



Air Quality Monitoring



Looking toward the Coachella Valley from Keys View in the park on days with high and low air quality (NPS photos)

Why Monitor Air Quality?

Visitors to Joshua Tree National Park (JTNP) expect clean desert air and beautiful views. But though the park is protected in many ways, air pollution ignores boundaries. Haze often obscures mountain vistas, and in hot weather, ozone concentrations sometimes exceed levels safe for people to breathe. Polluted air also drops nitrogen compounds onto desert soil, where they act like fertilizer, helping invasive plants get a foothold.

The JTNP Air Quality (AQ) Monitoring Program aims to address these issues using monitoring and analysis methods put in place by the National Park Service's Air Resources Division (ARD). The primary objectives of the JTNP program are to

- document current air quality conditions in the park;
- identify the sources of pollution that affect park air quality;
- track air quality trends using scientific data; and
- understand how pollution affects park resources

With the information gained by long-term AQ monitoring, park managers can recommend actions to mitigate the impacts of air pollution.

Where Does the Air Pollution Come From?

Much of the air pollution that reaches JTNP starts as emissions from power plants, factories, and motor vehicles in the densely populated Los Angeles Basin and Coachella Valley. Westerly winds blow these pollutants into the park. Smoke from local and regional wildland fires, dust from construction projects

near the park, and automobile exhaust from the growing number of park visitors also contribute to air quality problems at JTNP.

How Do You Monitor Air Quality?

AQ monitoring at JTNP focuses on measuring visibility, gaseous pollutants, and atmospheric deposition. Three automated monitoring stations collect most of the park's air quality data. The primary station is located south of Black Rock Canyon Campground in the Mojave Desert region of the park, the area most impacted by air pollution. The station began reporting data in 1993. Two additional stations went online later at southern (Cottonwood Visitor Center, 2005) and eastern (Pinto Wells, 2007) sites in the park.

Instruments at the three stations measure ozone (O₃), particulate matter (PM), and gaseous pollutants. Other instruments collect meteorological data such as air temperature, precipitation, relative humidity, and wind speed to help monitor climate change.

To maintain the accuracy of monitoring equipment, technicians make weekly site visits and conduct calibration checks. The California Air Resources Board also audits the stations annually.

Air Quality Data Online Resources

EPA: www.epa.gov/outdoor-air-quality-data

NPS ARD: www.nps.gov/subjects/air/airqualityparks.htm

Trends in Park Air Quality

In general, air quality at JTNP is holding steady or has improved slightly since monitoring began, but air quality remains a serious concern. Here are recent findings for some of the most worrisome pollutants.

Ozone. Ground level ozone, a respiratory irritant, has long been a problem in the northwestern part of the park. Ozone levels at the Black Rock site have improved since monitoring began, declining by 1.135 ppb, on average, each year between 1994 and 2019, possibly because of tighter controls on some industry emissions. Even so, ozone levels at Black Rock exceeded national health standards on 34 days in 2020, mostly during the months May–August. In fact, among the 38 national parks that monitor ozone, only Sequoia National Park routinely records more days exceeding ozone health standards. Exceedances are

uncommon at the park's Cottonwood and Pinto Wells stations.

Visibility. The haze that interferes with long-distance views is quantified in units called *deciviews*. Between 2001 and 2019, visibility at JTNP improved slightly, declining on average 0.10 dv/year. But visibility is still impaired. In 2020 the measured visual range was between 48 and 153 miles; in clean air, park visitors should be able to see 119 to 206 miles.

Particulate Matter. Particulate matter includes solid particles and liquid droplets in the air: dust, smoke, soot, organic chemicals, and dirt in many shapes and sizes. These microscopic droplets and particles can enter the lungs and even the bloodstream. They are also the main cause of reduced visibility.

According to the ARD, particulate matter levels are "good" at JTNP, but with

a deteriorating trend from 2011–2020. This change is likely due to development outside the park and wildland fires.

Nitrogen and Sulfur. Airborne nitrogen (N) and sulfur (S) compounds can harm ecosystems by increasing plant nutrients (N) and soil acidity (N & S). In recent years the deposition of nitrates and sulphates in precipitation has decreased, but ammonium (another N compound) and total nitrogen in precipitation are unchanged. Of concern is a likely increase in the *dry* deposition of nitrogen products; increased nitrogen in the soil may help invasive plant species outcompete native plants, which evolved to thrive in low-N soils. When non-native grasses dry out in late summer, they provide fuel for wildfires, which threaten plants like piñon pines, juniper trees, and the park's flagship Joshua trees. Fires also further compromise air quality.

Monitoring Collaborations

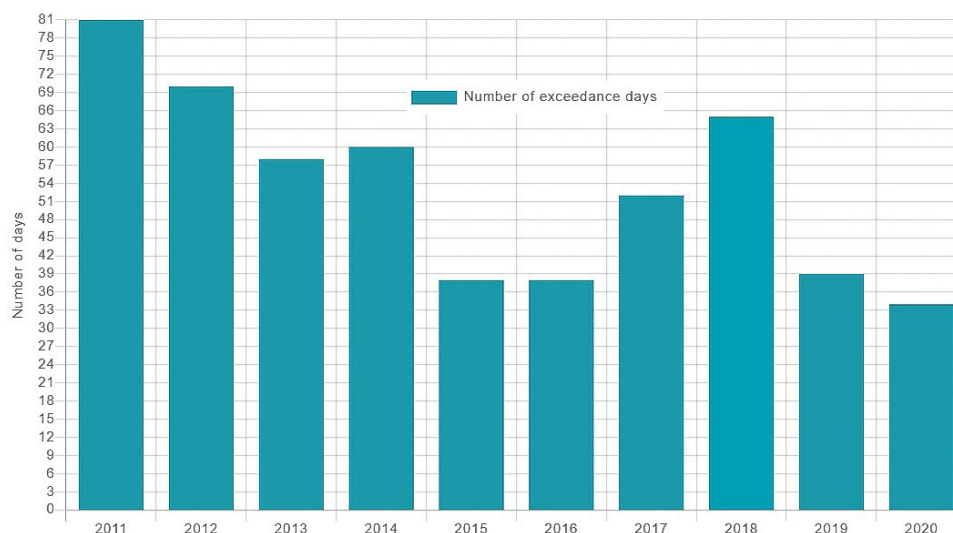
JTNP participates in multi-agency monitoring networks, including:

ASCENT. The [Atmospheric Science and Chemistry Measurement Network](#), an NSF program, selected JTNP's Black Rock site as one of twelve locations where advanced instruments are used to monitor atmospheric aerosols.

CASTNet: The NPS collaborates with the EPA to operate the [Clean Air Status and Trends Network](#). A CASTNet station that estimates dry atmospheric deposition is located at Black Rock.

IMPROVE. [Interagency Monitoring of Protected Visual Environments](#) chose the Black Rock site to host instruments that monitor how pollution affects visibility. IMPROVE collects data on fine particulate matter including ammonium sulfate, ammonium nitrate, organic mass, elemental carbon, fine soil, and fine sea salt.

NADP. The [National Atmospheric Deposition Program](#) analyzes rainfall from JTNP for NO_x and SO_x and maintains long-term records of precipitation chemistry and passive ammonia.



Number of days each year that ozone levels have exceeded the EPA's National Ambient Air Quality Standards, 2011–2020 (NPS graphic)

Management Applications

The JTNP air quality monitoring program shares its findings with park management and the NPS Air Resources Division. These findings steer management actions to mitigate air pollution impacts on biological and wilderness resources in the park.

The park notifies visitors and the general public about air quality through daily forecasts that are posted at visitor centers and entrance stations. Park staff also receive this information daily.

More Information

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