air quality before the prescribed burn can commence. Local air districts also work independently and in partnership with CARB to monitor the smoke emissions and air quality impacts from prescribed fire.