2019 Ozone (O_3) Season Data Summary Report

Indiana Department of Environmental Management (IDEM)
Office of Air Quality

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About This Report

The Indiana Department of Environmental Management (IDEM) collects and analyzes outdoor air samples for regulated pollutants, including ground-level ozone. Monitoring is conducted for Indiana's ozone season from March 1 through October 31, as mandated by United States Environmental Protection Agency (U.S. EPA), and the data is reported to U.S. EPA's Air Quality System (AQS). This ***2019 Ozone (O_3) Season Data Summary Report*** provides an overview of ground-level ozone and its impacts, national air health standards, Indiana's ozone monitoring network, a summary of 2019 ozone monitoring data, air quality trends over the last ten years, and the status of ozone designations in Indiana.

What is Ozone (O_3)?

Ozone, referred to as O_3, is a gas that is comprised of three oxygen atoms. It occurs naturally, high above the earth, and provides important protection from the sun's harmful rays. O_3 can also form at ground level near the earth's surface when other manmade pollutants react together in heat and sunlight. Unfortunately, ground-level ozone is a pollutant that is unhealthy to breathe and can cause damage to trees and crops.

Where does ground-level ozone come from? Ground-level ozone is not emitted directly into the air. Instead, it is created by a chemical reaction between nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. Some of the major sources of NO_x and VOCs are emissions from industrial facilities and electric utilities that use fossil fuel for combustion, motor vehicle exhaust, and vapors from gasoline and chemical solvents. O_3 is most likely to form at ground level during the summer when there are long days of sunlight and still winds. Unhealthy levels are most likely to build up in urban areas with many local sources of NO_x and VOCs. Since wind can transport pollutants hundreds of miles, rural areas are also affected.

What are the health effects of exposure to ground-level ozone? Breathing O_3 can cause respiratory problems for anyone. However, sensitive groups such as young children, the elderly, and individuals with asthma or other chronic respiratory ailments are particularly vulnerable to ill health effects. Exposure can:

- Cause chest pain, coughing, throat irritation and congestion.
- Worsen bronchitis, emphysema and asthma.
- Decrease lung function and inflame the linings of the lungs.
- Scar lung tissue.

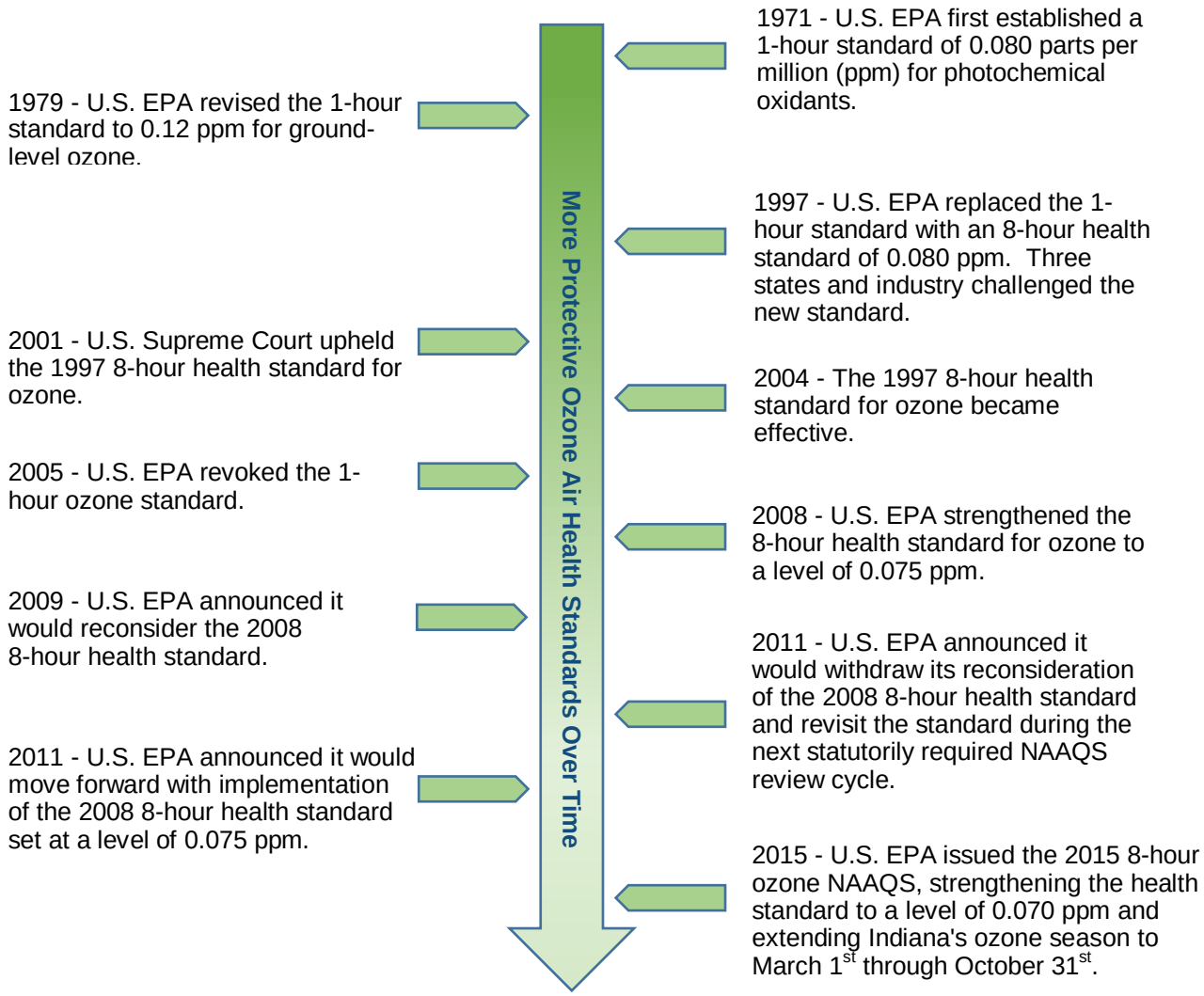
National Ambient Air Quality Standards (NAAQS) for Ozone

The federal Clean Air Act requires U.S. EPA to establish National Ambient Air Quality Standards (NAAQS) for common outdoor air pollutants, including ground-level ozone. NAAQS, which are also known as air health standards, include:

- Primary standards for public health, with pollutant limits designed to protect the most vulnerable groups such as young children, the elderly and individuals with respiratory illnesses.
- Secondary standards for public welfare, with limits designed to protect visibility and prevent damage to animals, crops, vegetation, and buildings.

Primary and secondary NAAQS were first established for total photochemical oxidants in 1971 and further developed over the years. U.S. EPA made revisions in 1979 and established a 1-hour standard for measurements of hourly ozone concentrations. In 1997, the 1-hour standard was replaced with an 8-hour standard based on maximum daily 8-hour average ozone concentrations. A more stringent 8-hour standard was adopted in 2008 and again in 2015. Figure 1 notes milestones in the NAAQS history.

Figure 1: History of the Ozone NAAQS



Attaining the Ozone Standards

Air quality monitoring data must measure at or below the maximum concentration set by U.S. EPA for three complete, consecutive years to be in attainment of the primary and secondary standards, which are set at the same level. For example, an evaluation in 2021 will be based on data from 2018 through 2020.

How does an area attain the current standards? An area is determined to be attaining both the 2015 primary and secondary 8-hour ozone NAAQS when the annual fourth (4th) highest daily maximum 8-hour average concentration, averaged over three consecutive years, does not exceed 0.070 parts per million (ppm).

What is a design value? The three-year average of the annual 4th highest daily maximum average concentration is called the **design value**. Monitor design values are calculated at the end of each ozone season once all of the data from Indiana's monitoring network has been quality assured. Indiana's ozone season runs from March 1st through October 31st, as established in the 2015 ozone NAAQS. Where two or more monitors are placed in an area, the monitor with the highest design value is used for the area's air quality designation.

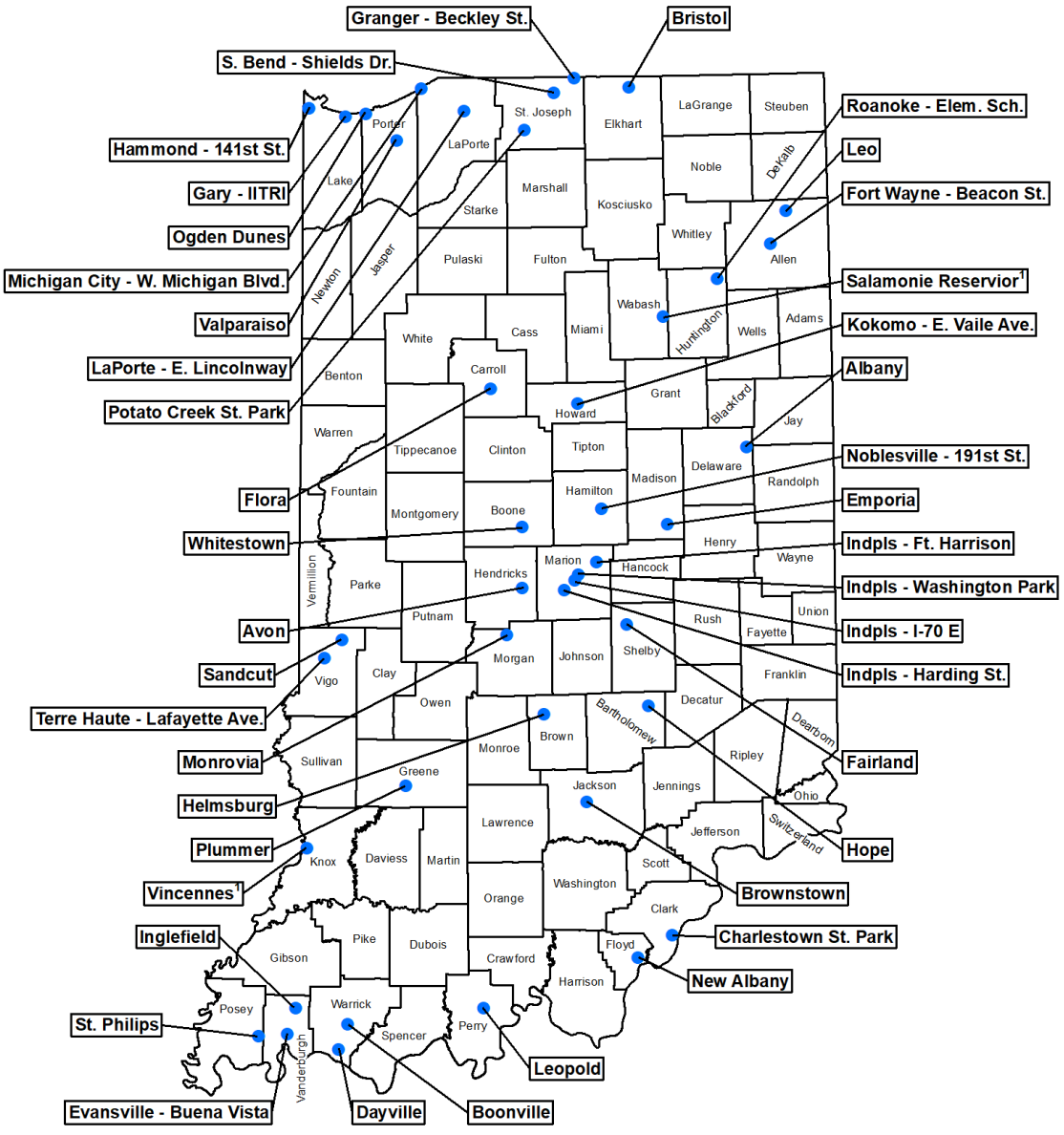
What is the difference between an exceedance and a violation? When a monitor records a concentration above the limit established by the NAAQS it is referred to as an **exceedance**. A monitor can have an exceedance without being in **violation** of the standard. However, if a monitor's three-year design value exceeds the NAAQS the area is considered to be in violation.

2019 Ozone Monitoring Network

Indiana's 2019 monitoring network included 40 ozone monitors placed in 28 counties across Indiana. U.S. EPA provides guidance on monitor placement. The major determining factors are population density and manufacturing levels. IDEM conducts annual reviews of the monitoring network, which are published each year in the *Indiana Annual Ambient Air Monitoring Network Plan* at: https://www.in.gov/idem/airquality/2389.htm.

U.S. EPA operated two additional ozone monitors in rural counties as part of its Clean Air Status and Trends Network (CASTNET). Figure 2 shows the monitor locations in Indiana for ozone in 2019.

Figure 2: 2019 Ozone Monitoring Network



Notes:
[1] Monitors owned and operated by the U.S. Environmental Protection Agency (U.S. EPA).

● Ozone Monitor

0 25 50 mi
0 25 50 km

N W E S

Mapped By: C. Mitchell, OAQ **Date:** 02/27/2020 **Source:** IDEM, Air Monitoring **Map Projection:** UTM Zone 16 N **Map Datum:** NAD83

2019 Ozone Monitoring Data Summary

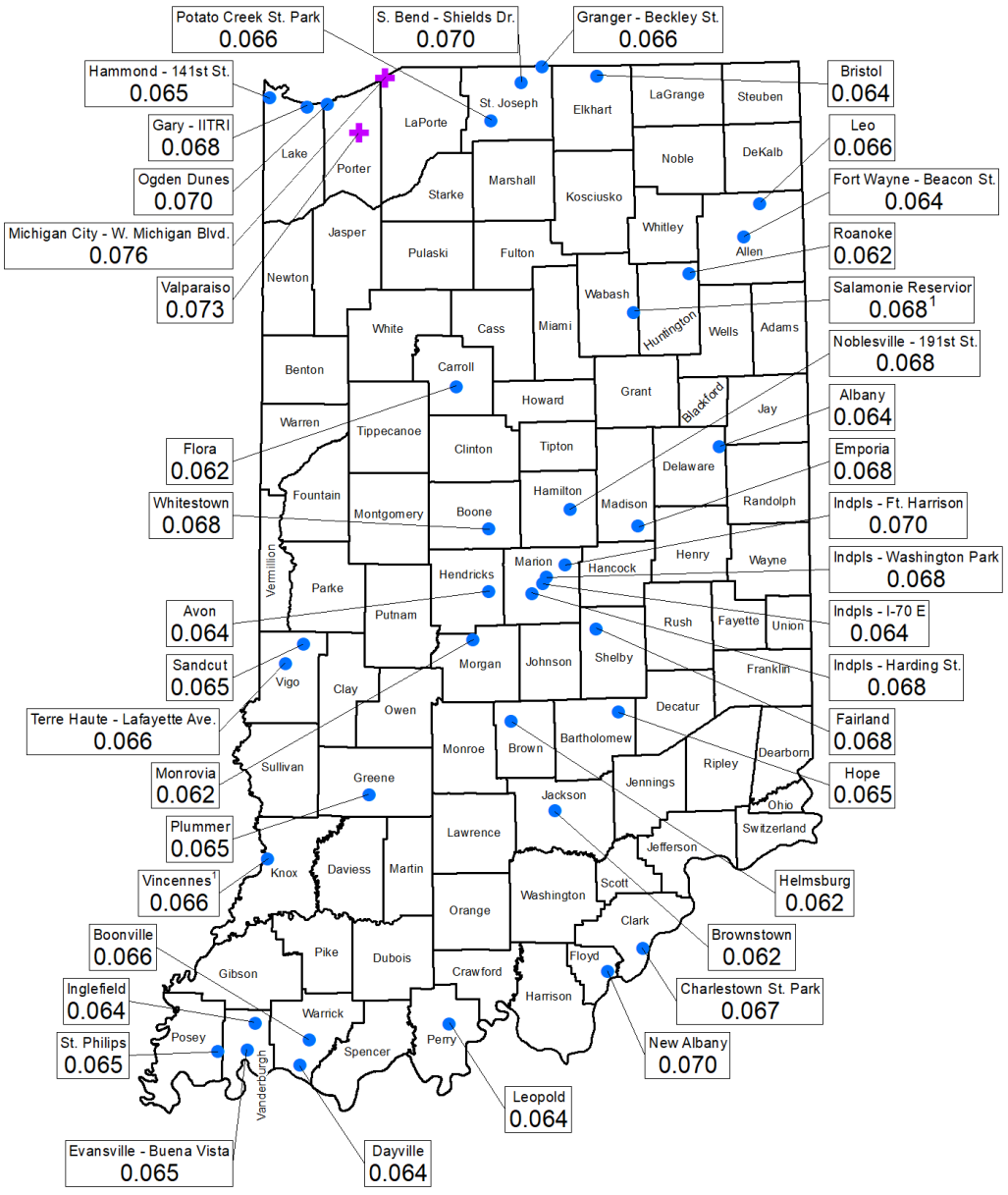
Data has been quality assured for the 2019 ozone season.

Annual 4th highest concentrations: Two monitors had an annual 4th highest daily maximum concentration above the 2015 ozone standard in 2019.

Exceedances in 2019: Exceedances, or concentrations above the standard, were recorded on 13 days during 2019.

Design values: Design values for 2017-2019 were above the 2015 ozone NAAQS for two monitors in Northwest Indiana (0.076 ppm and 0.073 ppm). Figure 3 shows 2017-2019 design values for Indiana's ozone monitors.

Figure 3: Ozone Monitor Design Values for 2017-2019



Notes:
- Map excludes monitors with incomplete data and/or less than three full years of monitoring data.
- Posted data are in units of parts per million (ppm).
- 1 indicates monitors owned and operated by the U.S. Environmental Protection Agency (U.S. EPA).

Ozone monitor with design value less than or equal to the standard of 70 ppm.

Ozone monitor with design value over the standard of 70 ppm.

0 25 50 mi
0 25 50 km

N W E S

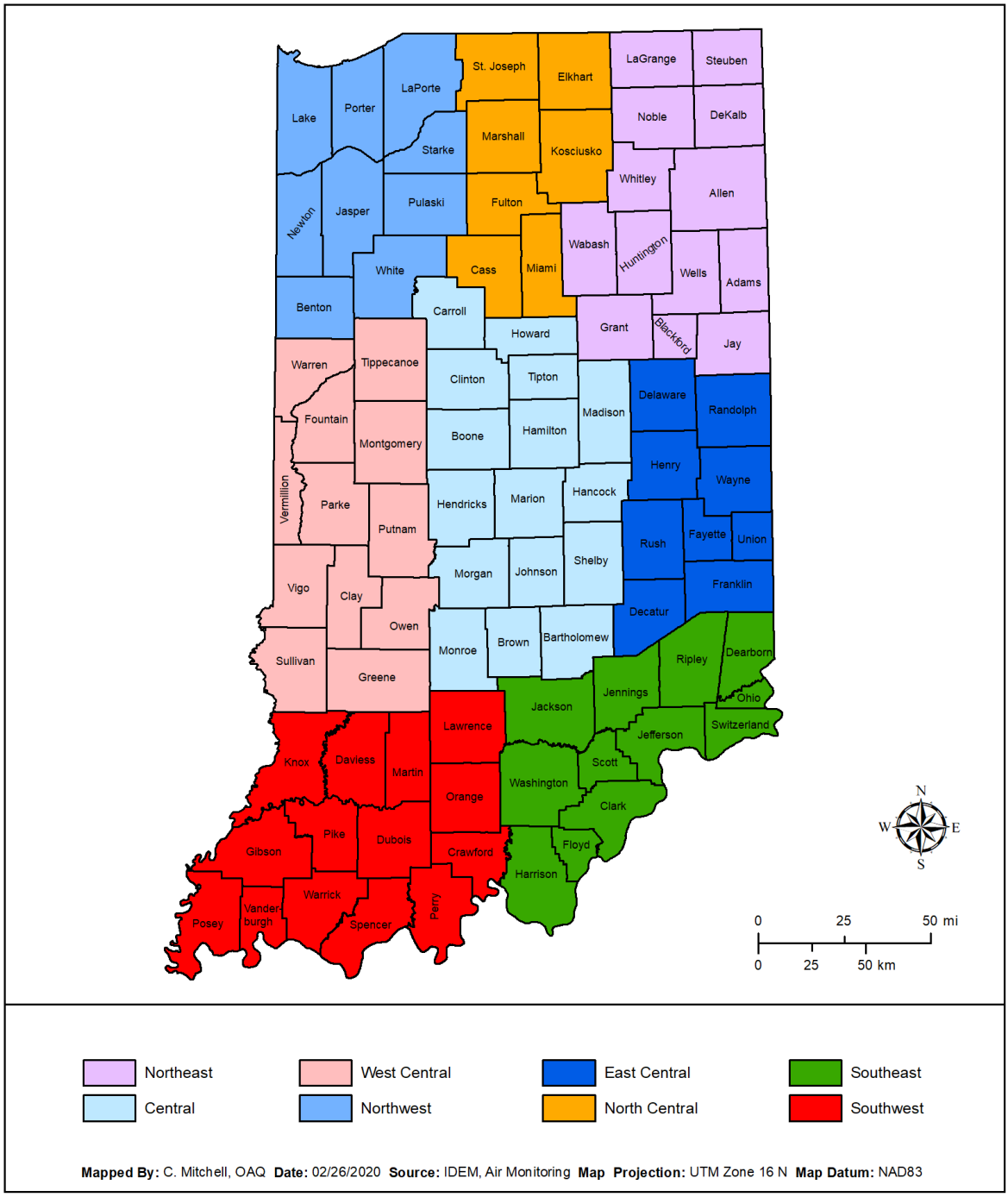
Mapped By: C. Mitchell, OAQ **Date:** 02/27/2020 **Source:** IDEM, Air Monitoring **Map Projection:** UTM Zone 16 N **Map Datum:** NAD83

Air Quality Action Days: IDEM works throughout the ozone season to analyze continuous monitoring data and issue air quality forecasts in coordination with local, state, and regional partners. Public alerts called **Air Quality Action Days** (AQADs) are issued when unhealthy air pollution is predicted. Six AQADs were issued for ozone in 2019. The public can find daily air quality forecasts and sign up to receive email or text alerts on IDEM's website at: https://www.in.gov/idem/airquality/pages/smogwatch/index.htm.

Ozone Air Quality Trends, 2010-2019

Ozone monitoring data shows Indiana's ozone air quality trends over the last 10 years. Ozone monitoring data in Chart 1 and Chart 2 below is divided into regions as shown in Figure 4.

Figure 4: Ozone Monitoring Regions of Indiana



Annual 4th highest maximum average concentrations for each area are plotted in comparison with the 2008 and 2015 8-hour standards in Chart 1. Design values are plotted in comparison with the standards in Chart 2.

Chart 1: 4th Highest Ozone Value Trends by Region for 2010 Through 2019

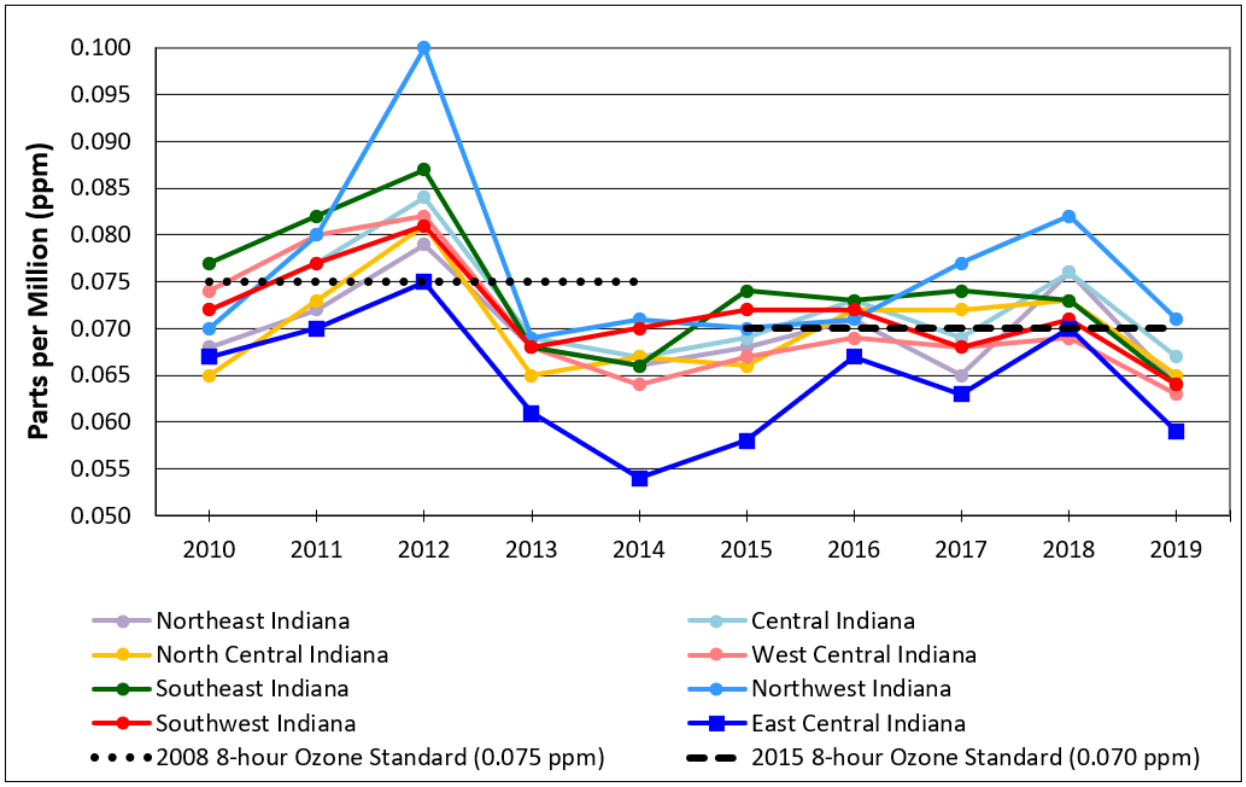


*Chart excludes monitors with incomplete data and/or less than three years of monitoring data.

Chart 2: Ozone Design Value Trends by Region for 2010-2012 through 2017-2019

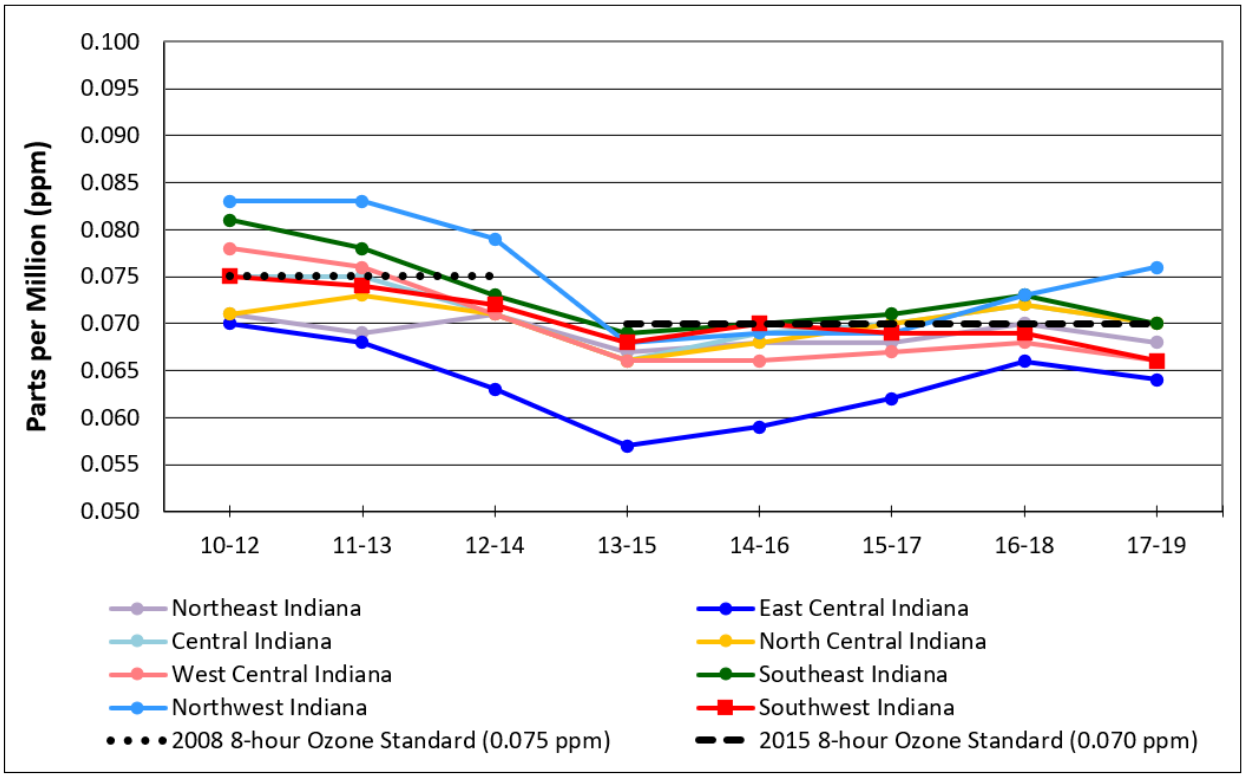


*Chart excludes monitors with incomplete data and/or less than three years of monitoring data.

Status of Ozone Designations

When a NAAQS is issued, the implementation process begins. The first step is for U.S. EPA to designate air quality for all areas of the country. Areas that are not attaining the new standard, and areas that are contributing to areas that are not attaining the standard, are designated as nonattainment. When a nonattainment area attains the standard, IDEM ensures it is formally recognized for its compliance and redesignated to attainment status.

Ground-level ozone has been reduced over the years. At the same time, ozone air health standards have become tighter based on scientific studies. These studies have found that health and environmental impacts can still occur from lower concentrations of pollutants than previously believed. As a result, air quality still needs to improve in some areas. All 92 Indiana counties meet the 1997 8-hour ozone NAAQS. However, two counties are designated as nonattainment under the 2008 standard and three counties are either entirely or partially designated as nonattainment under the 2015 standard.

1997 8-Hour Ozone NAAQS: An 8-hour NAAQS was established in 1997 that set a limit of 0.080 ppm. Following the resolution of legal challenges to the new standard, designations were issued several years later on April 15, 2004, and effective June 15, 2004 (69 FR 23858)[1]. Although 23 counties and one township in Indiana were initially designated as nonattainment, subsequent monitoring data showed compliance. Indiana submitted petitions for redesignation with maintenance plans for the affected counties and townships in 12 areas. Attainment status was approved for all areas by May 2010, as shown in Table 1.

Table 1: Designations Under the 1997 Ozone NAAQS

County/Area	Current Status
Allen	Attainment Redesignation, February 12, 2007
Central Indiana, including Boone, Hamilton, Hancock, Hendricks, Johnson, Madison, Marion, Morgan, and Shelby Counties	Attainment Redesignation, October 19, 2007
Clark and Floyd Counties	Attainment Redesignation, July 19, 2007
Dearborn County, Lawrenceburg Township Only	Attainment Redesignation, May 11, 2010
Delaware County	Attainment Redesignation, January 3, 2006
Greene County	Attainment Redesignation, December 29, 2005
Jackson County	Attainment Redesignation, December 29, 2005
Lake and Porter Counties	Attainment Redesignation, May 11, 2010
LaPorte County	Attainment Redesignation, July 19, 2007
St. Joseph and Elkhart Counties	Attainment Redesignation, July 19, 2007
Vanderburgh and Warrick Counties	Attainment Redesignation, January 30, 2006
Vigo County	Attainment Redesignation, February 6, 2006
All Other Indiana Counties	Unclassifiable/Attainment

2008 8-Hour Ozone NAAQS: The 8-hour NAAQS was strengthened to 0.075 ppm in 2008. Ozone nonattainment areas are classified as marginal, moderate, serious, severe, or extreme. Attainment dates are established by law for each classification.

U.S. EPA issued designations for most areas of Indiana on April 30, 2012 (77 FR 30087). Remaining areas were designated on May 31, 2012 (77 FR 34221). Designations were based on 2008-2010 data. They were effective on July 20, 2012. All areas of the state were designated as unclassifiable/attainment, with the following exceptions:

- Lawrenceburg Township in Dearborn County was designated as part of the Cincinnati, OH-KY-IN nonattainment area, which was classified as “marginal” with an attainment date of July 20, 2015. On February 23, 2016, IDEM submitted

[1] Federal Register (FR) notices (cited by volume and page number) can be viewed at https://www.federalregister.gov/.

a maintenance plan and request for Lawrenceburg Township to be redesignated to attainment status based on 2012-2014 monitoring data. U.S. EPA approved the attainment designation on March 17, 2017 (82 FR 16940).

- Lake and Porter counties were designated as part of the Chicago-Naperville, IL-IN-WI nonattainment area, which was classified as “marginal” with an attainment date of July 20, 2015. On April 11, 2016, U.S. EPA determined that the standard was not met by the attainment date based on 2012-2014 data for the Chicago-Naperville, IL-IN-WI nonattainment area and reclassified it from “marginal” to “moderate’’ with an attainment date of July 20, 2018 (81 FR 26697). On August 7, 2019 (84 FR 44238), U.S. EPA determined that the Chicago-Naperville, IL-IN-WI nonattainment area failed to attain the standard using 2015-2017 monitoring data by the attainment date of July 20, 2018. It was reclassified to “serious”, effective September 23, 2019, with a new attainment date of July 20, 2021. On February 27, 2020, IDEM submitted a maintenance plan and request for Lake and Porter counties to be redesignated to attainment based on 2017-2019 monitoring data.

Table 2 shows Indiana’s status under the 2008 NAAQS.

Table 2: Designations Under the 2008 Ozone NAAQS

County/Area	Current Status
Dearborn County, Lawrenceburg Township Only	Attainment Redesignation, March 17, 2017
Lake and Porter Counties	Nonattainment, Classified as “Serious” with an attainment date of July 20, 2021.
All Other Indiana Counties	Unclassifiable/Attainment

2015 8-Hour Ozone NAAQS: On October 1, 2015, U.S. EPA finalized a rule that strengthened the 8-hour ozone standard to 0.070 ppm and extended Indiana's ozone season to March 1st through October 31st. Designations were issued in two rounds. In the first round on November 6, 2017, most Indiana counties were designated as attainment/unclassifiable, effective January 16, 2018 (82 FR 54232). In the second round, issued on April 30, 2018, and effective August 3, 2018, remaining areas were designated as attainment/unclassifiable with the following exceptions (83 FR 25776):

- Clark and Floyd counties were designated as part of the Louisville, KY-IN nonattainment area with a classification of "marginal."

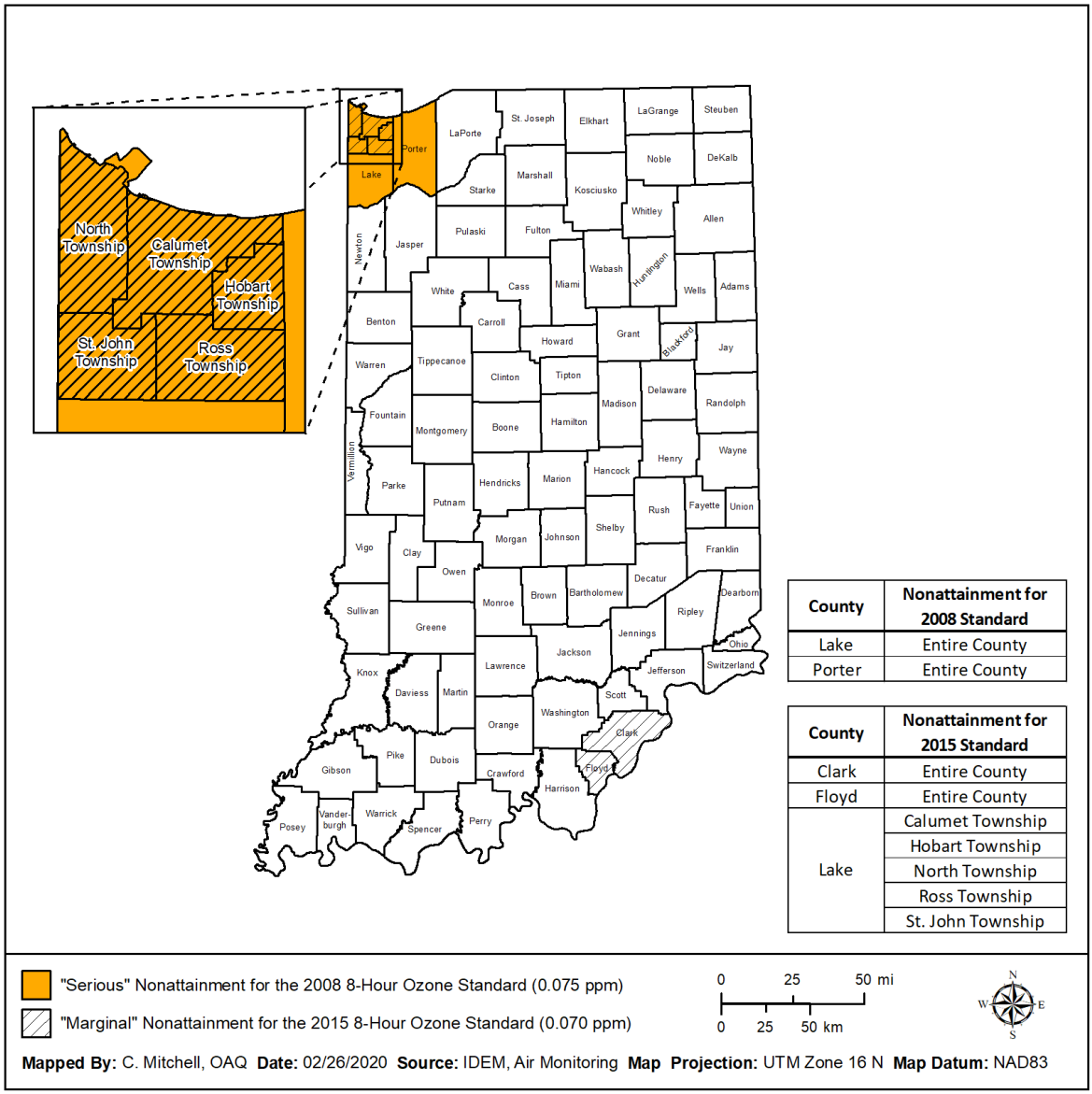
- Calumet, Hobart, North, Ross, and St. John townships in Lake County were designated as part of the Chicago, IL-IN-WI nonattainment area with a classification of "marginal."

Table 3 shows Indiana’s status under the 2015 NAAQS and Indiana’s current ozone nonattainment areas are shown in Figure 5.

Table 3: Designations Under the 2015 Ozone NAAQS

County/Area	Current Status
Clark and Floyd Counties	Nonattainment with a "Marginal" classification. Attainment is required by August 3, 2021.
Lake County, Calumet, Hobart, North, Ross and St. John Townships Only	Nonattainment with a "Marginal" classification. Attainment is required by August 3, 2021.
All Other Indiana Counties	Attainment/Unclassifiable

Figure 5: Indiana's Ozone Nonattainment Areas



County	Nonattainment for 2008 Standard
Lake	Entire County
Porter	Entire County

County	Nonattainment for 2015 Standard
Clark	Entire County
Floyd	Entire County
Lake	Calumet Township
	Hobart Township
	North Township
	Ross Township
	St. John Township

Additional Information

The public can find additional ozone air monitoring data, air quality plans, and resources, including:

- Continuous ozone monitoring data: https://www.IN.gov/idem/airquality/2346.htm.
- Air quality designations, nonattainment plans, redesignation petitions and maintenance plans: https://www.IN.gov/idem/airquality/2343.htm.
- U.S. EPA information about ground-level ozone pollution and NAAQS implementation: https://www.epa.gov/naaqs.
- U.S. EPA AQS: https://www.epa.gov/aqs.
- U.S. EPA CASTNET: https://www.epa.gov/castnet.

Contact IDEM's Office of Air Quality

Please feel free to direct questions or comments to Ms. Leslie Ferguson, Environmental Manager with IDEM's Office of Air Quality, at (800) 451-6027 Option 4 (*toll free*), (317) 233-1179 (*direct*), or lferguso@idem.IN.gov (*email*).