Ozone Season Summary
2019

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Executive Summary

Arkansas experienced an ozone season, which lasts from May 1 to September 30, with predominantly healthy concentrations. The Little Rock–North Little Rock–Conway Metropolitan Statistical Areas (MSA) experienced 135 days within the Air Quality Index's (AQI) green or "good" category, 18 days in the yellow or "moderate" category, and no days in the orange or "unhealthy for sensitive groups" category. Similarly, the Fayetteville-Springdale-Rogers MSA experienced 140 days in the green or "good" category, 13 days in the yellow or "moderate" category, and no days in the orange or "unhealthy for sensitive groups" category. The Memphis MSA, which includes Crittenden County, Arkansas, experienced 98 days in the green or "good" category, 51 days in the yellow or "moderate" category, and 4 days in the orange or "unhealthy for sensitive groups" category.

In addition, the entire State of Arkansas remains in attainment for all National Ambient Air Quality Standards including the 2015 Ozone Standard of 70 ppb. The design value for 2015 Ozone Standard is 62 ppb for both the Little Rock–North Little Rock–Conway and the Fayetteville–Springdale–Rogers MSA. The design value for the Memphis MSA is 68 ppb. The design value for all other monitors is less than 61 ppb.

1. Anthropogenic Ozone

Ozone (O_3) is a colorless gas made up of three oxygen atoms and is not emitted directly into the air. Anthropogenic ground-level ozone formation depends on the complex reaction of pre-cursor volatile organic compounds (VOCs) and nitrogen oxides (NO_X) in the presence of solar radiation, most commonly during hot, sunny, summer days with stagnant winds.

1.1 Sources of ozone pre-cursors

- Fuel combustion (NO_X) and evaporation (VOCs) associated with stationary sources, such as power plants, industrial boilers, refineries, chemical plants, and other sources.
- Fuel combustion (NO_X) and fueling evaporation (VOCs) associated with motor vehicles, such as cars, trucks, buses, etc.
- Organic compound evaporation (VOCs) such as paints, cleaners, and solvents.
- Fuel combustion (NO_X) and fueling evaporation (VOCs) associated with off-road engines such as aircraft, trains, agricultural operations, lawn and garden equipment, etc.

1.2 Weather conditions favorable to the production of ozone

- Slow to stagnant wind speeds: In general, low wind speed is necessary for the accumulation of the ozone precursors.
- Higher temperature: Higher temperature enhances the photochemical reaction rates and increases the evaporative emissions of pre-cursor VOCs.
- Low humidity, lack of cloud cover, and precipitation can increase ozone formation.

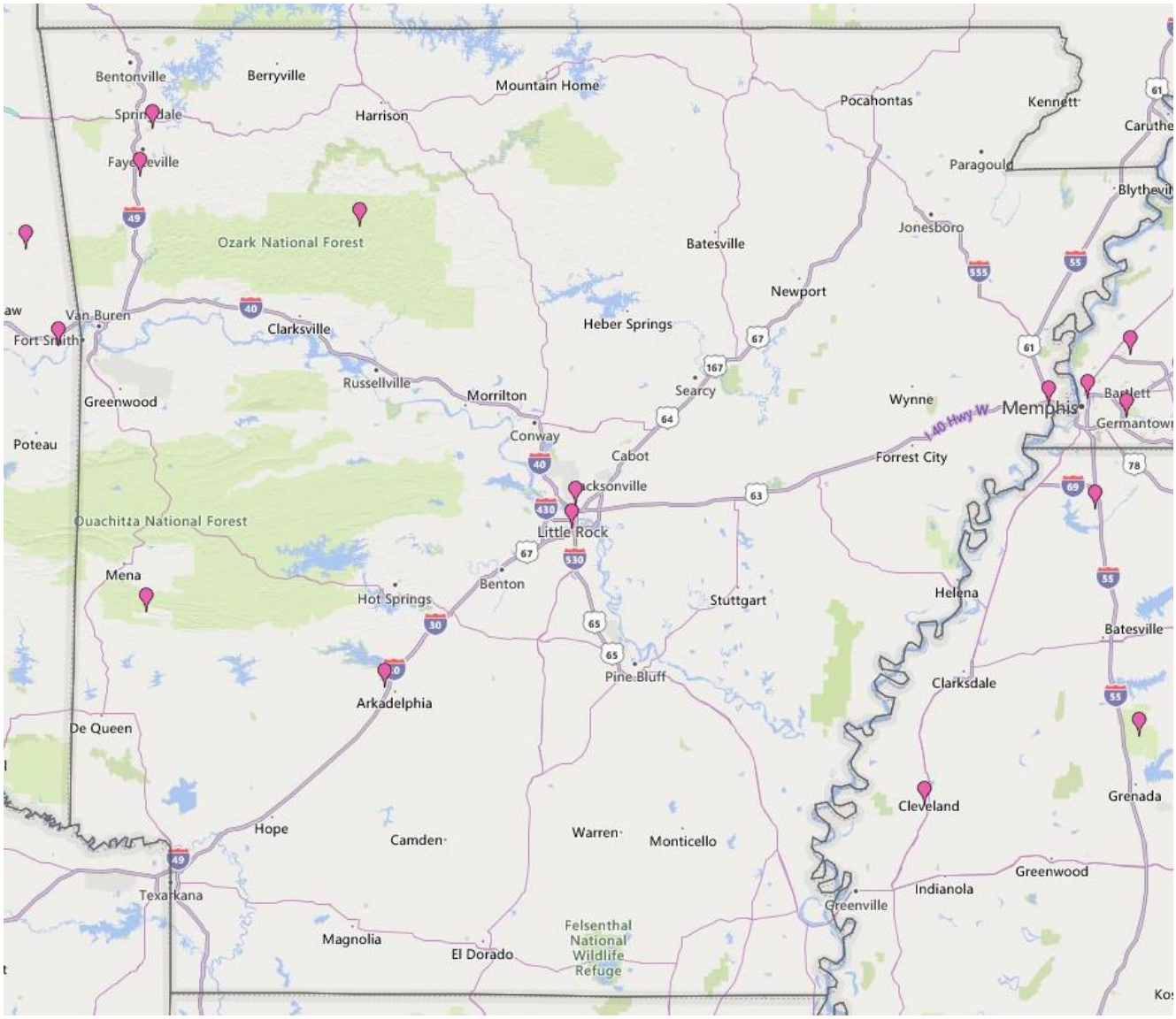
1.3 Effects of Ozone

- Ozone can inflame and irritate the respiratory tract, causing breathing difficulty, coughing, and throat irritation, particularly among individuals with preexisting respiratory conditions, as well as in the elderly and in children.
- Exposure to ozone can increase the lung's susceptibility to infections and allergens.
- Elevated ozone concentrations can reduce crop yields and damage native plants.

2. National Ambient Air Quality Standard

The National Ambient Air Quality Standard (NAAQS) concentration for ground level ozone is 0.070 ppm. The averaging time and form of the ozone NAAQS is calculated as the annual fourth-highest daily maximum 8-hour average concentration at each monitor averaged over three consecutive years, which is referred to as the Design Value. Arkansas currently operates eight ozone monitors (Figure 1).

Figure 1: Ozone monitors in Arkansas and on the periphery of adjacent state



The EPA sets the NAAQS to protect human health with an adequate margin of safety, including sensitive populations such as children, the elderly, and individuals suffering from respiratory diseases, as well as to prevent damage to property, protect against transportation hazards, protect economic values, and ensure personal comfort. The Air Quality Index (AQI) is an index for reporting daily air quality to the public to inform the public of the air quality in specific area (Figure 2). The Division of Environmental Quality (DEQ) forecasts ozone AQI for both central Arkansas and northwestern Arkansas throughout the ozone season.

Figure 2: Ozone air quality indices

Index Values	O_3 (8hr) (ppm)	Air Quality
0 - 50	0.000 - 0.054	Good
51 - 100	0.055 - 0.070	Moderate
100 - 150	0.071 - 0.085	Unhealthy for Sensitive Groups
151 - 200	0.086 - 0.105	Unhealthy
201 - 300	0.106 - 0.200	Very Unhealthy
301 - 400	0.201 & above	Hazardous

An Ozone Action Day Advisory is issued when the ozone AQI exceeds 100 and an Ozone Action Day Alert is issued when the ozone AQI exceeds 150 (Figure 3).

Figure 3: Thresholds for Ozone Action Day Advisories and Alerts

Category	AQI
Action Day Advisory	100<AQI≤150
Action Day Alert	151<AQI

3. Ozone Season (May 1 to September 30)

An ozone season is a period of time in which ground-level anthropogenic ozone typically reaches its highest concentrations. The ozone season in Arkansas consists of 153 days from May 1 to September 30. In the Little Rock–North Little Rock–Conway MSA since at least 2015, the annual highest concentrations of ozone reached the orange "Unhealthy for Sensitive Groups" level in 2017 and 2018 and the yellow "Moderate" level in 2015, 2016, and 2019 (Figure 4). These annual highest concentrations have all occurred in late May or early June. Concentrations in the Fayetteville–Springdale–Rogers MSA (Figure 5) were typically lower than the Little Rock–North Little Rock–Conway MSA and did not reach the orange "Unhealthy for Sensitive Groups" level. Here, the annual highest concentrations are also predominantly in May or June.

Figure 4: Annual highest ozone AQI (2015-2019) in the Little Rock–North Little Rock–Conway MSA and date of occurrence

Index Value	Date
87	5/31/2019
122	6/06/2018
115	6/09/2017
100	6/09/2016
100	6/05/2015

Figure 1: Annual highest ozone AQI (2015-2019) in the Fayetteville–Springdale–Rogers MSA and date of occurrence

Index Value	Date
74	5/31/2019
87	8/01/2018
64	6/09/2017
77	6/09/2016
87	6/05/2015

3.1 2019 Ozone season in the Little Rock–North Little Rock–Conway MSA

- 135 days (88%) in the green "Good" category
- 18 days (12%) in the yellow "Moderate" category
- Zero Ozone Action Days

3.2 2019 Ozone season in the Fayetteville–Springdale–Rogers MSA

- 140 days (92%) in the green "Good" category
- 13 days (8%) in the yellow "Moderate" category
- Zero Ozone Action days

3.3 2019 Ozone season in the Memphis MSA

- 98 days (64%) in the green "Good" category
- 51 days (33%) in the yellow "Moderate" category
- 4 days (3%) in the orange "Unhealthy for Sensitive Groups" category

3.4 ADEQ's Ozone Forecasting Statistics

DEQ forecasts the ozone AQI for the Little Rock–North Little Rock–Conway MSA and the Fayetteville–Springdale–Rogers MSA and publishes these forecasts on the DEQ website (http://www.adeq.state.ar.us/) to inform the public. DEQ's ozone forecasting statistics for the 2019 ozone season are:

- No action versus Action day forecast accuracy was 100%.
- Good versus Moderate ozone level forecast accuracy was 82%.

4. Ozone Design Values

The Design Value, calculated as the consecutive three year average of the annual fourth-highest daily maximum 8-hour ozone concentration at each monitor, determines attainment with the NAAQS of 0.070 ppm. Note that if multiple pollutant-specific monitors occur in a MSA, then the monitor with the highest Design Value is considered the "controlling monitor" and determines attainment/non-attainment in that MSA. The 2017–2019 Design Values (Figure 4) are:

- 0.062 ppm for the Little Rock–North Little Rock–Conway MSA.
- 0.062 ppm for the Fayetteville–Springdale–Rogers MSA.
- 0.068 ppm for the Memphis MSA.
- All other monitors are ≤ 0.061 ppm.

Figure 6: 2017-2019 Arkansas's and peripheral adjacent state monitor's Ozone NAAQS Design Values