

2019 Novel Coronavirus (COVID-19) Response

The National Park Service is modifying its operations on a park-by-park basis in accordance with the latest guidance from the Centers for Disease Control and Prevention (CDC) and state and local public health authorities. While most facilities and events are closed or canceled, outdoor spaces in some parks remain accessible to the public. Before visiting, please check with **individual parks** regarding changes to park operations. If you choose to visit a national park, please ensure that you follow CDC and state and local guidelines to prevent the spread of infectious diseases and practice **Leave No Trace principles**. Updates about the NPS response, including safety information, are posted on **www.nps.gov/coronavirus**.

National Park Service

Air

NPS.gov / Home / Understanding Air / Effects of Air Pollution / Nature / Ozone Effects

Ozone Effects on Plants

Ground-level ozone is one of the most widespread air pollutants. Naturally-occurring ozone in the upper atmosphere forms a layer that absorbs the sun's harmful ultraviolet rays and protects all life on earth. But, ground-level ozone can harm plants as well as [human health](#). It does not come directly from smokestacks or vehicles, but instead is formed when other pollutants, mainly nitrogen oxides and volatile organic compounds, react in the atmosphere in the presence of sunlight. Ozone causes considerable damage to plants around the world, including agricultural crops and plants in natural ecosystems.

Ozone damages plants by entering leaf openings called stomata and oxidizing (burning) plant tissue during respiration. This damages the plant leaves and causes reduced survival. Many factors can increase the amount of ozone injury such as soil moisture, presence of other air pollutants, insects or diseases, and other environmental stresses. Ozone effects on natural vegetation have been documented throughout the country, especially in many areas of the eastern U.S. and in California. [Ozone gardens](#) are one way that national parks are studying ozone effects on vegetation in collaboration with students and community groups.

NPS [ozone risk assessments](#) rank park risk according to pollutant exposure and ecosystem sensitivity (soil moisture and sensitive species). Some species are more sensitive to ground-level ozone than others. Search for a [list of sensitive plant species](#) by park. Also, learn how ozone affects [tree growth](#). Learn more about the effects of air pollution in parks by visiting the [Park Air Profiles](#) pages or [AQRV Inventory Products](#) page.



Photo of healthy (top) and ozone-injured (bottom) tulip tree (yellow poplar) foliage.

Research in Parks

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Park Air Profiles - Sequoia & Kings Canyon National Parks



Air quality profile for Sequoia & Kings Canyon National Parks. Gives park-specific information about air quality and air pollution impacts for Sequoia & Kings Canyon NPs as well as the studies and monitoring conducted for Sequoia & Kings Canyon NPs.

Park Air Profiles - Shenandoah National Park



Air quality profile for Shenandoah National Park. Gives park-specific information about air quality and air pollution impacts for Shenandoah NP as well as the studies and monitoring conducted for Shenandoah NP.

Park Air Profiles - Lava Beds National Monument



Provides information about air pollution, research and monitoring, and related references specific to Lava Beds National Monument.

Park Air Profiles - Everglades National Park



Air quality profile for Everglades National Park. Gives park-specific information about air quality and air pollution impacts for Everglades NP as well as the studies and monitoring conducted for Everglades NP.

Park Air Profiles - Glacier National Park



Air quality profile for Glacier National Park. Gives park-specific information about air quality and air pollution impacts for Glacier NP as well as the studies and monitoring conducted for Glacier NP.

Park Air Profiles - Redwood National and State Parks



Air quality profile for Redwood National and State Parks. Gives park-specific information about air quality and air pollution impacts for Redwood NSP as well as the studies and monitoring conducted for Redwood NSP.

Park Air Profiles - Olympic National Park



Air quality profile for Olympic National Park. Gives park-specific information about air quality and air pollution impacts for Olympic NP as well as the studies and monitoring conducted for Olympic NP.

Park Air Profiles - Petrified Forest National Park

Air quality profile for Petrified Forest National Park. Gives park-specific information about air quality and air pollution impacts for Petrified Forest NP as well as the studies and monitoring conducted for Petrified Forest NP.



GREAT SMOKY MOUNTAINS NATIONAL PARK

Ozone effects on two ecosystem services at Great Smoky Mountains National Park, USA



Protected areas such as national parks are recognized as important providers of ecosystem services, the benefits nature conveys to humans. However, some threats to these services, such as air pollution, can derive from outside a park's boundaries.

Park Air Profiles - Mammoth Cave National Park



Air quality profile for Mammoth Cave National Park. Gives park-specific information about air quality and air pollution impacts for Mammoth Cave NP as well as the studies and monitoring conducted for Mammoth Cave NP.

Tags: [ozone](#) [ground level ozone](#) [O3](#)

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