
My NASA Data - Lesson Plans

Monitoring Ozone in National Parks

Grade Band

- 6-8

Time

- 50 minutes

Overview

This lesson uses the National Park Service StoryMap which displays national parks around the contiguous United States and their standard exceedance ozone concentrations from 2016-2021. Students will navigate the map by clicking various symbols to view data about selected ozone levels and answer the following questions.

Materials Required

Choose one of the following

- Monitoring Ozone in National Parks [PDF document](#)
- Monitoring Ozone in National Parks [Google Doc](#)

Procedure

This lesson uses the National Park Service StoryMap which displays national parks around the contiguous United States and their standard exceedance ozone concentrations from 2016-2021. That means the ozone levels were higher than the allowed levels for the day.

1. Students will read the paragraph on **Monitoring Ozone in National Parks**, then answer **Question Set 1**.
 1. A table will follow the first question to organize each National Park location and their ozone concentrations.
 2. Feel free to modify the table to reflect the goals of your lesson.
2. Students will read the paragraph on **Joshua Tree National Park**.

3. Analyze the [Daily Ozone AQI chart for Los Angeles County](#) to answer **Question Set 2**.

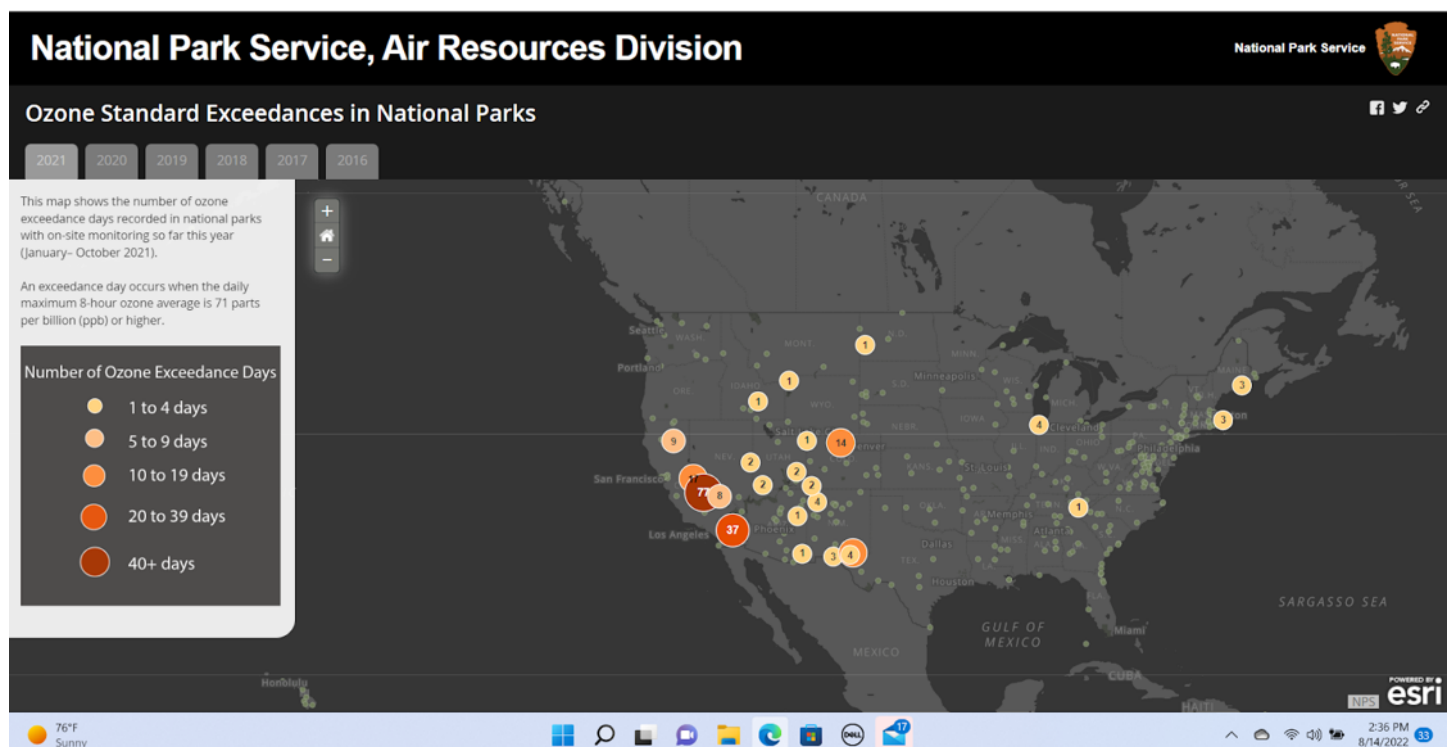
Monitoring Ozone in National Parks

The current National Ambient Air Quality Standard for ozone is of 70 parts per billion (ppb), daily maximum 8-hour average ozone concentration. Exceedance days are when ozone levels are above the national standard level. An exceedance day occurs on each calendar day when the daily maximum 8-hour average is greater than or equal to 71 ppb.

The National Park Service (NPS) monitors ozone in parks around the country. The interactive map shows the number of days that exceed National Ambient Air Quality Standard for ozone by park. This standard is set by the Environmental Protection Agency and identifies the level at which ozone in the air becomes unhealthy.

The map displays the parks and the number of days where ozone levels have exceeded the standard in each year from 2016–2021. Monthly summaries of exceedance days as well as the maximum and 4th highest 8-hour average ozone concentrations are also provided by park.

Click on park circle symbols in the [StoryMap Page](#) to see this information.



[Ozone Exceedances in National Parks. Source: nps.gov | https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/NPS_ozone.png](#)

Question Set 1

Name of park	Which months exceed?	Total days exceeding 2016-2021

2. Are any of the parks on the list every year?
3. Of the parks that have exceedance days, which has the most? Does this surprise you? Why or why not?
4. Where are most of the parks that have exceeded the standards generally located?
5. Do parks with a year of exceedance over 10, exceed every year? What might be an explanation for this observation?
6. What is the similarity between parks and the most common months of exceeding the standard?

Joshua Tree National Park

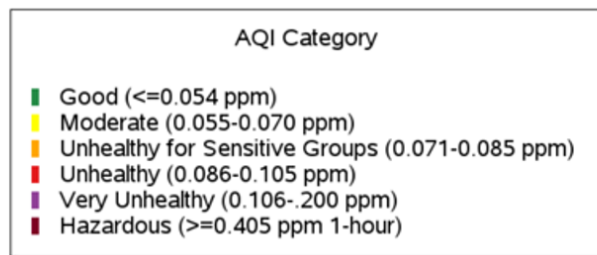
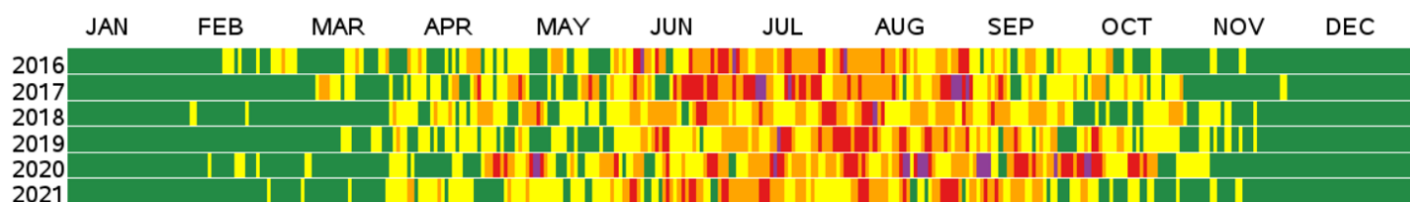
On a clear day visitors to Joshua Tree National Park can see the Mexican border from the mile-high vantage point of Keys View. More often, visitors can barely discern the tip of 10,000-foot-high Mount San Jacinto, about 50 miles away.

The haze that obscures these vistas is the result of smog that blows into the park from surrounding urban areas. Growth in the Coachella Valley, the current real estate boom in the hi-desert, and construction of power plants nearby, all impact air quality in the park. But Los Angeles basin, with a population over 12 million, is the major contributor of ozone and other pollutants that reach the park.

1. Which parks have had a year with 10 or more days that exceed ozone standards?

Ozone Daily AQI Values, 2016 to 2021

Los Angeles County, CA



[AQI Values, 2016 to 2021, Los Angeles County, Ca. Source: EPA.gov | https://mydasdata.larc.nasa.gov/sites/default/files/inline-images/AQI_1.png](https://mydasdata.larc.nasa.gov/sites/default/files/inline-images/AQI_1.png)

Question Set 2

1. How does the data from this tile plot support the explanation that most of the ozone detected in Joshua Tree comes from the Los Angeles Basin area?
2. Based on this information, when is the best time to visit Joshua Tree National Park? What evidence supports your answer?

Note: Consider using any of the short video clips provided about national parks or air quality as a hook or activating prior knowledge for students:

- [Air Quality Index](https://www.youtube.com/watch?v=G9ZwsbfiGuI). Source: CraterLakesNPS. Video Length: 2:52 | <https://www.youtube.com/watch?v=G9ZwsbfiGuI>
- [Air Quality Explained](https://www.youtube.com/watch?v=_hk63Oozcjo). Source: National Weather Service. Video Length: 1:43 | https://www.youtube.com/watch?v=_hk63Oozcjo
- [Clear Air and Magnificent Skies \(Utah\)](https://www.youtube.com/watch?v=aaoPYRCkpu0). Source: NPS Natural Sounds and Night Skies. Video Length: 4:51 | <https://www.youtube.com/watch?v=aaoPYRCkpu0>

Answers:

Teachers who are interested in receiving the answer key, please complete the [Teacher Key Request and Verification Form](#). We verify that requestors are teachers prior to sending access to the answer keys as we've had many students try to pass as teachers to gain access.

Sources:

1. Air Quality Index. (2020, September 17). YouTube. Retrieved September 27, 2022, from <https://www.youtube.com/watch?v=G9ZwsbfiGuI>
2. Air quality explained. (2022, May 25). YouTube. Retrieved September 27, 2022, from https://www.youtube.com/watch?v=_hk63Oozcjo
3. Clear Air and Magnificent Skies (Utah). (2015, March 10). YouTube. Retrieved September 27, 2022, from <https://www.youtube.com/watch?v=aaoPYRCkpu0>

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4. Ozone Standard Exceedances in National Parks. (n.d.). National Park Service. Retrieved September 27, 2022, from <https://www.nps.gov/gis/storymaps/MapSeries/v1/index.html?appid=5d82502...>
 5. Ozone Exceedances in National Parks - Air (U.S. (2022, July 1). National Park Service. Retrieved September 27, 2022, from <https://www.nps.gov/subjects/air/ozone-exceed.htm>
 6. Surface Ozone. (n.d.). GLOBE.gov. Retrieved September 27, 2022, from <https://www.globe.gov/do-globe/globe-teachers-guide/atmosphere/surface-...>
 7. Air Data - Multiyear Tile Plot | US EPA. (2021, December 6). EPA. Retrieved September 27, 2022, from <https://www.epa.gov/outdoor-air-quality-data/air-data-multiyear-tile-pl...>
 8. Air Quality - Joshua Tree National Park (U.S. (2015, February 28). National Park Service. Retrieved September 27, 2022, from <https://www.nps.gov/jotr/learn/nature/airquality.htm>

NGSS Three Dimensional Learning

NGSS Disciplinary Core Ideas

- ESS3C: Human Impacts on Earth Systems

NGSS Crosscutting Concepts

- Patterns
- Cause and Effect

NGSS Science and Engineering Practices

- Developing and Using Models
- Analyzing and Interpreting Data

Learning Objectives

Access and use data the EPA makes available from monitors in our national parks.

Essential Questions

When, where, and why are ozone levels high in national parks?

Student Resources

- [Monitoring Ozone in National Parks](#)

Google Docs Interactive Files

[Monitoring Ozone in National Parks](#)

