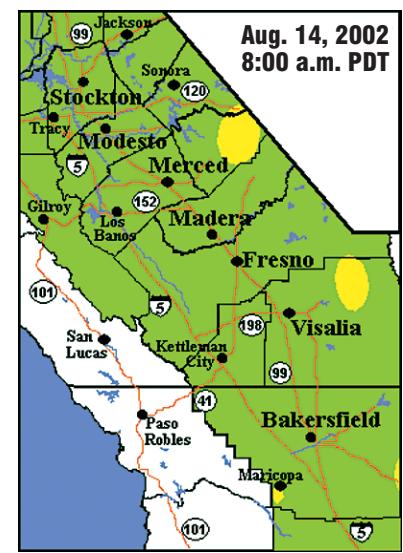


## LASTGASP

## OVERVIEW

**A day in the life of the ozone cycle**

On Aug. 14, the Valley suffered an intense ozone episode, the result of a weeklong heat wave along with a forest fire and other pollution sources. The maps below, generated by the U.S. Environmental Protection Agency, show how ozone developed throughout the day. The peak was at 5 p.m. in the fourth map, also enlarged below.



**The air at night in Sequoia National Park can be worse than that on the streets of Fresno.**

**G**IANT FOREST — In the neighborhood where 2,000-year-old giant sequoias live in Sequoia National Park, there is no 5 o'clock rush hour. Lines of cars don't jam freeway onramps. There is no freeway.

Yet, even though the major traffic consists of wildlife — squirrels, porcupines, woodpeckers — corrosive pollution hangs in the air all night.

"What's wrong with this picture?" Annie Esperanza, a National Park Service air specialist asks, looking at the ozone [smog] reading at an air-monitoring station near majestic Giant Forest. "All we've got is nature here. But we're at 77 parts per billion for ozone."

That reading next to Giant Forest is only 8 ppb from a federal violation of the human health standard.

On this 73-degree August morning, that smog reading is higher than in Parlier, a San Joaquin Valley smog pocket downwind of the 500,000 people in the Fresno-Clovis metropolitan area.

In fact, you might have breathed easier if you had camped in Parlier the previous night. Pollution levels actually remain higher overnight at mid-elevations such as Giant Forest in the Sierra than they do in Valley cities.

For Esperanza, this puzzle is all too familiar. As one of the few air pollution management specialists at a national park, she monitors Sequoia air that ranks among the worst anywhere in the federal system.

Sequoia-Kings Canyon National Parks are home to the highest of the high Sierra, the largest trees in the world — and smog as bad as parts of Los Angeles.

The prevailing wind carries smog from cars, trucks, farms, industries and businesses along a main state traffic artery, Highway 99, as well as Fresno, Clovis and Visalia to Sequoia in the rugged southern Sierra Nevada.

The pine-scented air in Sequoia is the worst in the West for smog, just ahead of Joshua Tree National Park, which is downwind of the Los Angeles area.

Nationally, Sequoia's smog is ranked right behind the Great Smoky Mountains and Shenandoah national parks.

None of the other smoggy parks has a tree anywhere near the size of the General Sherman, which stands 275 feet tall and 103 feet in circumference at its base.

But Sequoia's reputation for dirty air may some day approach its fame for giant sequoias.

John Reynolds, Western regional director for the park service, says Sequoia employees have asked for transfers because the ozone irritates their asthma.

"You wouldn't think you would have that kind of a problem in a national park," Reynolds says. "We're working on ways to communicate to people that it might not be a good idea to climb Moro Rock if it's a bad ozone day."

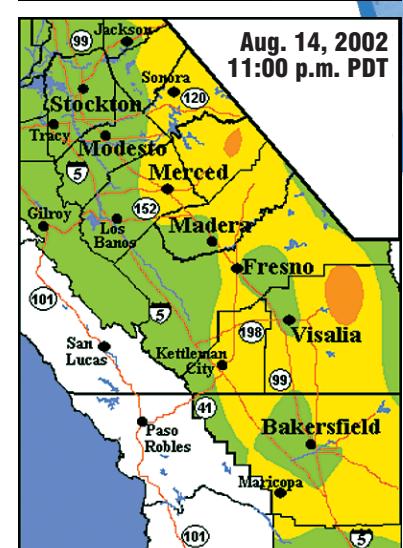
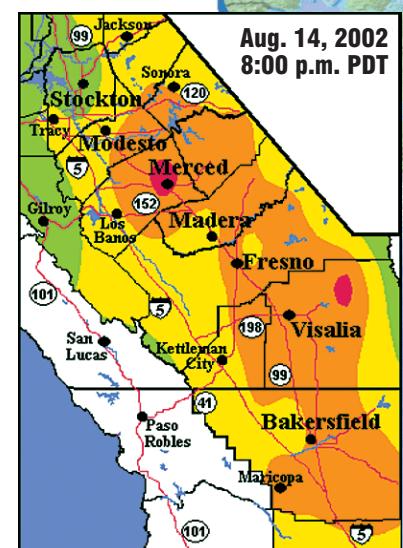
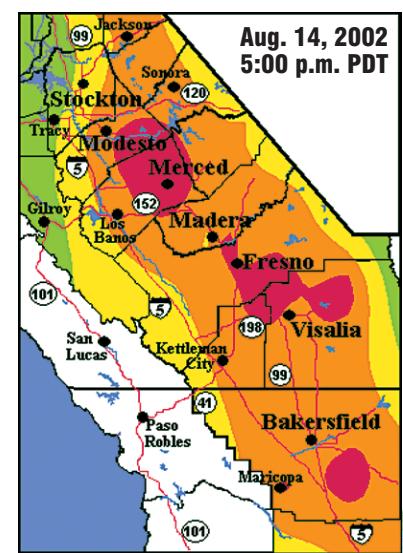
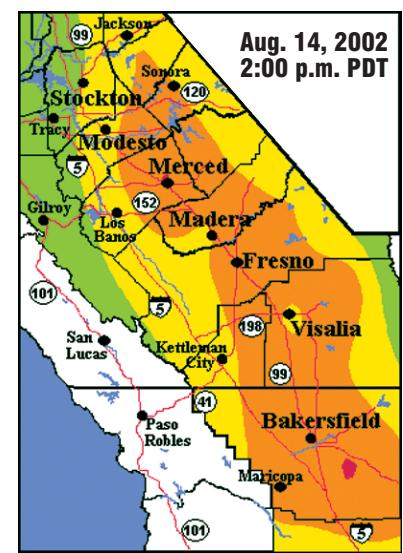
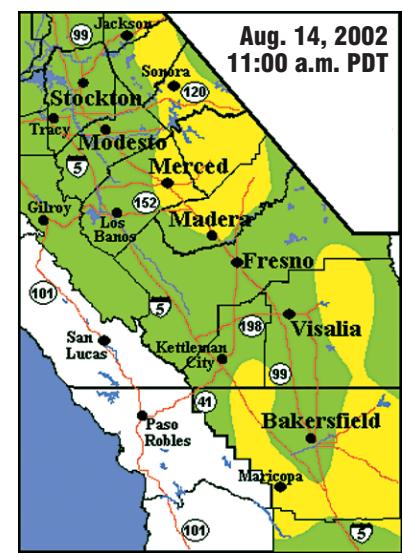
A bad ozone day in a national park may seem like a sad contradiction in terms, but at Sequoia and Kings Canyon, the visitor centers now have signs showing how bad the ozone will be each day.

It's a tough issue for the public to comprehend. The federal government is trying to raise awareness through a push to reduce haze in national parks.

Officials want to clear the haze that often obscures such outdoor treasures as the Great Smoky Mountains in Tennessee or Acadia National Park in Maine.

The Environmental Protection Agency has put together a public awareness campaign about the new rules, which will cut back on coal plant emissions, primarily in the East.

Out West, in Sequoia, Grand Canyon and other places, there



**San Joaquin Valley Air Pollution Control District**

Sources: U.S. Environmental Protection Agency; San Joaquin Valley Air Pollution Control District; U.S. Geological Survey

also is a considerable haze problem, mostly dust and other particles.

But the real culprit in Sequoia is an invisible gas: ozone. You can see the chemicals, or the so-called precursors of ozone, hanging in the air early in the day. But when the sun bakes the chemicals, they turn into ozone, a gas that damages lungs, crops, pine trees and other living things.

Add a little smoke or dust in the air on a hot day and you get a brown, chemical soup called smog — still mostly ozone.

Clearing the air of haze may improve the view, and it will make breathing easier in Sequoia. But it probably won't chase away a significant amount of ozone.

"Those [haze] rules won't help ozone issues," Reynolds says.

Sequoia and the surrounding Sierra are suffering

generally agree that plant damage can occur. (To understand the scale of the pollution, 1 ppb is equivalent to about 1 drop in a backyard swimming pool.)

Lodgepole and Jeffrey pine trees begin showing yellow spots on the needles, which become more fragile and fall out sooner than they should.

The mature giant sequoias — which can live 2,000 to 3,000 years — do not yet show signs of damage from ozone, according to scientists. But sequoia seedlings, the next generation of giants, show damage in tests that researchers have performed.

The effects are pretty obvious. Ozone stops the movement of sugar in the plant, inhibits photosynthesis (the plant process of making its own nutrition) and bleaches out the vegetation in spots.

"You'll see this chlorotic mottling," says plant pathologist Mark Fenn of the U.S. Forest Service's Pacific Southwest Research Center in Riverside.

Fenn has studied air pollution effects on plants for many years in Southern California mountains. Being downwind of the Los Angeles area, the mountains have been hit with some of the country's highest ozone levels for decades.

Trees become more vulnerable when insect infestations or other challenges occur. Plant scientists say many trees die from these other challenges, even though ozone damage often makes them more susceptible.

Fenn has been closely looking at the effects from nitrogen, another ingredient in the air pollution puzzle.

Nitrogen, a gaseous chemical element, is ubiquitous in living things. It forms almost 80% of the atmosphere. But it could threaten animal and human life if too much enters the natural system.

Scientists are worried about oxides of nitrogen, which pass from combustion sources, such as cars, diesel engines and other activities.

Researchers know nitrogen is being overloaded in the mountain ecosystem, says Fenn. Nitrogen generally acts as a fertilizer and helps plants grow — it's found abundantly in manure, which is used as a plant nutrient.

Esperanza says scientists are worried about nitrogen causing too much growth at the wrong time of year. And the wrong plants could be growing too well.

Fast-growing plants, inadvertently or intentionally introduced into the Sierra from other parts of the world, have the potential to eliminate natural species and compromise the overall health of the forest.

"The invasive plants can grow better because of the increased nitrogen," she says. "Often they have developed in places where nitrogen is more plentiful."

There also is concern about the chemistry and biology in lakes around the Sierra. Rainfall tainted with smog can contain acid or sulfur that accumulates in bodies of water.

Scientists believe some of the most pristine lakes in the high Sierra could turn more acidic and destroy some life in the ecosystem. Perhaps ozone is even contributing to the mysterious decline in Sierra frogs and toads, though research does not yet support that conclusion.

Traffic reduction would seem to be among the answers, officials said. Sequoia-Kings Canyon, side-by-side parks in the southern Sierra, attract about 1.7 million visitors annually, but traffic is not the same problem as it is with their more famous northern neighbor, Yosemite.

In Yosemite, officials acknowledge that part of the ozone problem comes from vehicles in Yosemite Valley, which is traveled by about 70% of the 3.5 million visitors annually.

But ozone from cities also drifts into the area through mountain passes. A regional cleanup of the air is necessary, says Yosemite planner Russell Galipeau.

"For us to clean up the air, we need to be a player in the regional discussions," Galipeau says. "We need to reduce our emphasis on the car and support regional transportation."

## Ozone lingers among sequoias

Smog drifts on gentle winds from urban areas into the Sierra and the giant sequoia groves during the day. The same stagnant weather patterns that hold the bad air in the San Joaquin Valley also will trap the air in mountain canyons on the Sierra's western slope.

Strangely, the smog, or ozone, remains at higher concentrations overnight in the mountains than in San Joaquin Valley cities. The reason: Traffic in the Valley continues producing smog-making chemicals that actually consume ozone when the sun goes down. There is little traffic in the mountains and no additional chemicals to eliminate the ozone, so the ozone level remains high all night. Readings at Sequoia National Park's monitors were higher at 8 a.m. and 11 p.m. than anywhere in the Valley.

THE FRESNO BEE

**MYTH:** Low levels of soot, dust and chemical particles in the air can't harm you.

**REALITY:** Science has not identified any safe level. Even moderate spikes of particulates create some health effect.



Air monitoring station

### Ozone levels Aug. 14, 2002 5:00 p.m. PDT

Good

Moderate

Unhealthy for sensitive groups

Unhealthy

Very unhealthy

### Tracking the problem

The San Joaquin Valley Air Pollution Control District maintains numerous air monitoring sites throughout the region to measure pollutants and forecast health advisories. Yosemite and Sequoia national parks also monitor the air.

## SUNDAY

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