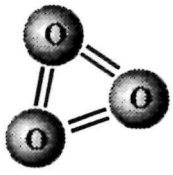
Sequoia and Kings Canyon

National Parks
National Park Service
U.S. Department of the Interior



OZONE - The Invisible Poison

WHAT IS OZONE?

Ozone is a poisonous form of oxygen that can damage both plant and animal tissue. The molecules forming this invisible, odorless gas contain 3 oxygen atoms — O_3. The oxygen we need to live contains 2 oxygen atoms per molecule. It may not seem like a big difference — just one more atom per molecule -- but the effects of high ozone levels are considered a serious threat in our cities and at Sequoia and Kings Canyon National Parks.

WHERE DOES OZONE COME FROM?

A natural ozone layer high in the atmosphere blocks much of the sun's harmful ultraviolet radiation from reaching Earth. Unlike this protective layer, ozone near the Earth's surface can be very destructive. It forms when other chemicals in the air -- nitrogen oxides and hydrocarbons -- react in the presence of sunlight. Most nitrogen oxides and hydrocarbons come from car and truck exhaust; an estimated 60% of the ozone problem is due to vehicle emissions. Over 40% of these emissions are from diesel trucks and buses. Ozone is the most widespread air pollutant in our country and is the main ingredient in smog.

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Ozone can cause permanent lung damage, coughing, sinus inflammation, chest pains, scratchy throat, stinging eyes, and general malaise. High concentrations are hazardous to people with heart and respiratory ailments. Most vulnerable are children, the elderly, and those with existing health problems.

WHAT ARE THE EFFECTS OF TOO MUCH OZONE?

Ozone damages plants by interfering with photosynthesis, the process plants use to make food. Studies have found that 39% of the Jeffrey and ponderosa pine trees in Sequoia and Kings Canyon National Parks show some visible ozone injury. Tests on giant sequoia seedlings showed a significant decrease in photosynthesis and reduced growth at ozone levels 50% higher that what is already in the air.

Ozone injures the lungs of humans and other animals, decreasing their ability to fight infection and remove inhaled particles. Ozone can cause permanent lung damage, coughing, sinus inflammation, chest pains, scratchy throat, stinging eyes, and general malaise. High concentrations are hazardous for people with heart and respiratory ailments. Most vulnerable are children, the elderly, and those with existing health problems.

OZONE MONITORING

The National Park Service keeps track of ozone levels at four places in these parks. During summer, ozone levels here exceed the California Health Standard of 0.09 ppm (parts per million) an average of one out of every three days at low-elevation sites like Ash Mountain, and one out of every five days at mid-elevation sites like Grant Grove and the Giant Forest. Ozone levels at these park sites are often higher than in cities like Los Angeles. Continued research and monitoring will help to evaluate the extent of the problem. With this information, we can take appropriate actions to protect park ecosystems, and ourselves, from this invisible poison.

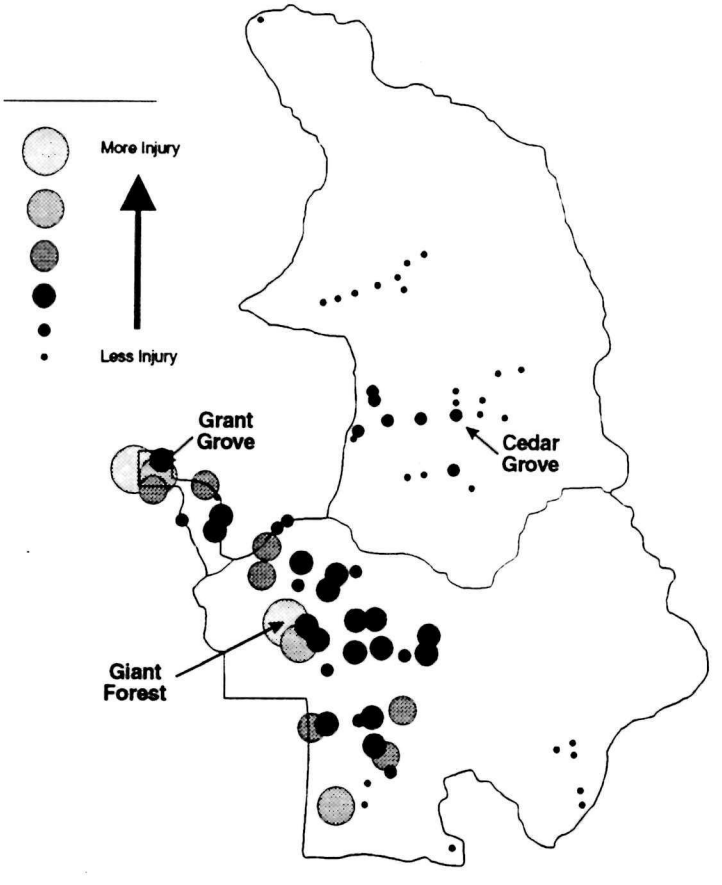
During summer, ozone levels in Sequoia and Kings Canyon exceed the California State Health Standard of 0.09 ppm an average of one out of every three days at lower elevations, and one out of every five days at mid-elevations.

AIR POLLUTION:
How does it get in the parks?

Most pollution starts outside the parks, but park boundaries cannot keep it out. The San Joaquin Valley is ideally shaped to trap pollutants. Mountain ranges to the west, south, and east create a large basin -- 100 miles wide by 300 miles long. Prevailing winds blow pollution into this basin from cities along the central coast. Wind patterns then carry it south through the San Joaquin Valley, picking up additional pollutants along the way. When the winds hit the mountains at the southern end of the valley, much of the polluted air turns and is forced back into the valley. This collection of trapped pollutants rises up into Sequoia and Kings Canyon National Parks — giving these parks some of the worst air quality of any national park in the country.

During the past century, the marshes, grasslands, and oak woodlands of the San Joaquin Valley have been replaced by roads and cities, industry and agriculture. Trucks and cars now contribute more than half of the valley's ozone pollution. Other sources of pollution include electric power generation, petroleum production, and agricultural practices. Since this area has the fastest-growing population in California, it will be a difficult challenge to keep pollution from increasing.

Is it hurting our forests?



This map of Sequoia and Kings Canyon National Parks shows the relative severity of ozone injury observed at sample sites. More injury (larger dots) occurs in areas closer to the San Joaquin Valley.

The Damage

Ozone affects plants by interfering with the process of photosynthesis. As a result, plants are more likely to be harmed by other stresses, such as drought, disease, or insects.

Some 39% of the Jeffrey and ponderosa pines in Sequoia and Kings Canyon show some visible ozone injury, according to National Park Service studies. They have also shown that giant sequoia seedlings are sensitive to ozone injury.

What Can Be Done

Researchers continue to study the effects of air pollution on our forests, but it will take all of us to help solve the problem. We ***can*** help to improve the air in our national parks and at home: recycle resources, purchase ecologically sound items,and reduce use of electricity. Use cars only when necessary -- ride a bike or try carpooling.

Keep informed of efforts in your community — at the local, state, and federal level — and support efforts to clean up our air!

INT-821-1293