

## NATURE'S BENEFITS: AIR



### **Air Quality: What benefits do National Forests in California provide in terms of clean air?**

National Forests in California and trees provide many benefits, including the ability to clean our atmospheric environment both directly underneath their canopies, and at a larger, regional scale. Trees block the direct heat from the sun and reduce the speed of the winds that would otherwise suck the moisture from our mountain landscapes. Because leaves transpire large amounts of moisture, trees have a cooling effect on the surrounding environment—like air conditioning. By cooling and cleansing the atmosphere, trees help to make air safer for breathing by plants, animals, and humans and has positive benefits on habitat. In fact, air quality underneath a closed tree canopy is often significantly better than above that tree canopy, especially for ozone—a common air pollutant that forms downwind of urban air pollution sources. While some trees are injured by gases like ozone and fine particles in the air, others absorb and use contaminants like nitrogen without apparent harm. Too much nitrogen however, can “overfertilize” and weaken trees, leaving them unable to handle drought and other stress as well.

Clean air also relates to better visibility from the reduction of ozone and less particulate matter in the air. People equate less smog, smoke, industrial pollutants and natural particulate matter in the air to healthy, and fresh air which can provide a sense of well-being. Good visibility impacts peoples’ desire to engage in spiritual and cultural activities, and recreate on National Forests in California and the outdoors in general, which in turn provides positive impacts to recreation-associated jobs and to the economy.

Forests are also climate and air pollution refuges for people and wildlife alike. They provide “escapes” for those sensitive to pollutants from urban areas (like ozone and fine particles). On a regional scale, they also scrub ozone and other nitrogen and sulfur-containing air pollutants out of the prevailing winds which can negatively impact the high elevation ecosystems of the Sierra Nevada including Tahoe and Yosemite, where lake and forest ecology is much more sensitive to such disturbance.

Healthy forests with large, widely-spaced trees also protect from wildfire smoke because pines and other fire-adapted trees with their thick, fire retardant bark better resist fire in all but the most extremely hot, dry, and windy conditions. Maintaining this forest structure is critical to keeping low-intensity fires burning on those forests more frequently, so that the underbrush and lower limbs are pruned away and fire has less ability to spread and create smoke impacts that affect regional and even national air quality.

## Background

The U.S. Forest Service has been an integral part of the larger effort, led by the Environmental Protection Agency (EPA) to achieve dramatic progress cleaning the air since 1970. Despite this progress, air pollution in the United States continues to harm forest ecosystems and human health. Under the Clean Air Act and in partnership with the USFS, EPA continues to work with state, local and tribal governments, other federal agencies, and stakeholders to reduce air pollution and the damage that it causes.<sup>1</sup> Like water and soil, air is one of the three critical resources humans, plants, animals and all other organisms in a natural area cannot live without. The Clean Air Act delegates an affirmative responsibility to the Forest Service to protect air quality related values in wilderness areas designated as Class I (those that existed in 1977). Megafires of unprecedented scale and intensity have begun to burn in some of the areas most damaged by air pollution, and those fires further degrade air quality. The Forest Service strives to protect, maintain, and restore its landscapes to resist these catastrophic fires, which create the most risk to California air quality now and into the future.

To do this, the Forest Service is identifying and commenting on new sources of pollution that might damage forest health, monitoring the levels of air pollution throughout our forest landscapes, and using science to understand the best indicators of forest health and the best methods to restore it. The Forest Service is using scientific data and methods to directly restore and protect forest health. Important tools for restoration are prescribed fire, wildfires managed for resource objectives, and mechanical methods to restore our forests to a basic, resilient structure where trees are large and widely spaced, with those spaces maintained by fire. Forest activities that can affect air quality such as prescribed burning, ski areas, and mining are often monitored or analyzed to ensure compliance with air regulations and to monitor possible impacts to natural resources.

## Key Messages

- California's 22 million acres of national forests create public benefits by acting as:
  - The "lungs" of the state insofar as they filter out air pollutants and create spaces under their canopies where you can breathe clean air, as part of high quality recreational experiences.
  - A climate refuge for wildlife and people to escape our warming climate.
  - A carbon bank where decades to centuries worth of potential GHG emissions are stored.
- Restoring fire to forests protects air quality by minimizing smoke exposure.
  - Healthy forests fight fire, especially large catastrophic megafires that harm statewide air quality, due to a predominance of large, widely spaced, thick-barked, fire-resistant trees.
- Maintaining this resilient and healthy forest structure poses a significant challenge in a state that faces, air pollution, drought, beetle infestation, and megafire.

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<sup>1</sup> <https://www.epa.gov/clean-air-act-overview/air-pollution-current-and-future-challenges>, EPA Clean Air Act overview, Air Pollution: Current and Future Challenges

- Only through an all-lands partner approach to restoration work on all of California’s forests and our urban spaces outside the forest, can we mitigate risks to the quality of our air.
  - Through restoration work with the state and private landowners on National Forests in California, much has, and continues to be accomplished to make the forests more resilient to stressors and improve forest health and sustainability.
    - Urban forests assist sheltering the most polluted urban areas from ozone and other pollutants through the use of U.S. Forest Service, state, and local grants that increase planting efforts.
- The Pacific Southwest Region of the U.S. Forest Service has been instrumental in protecting and improving California air quality by monitoring and helping EPA and state agencies reduce pollution from sources
  - Clean air not only increases agricultural productivity but it is critical to clean water, visibility, an overall feeling of wellness, and a desire to be outdoors for spiritual, cultural and recreation purposes; and ultimately impacts jobs, economic growth, and home values as well.
- California’s national forest land managers seek to improve forest health by using best management practices in their daily work on forest lands and through the management of the natural fire cycle in an effort to reduce the risk of catastrophic fire and associated smoke that can impact air quality.
  - Methodologies employed include prescribed and managed fires which help mitigate the smoke and poorer air quality normally associated with large fires.
  - Forest restoration, which includes thinning of overly dense forests using fuels treatments and replanting also helps to mitigate risk to air quality.
- Only through an all-lands partner approach to restoration work on all of California’s forests and our urban spaces outside the forest can we mitigate risks to the quality of our air.
  - Partner and citizen engagement to protect air quality by ensuring the resiliency and health of California’s forests is critical to ensuring clean air for future generations.

## Questions and Answers

### 1. What are Greenhouse Gases impacts on clean air?

**Answer:** Although greenhouse gases (e.g., carbon dioxide, methane, and nitrous oxide) are classified as air pollutants by the EPA, they are not usually directly harmful for humans to breathe like the “criteria pollutants,” (e.g., ozone and fine particles). Instead, greenhouse gases contribute to the energy imbalance that’s causing our planet to rapidly warm. This rapid warming causes harm globally and locally because it is occurring so fast that ecosystems and human economies are starting to have trouble adapting. More on global warming and its impacts on ecosystems and economies here in southwest the at: <http://nca2014.globalchange.gov/highlights/regions/southwest>

### 2. What are governmental and private entity land managers doing to ensure their practices do not pollute air?

**Answer:** We work with other land management agencies and air quality regulators to develop technical tools and operational protocols that allow us to minimize community exposure to emissions generated on forests. We have been very successful at that during unplanned wildfire episodes and beginning to apply what we have learned to planned prescribed fire.

### 3. How does air quality vary statewide?

**Answer:** Air Quality varies widely in California with different sources, different topography and different climates. Air quality is routinely measured at close to 300 locations in California. These measurements give us a good understanding of the air quality in the various regions of the state. However, specific locations may be affected by specific sources. You can refer to the Report on Assessment of California's Statewide Air Monitoring Network <https://www.arb.ca.gov/ch/programs/sb25/adequacyreport.pdf> for a discussion of the adequacy of California's air quality monitoring network.

#### **4. What progress are we making in cleaning up air?**

**Answer:** The air quality in California has improved dramatically over what it was 20 years ago. Twenty years ago, several air pollutants besides ozone and PM were at harmful levels in California air, including carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), and lead. These pollutants no longer exceed health-based standards. You can look at tables and graphs of air quality trends for ozone and PM<sub>10</sub> by going to the [Trends](#) Summary web pages. The trend graphs quickly show you the progress for individual sites or entire regions (as air basins). Trends in levels of many toxic compounds have also shown dramatic improvements over the years.

#### **5. What is being done to clean up the air?**

**Answer:** Much is being done at State, federal, and local levels of government.

[www.arb.ca.gov/ch/ch.htm](http://www.arb.ca.gov/ch/ch.htm)

[www.arb.ca.gov/knowzone/students/airpollu/airpolpage/cleanup.htm](http://www.arb.ca.gov/knowzone/students/airpollu/airpolpage/cleanup.htm)

#### **6. How can the public and volunteers assist land managers in ensuring our air remains unpolluted and that people continue to enjoy the benefits of fresh air?**

**Answer:** Learn what to do about smoke at: <https://www3.epa.gov/airnow/airaware/wildfires.html>, and understand how to respond to air quality alerts at:

<https://www3.epa.gov/airnow/airaware/wildfires-ara.html>

#### **7. What other benefits do forests and trees provide in addition to cleansing air?**

**Answer:** In addition to cleaning our air, one mature leafy tree produces as much oxygen in a season as 10 people inhale in a year. Trees also become "carbon sinks" as they produce their food and absorb and lock away carbon dioxide. As part of urban forests, trees provide carbon storage areas that can lock up as much carbon as they produce. They can also shade and cool neighborhoods and communities, and during windy and cold seasons, act as windbreaks lowering home heating bills up to 30% by reducing wind. Trees can also reduce the drying effect on other vegetation behind the windbreak; fight soil erosion, conserve rainwater, and reduce water runoff and sediment deposit after storms; muffle noise in communities from freeways and airports, and ultimately increase property values<sup>2</sup>

### **Example:**

#### **San Geronio Wilderness:**

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<sup>2</sup> A Trees Importance and Environmental Benefit, ThoughtCo., <https://www.thoughtco.com/trees-importance-and-environmental-benefit-1342855>

In the 1990's We began to monitor wilderness visibility and work with our state and local partners to develop strategies to bring our wilderness areas back to a natural visibility condition by the Clean Air Act goal of 2064. This has been a significant success with all wilderness areas in California showing improvement of the worst days between 2000 and 2014. An example of that success is the San Geronio Wilderness on the San Bernardino National Forest. In 2000 the average visual range on the worst days was 27 miles and in 2014 it improved to 49 miles, an 81% improvement!



Worst day visual range 27 miles in 2000



Worst day visual range 49 miles in 2014

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