



Indiana Department of Environmental Management

2016 Fine Particles (PM_{2.5}) Summary Report

Office of Air Quality

(800) 451-6027

www.IN.gov/idem/airquality/2391.htm



About This Report

The Indiana Department of Environmental Management (IDEM) collects and analyzes air samples to monitor for regulated pollutants, including fine particles referred to as PM_{2.5}. Monitoring and reporting of PM_{2.5} occurs on a year-round basis, as mandated by the U.S. Environmental Protection Agency (U.S. EPA). This **2016 Fine Particles (PM_{2.5}) Summary Report** provides an overview of PM_{2.5}, including 2016 data and air quality trends over the past 10 years (2007-2016).

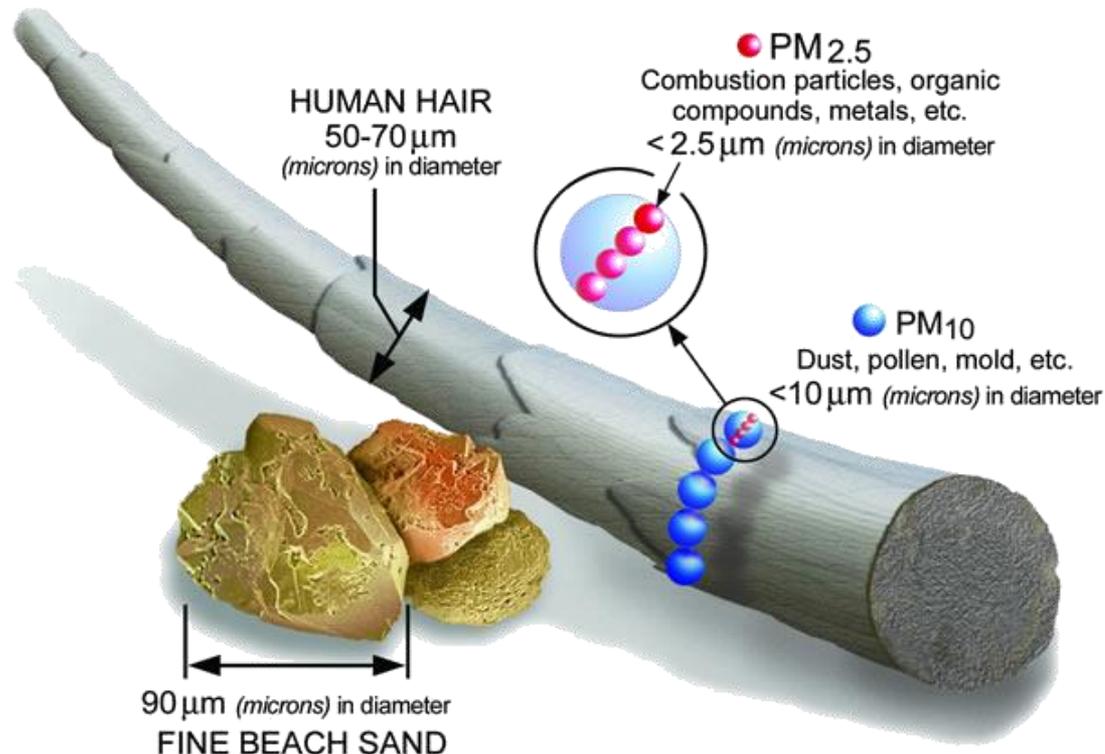
The following information is included in this report:

- General information about PM_{2.5} (*slides 3-5*)
- Overview of PM_{2.5} air health standards and requirements (*slides 6-8*)
- Overview of Indiana's PM_{2.5} monitoring network (*slides 9-11*)
- Summary of 2016 PM_{2.5} monitoring data (*slides 12-14*)
- PM_{2.5} air quality trends over the last 10 years (*slides 15-19*)
- Status of PM_{2.5} designations (*slides 20-23*)
- Links for additional information (*slide 24*)
- Contact information (*slide 25*)



What Is Particulate Matter (PM)?

Particulate matter is a complex mixture of small particles found in the air, including dust, dirt, smoke, and liquid droplets. PM_{10} refers to very small particles that are 10 micrometers, or microns, in diameter or smaller. $PM_{2.5}$ refers to small particles that are 2.5 microns or smaller.





Where Does PM Come From?

Sources of particulate matter (PM) include all types of combustion activities:

- Motor vehicles, coal-fired power plants, open burning, etc.
- Certain industrial processes.





What are the Health Effects of PM?

Small enough to be inhaled deep into the lungs, these tiny airborne particles have been linked to:

- Increased respiratory symptoms:
 - **Irritation of the airways.**
 - **Coughing or difficulty breathing.**
 - **Decreased lung function.**
 - **Aggravated asthma.**
 - **Development of chronic bronchitis.**
- Irregular heartbeats.
- Nonfatal heart attacks.
- Premature death in people with heart or lung disease.



National Ambient Air Quality Standards (NAAQS) for PM_{2.5}

The federal Clean Air Act requires U.S. EPA to establish National Ambient Air Quality Standards (NAAQS) for certain pollutants, including particulate matter (PM). NAAQS are also known as air health standards.

Primary and secondary NAAQS established in 1971 set the first limits for total suspended particles (TSP). Since then, the NAAQS for fine particles have been reviewed periodically and revised. Standards for particles 10 microns in diameter and smaller, referred to as PM₁₀, were established in 1987. Standards for PM_{2.5} were first established in 1997.

Primary Standards - Primary NAAQS set limits to protect public health, including the health of “sensitive” populations such as individuals with asthma, children and the elderly.

Secondary Standards - Secondary NAAQS set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.



History of the PM_{2.5} NAAQS

U.S. EPA revised the NAAQS and replaced TSP with PM₁₀

Industry and state governments challenged NAAQS

D.C. Circuit Court rejected all remaining legal challenges to the 1997 NAAQS

D.C. Circuit Court remanded the 2006 PM_{2.5} NAAQS to U.S. EPA for reconsideration, but did not vacate the standards

U.S. EPA strengthened the annual primary PM_{2.5} NAAQS to 12 µg/m³ and retained the existing secondary standard at 15 µg/m³ and the existing 24-hour NAAQS at 35 µg/m³

1971

1987

1997

2001

2002

2006

2009

2012

U.S. EPA issued first NAAQS for Total Suspended Particles (TSP)

U.S. EPA revised NAAQS and included PM_{2.5}
Annual 15 µg/m³
24-hour 65 µg/m³

U.S. Supreme Court upheld U.S. EPA's authority to enforce the Clean Air Act and rules, U.S. EPA not allowed to consider cost

U.S. EPA strengthened the 24-hour NAAQS to 35 µg/m³ and retained the existing annual standard at 15 µg/m³



Attaining the PM_{2.5} NAAQS

Air quality must meet both an annual standard and a 24-hour, or daily, standard for PM_{2.5}. Three complete, consecutive years of monitoring data is used to make a determination about a given area. For example, an evaluation in 2017 will be based on data from 2014 to 2016.

Primary Annual Standard - For the primary annual standard, measured concentrations are averaged on an annual rolling basis. Air quality meets the 2012 standard when the three-year average of the annual mean does not exceed 12 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). The data from each monitor is evaluated.

Primary 24-Hour Standard - For the primary daily standard, measured concentrations are averaged on a 24-hour rolling basis. Air quality meets the standard when the three-year average of the 98th percentile of measured concentrations does not exceed 35 $\mu\text{g}/\text{m}^3$. The data from each monitor is evaluated.

Design Values - The three-year averages are referred to as Design Values.

The Difference Between an Exceedance and a Violation - When a monitor records a concentration above the limit established by the standard, 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 standard, the monitor is in **violation**.



2016 PM_{2.5} Monitoring Network

Placement

- U.S. EPA provides guidance on placement of monitors.
- Monitor placement is based on population density and manufacturing levels.
- Indiana conducts an annual review of its ambient air monitoring network plan.

Monitors

- IDEM operated 32 annual fine particle monitors in 23 counties across Indiana.
- IDEM operated 35* 24-hour fine particle monitors in 23 counties across Indiana.

Calculating the Design Value

- A monitor's Design Value is calculated at the end of the year, once all of the data has been quality assured.
 - Annual Design Value: three-year average of the weighted annual mean PM_{2.5} concentrations.
 - 24-Hour Design Value: three-year average of the 98th percentile of 24-hour concentrations.

* Three monitoring sites reflect air quality in a relatively small area, are directly influenced by a specific source, and are intended to be used for attainment status under the 24-hour standard only.

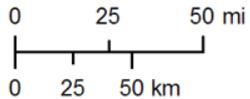


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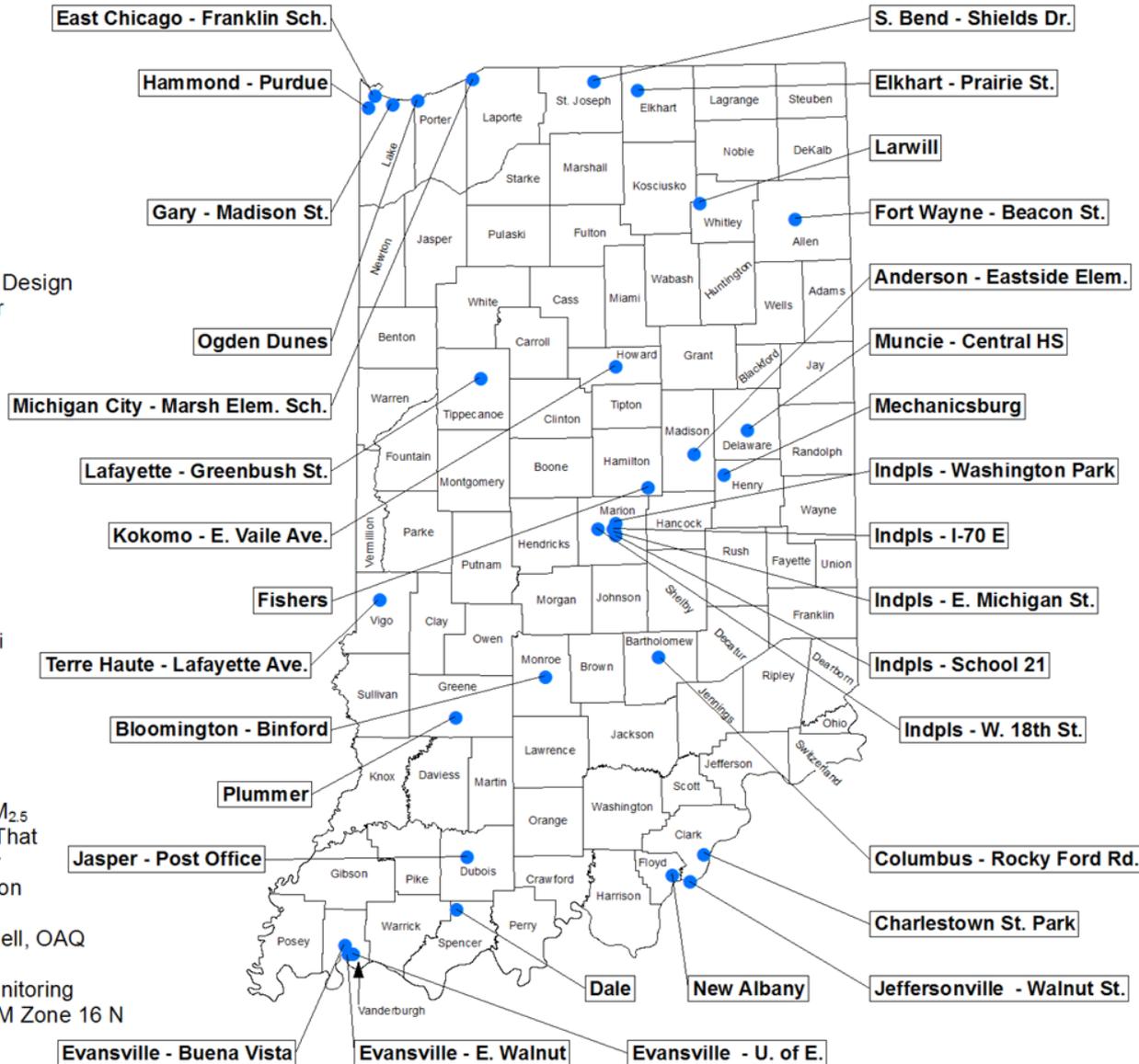
PM_{2.5} Annual Design Value Monitor

County



Notes:
Map Shows Active PM_{2.5} Monitors, Not Those That Were Discontinued or Are Pending Installation

Mapped By: C. Mitchell, OAQ
Date: 02/20/2017
Source: IDEM Air Monitoring
Map Projection: UTM Zone 16 N
Map Datum: NAD83



**2016
PM_{2.5}
Annual
Ambient Air
Monitoring
Network**

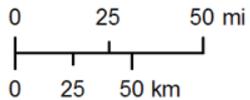


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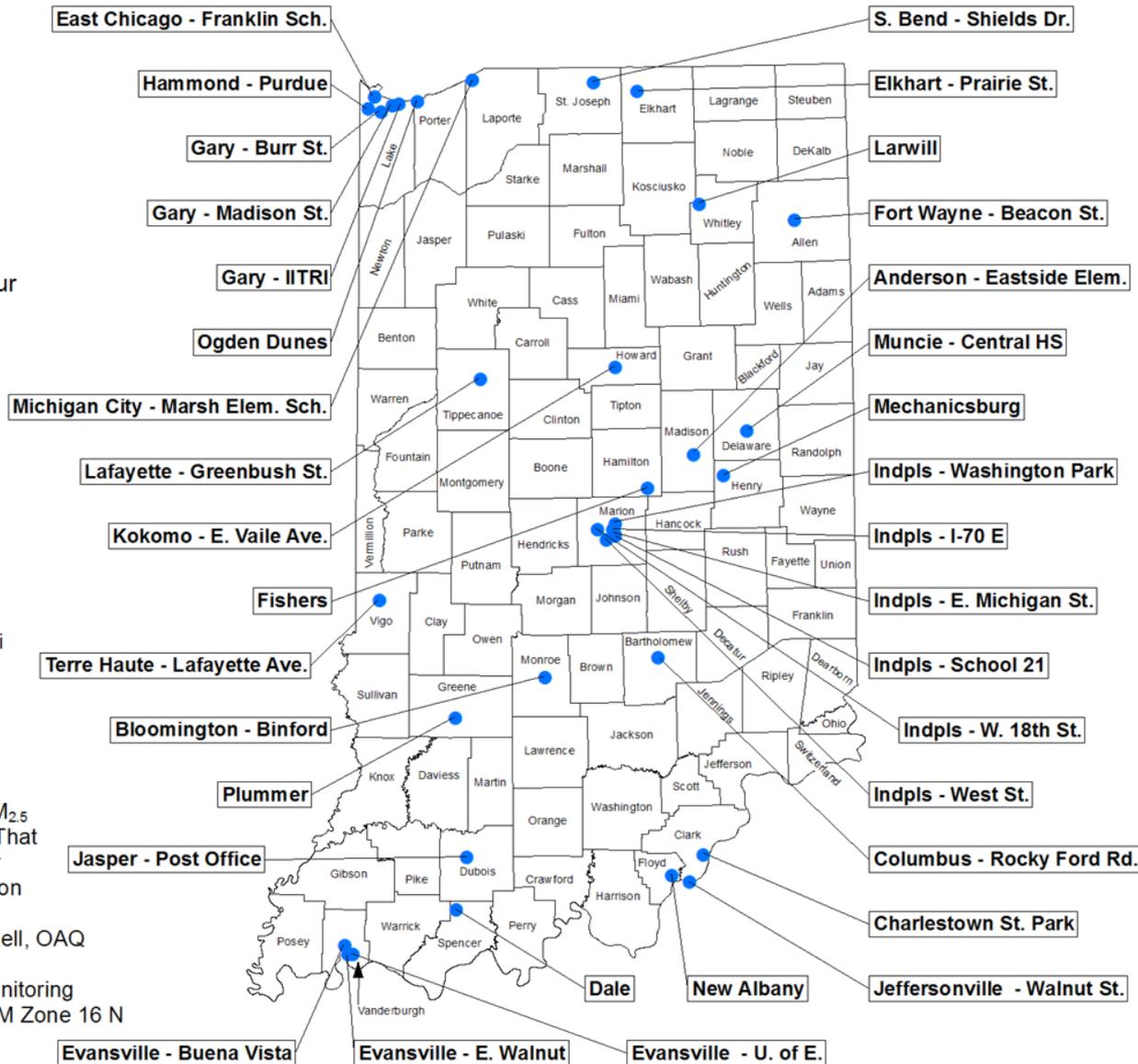
PM_{2.5} 24-Hour Monitor

County



Notes:
Map Shows Active PM_{2.5} Monitors, Not Those That Were Discontinued or Are Pending Installation

Mapped By: C. Mitchell, OAQ
Date: 05/05/2017
Source: IDEM Air Monitoring
Map Projection: UTM Zone 16 N
Map Datum: NAD83



**2016
PM_{2.5}
24-Hour
Ambient Air
Monitoring
Network**



2016 PM_{2.5} Monitoring Data Summary

Air Quality Action Days:

No Air Quality Action Days were issued for PM_{2.5}. (*Indiana and local, state and regional partners analyze data and issue air quality forecasts year-round. Air Quality Action Days are issued when poor air quality is forecasted.*)

Exceedances:

Exceedances were recorded on two days. Exceedance is the term for a concentration that is recorded above the standard.

Quality Assured Monitoring Data:

- No monitor had an annual mean of PM_{2.5} concentrations above the current primary annual standard of 12 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$).
- No monitor had a daily 98th percentile of 24-hour PM_{2.5} concentrations above the current primary 24-hour standard of 35 $\mu\text{g}/\text{m}^3$.
- More information about the annual and 24-hour standards is on slides 6 through 8.

Quality Assured Monitoring Data for the 2014–2016 Three-Year Timeframe:

- No monitor had an annual Design Value (*the average of the annual mean of PM_{2.5} concentrations over a three year period*) above 12 $\mu\text{g}/\text{m}^3$.
- No monitor had a 24-hour Design Value (*the average of the 98th percentile of 24-hour PM_{2.5} concentrations over a three year period*) above 35 $\mu\text{g}/\text{m}^3$.
- More monitoring data is found on slides 12 through 14.



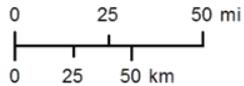
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PM_{2.5} Annual Design Values 2014 - 2016

Standard set at 12.0 µg/m³

Legend

● PM_{2.5} Monitor With Design Value Less Than or Equal to the Standard



Notes:

- Posted Data Are in Units of Micrograms Per Cubic Meter (µg/m³)

- Data is quality assured but not yet certified.

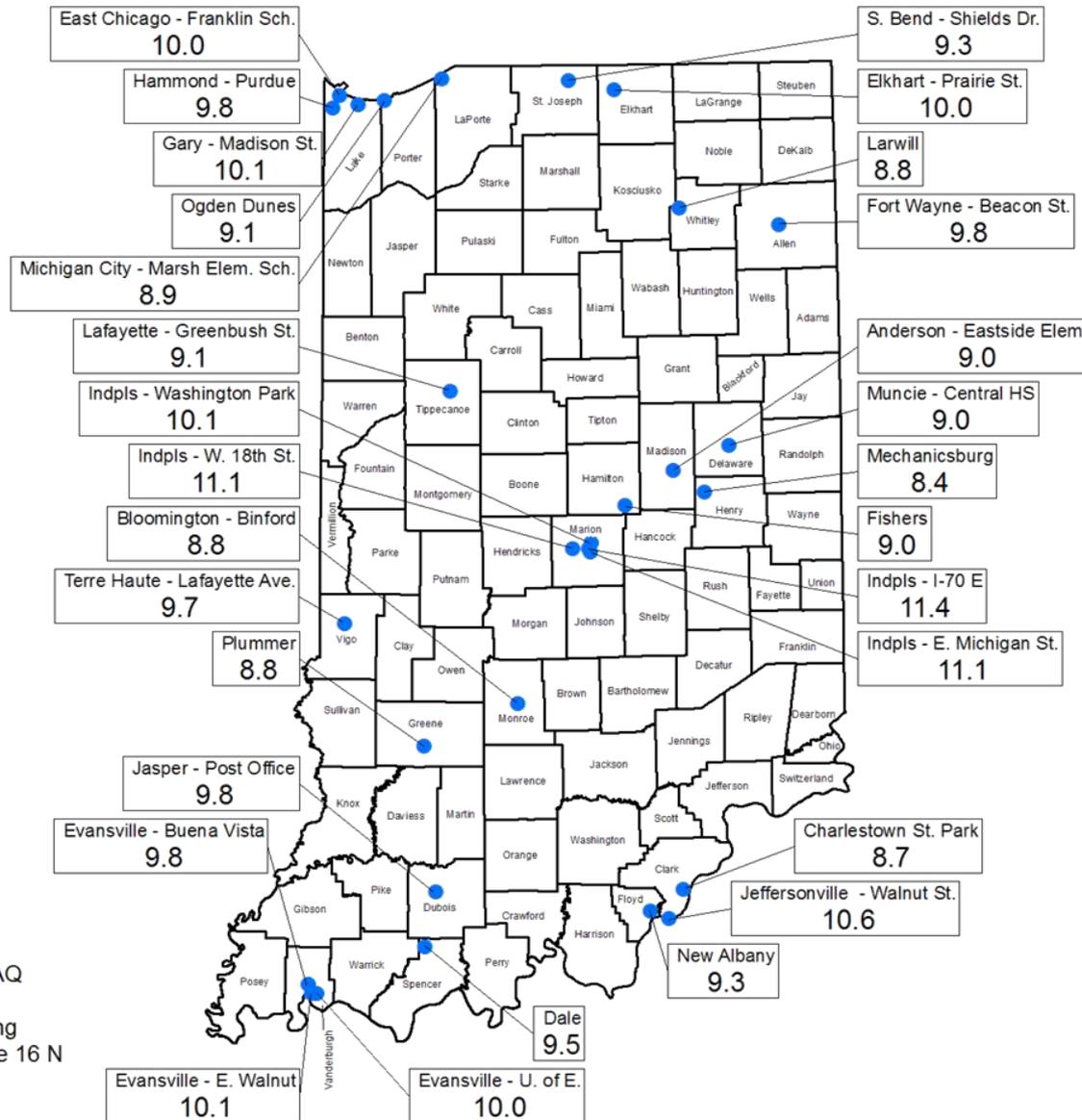
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Date: 05/04/2017

Source: IDEM, Air Monitoring

Map Projection: UTM Zone 16 N

Map Datum: NAD83





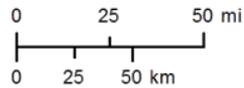
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**PM_{2.5} 24-Hour
Design Values
2014 - 2016**

Standard set at
35.0 µg/m³

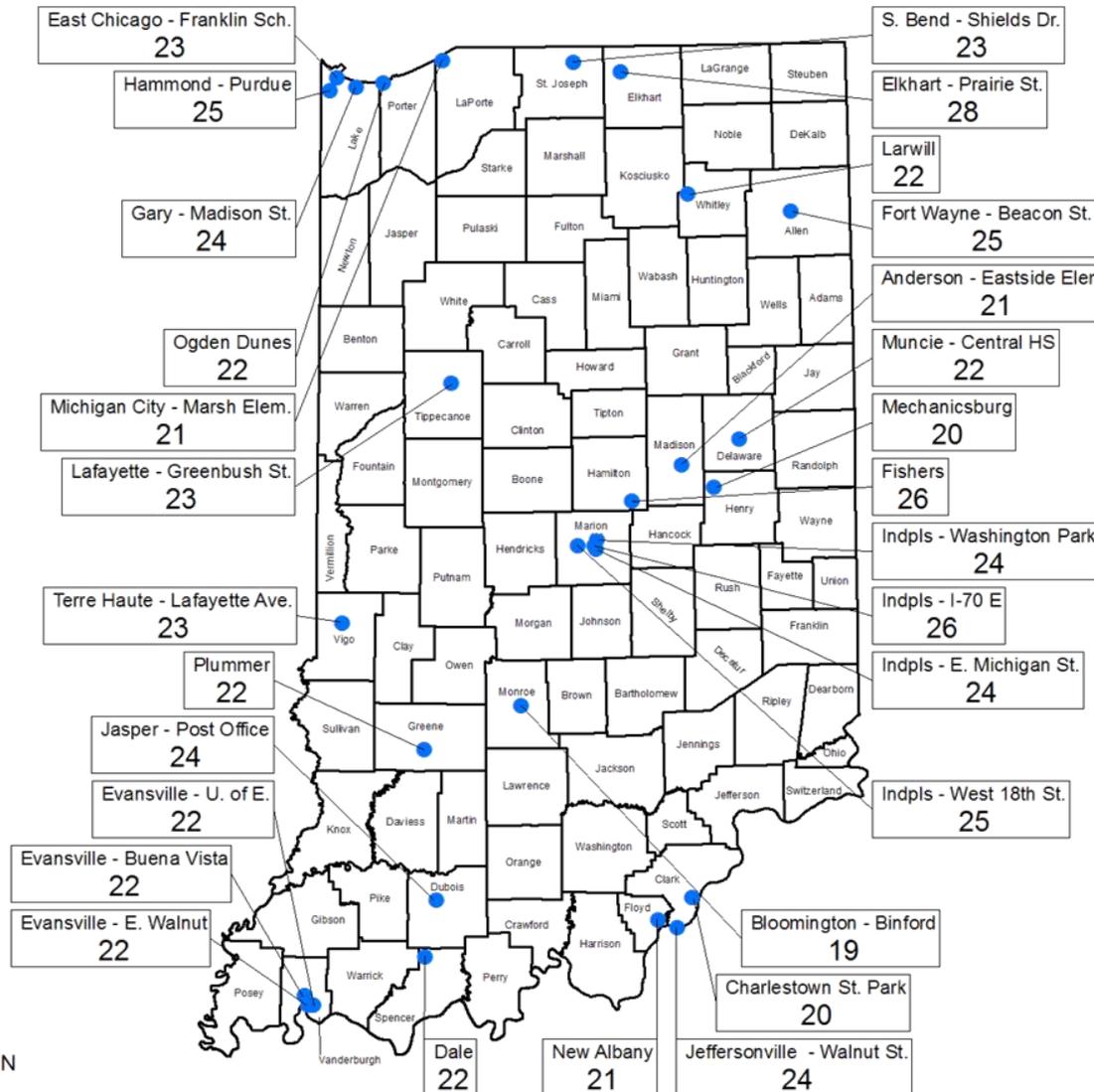
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● PM_{2.5} Monitor With
Design Value Less Than
or Equal to the Standard



Notes:
Posted Data Are in Units
of Micrograms Per Cubic
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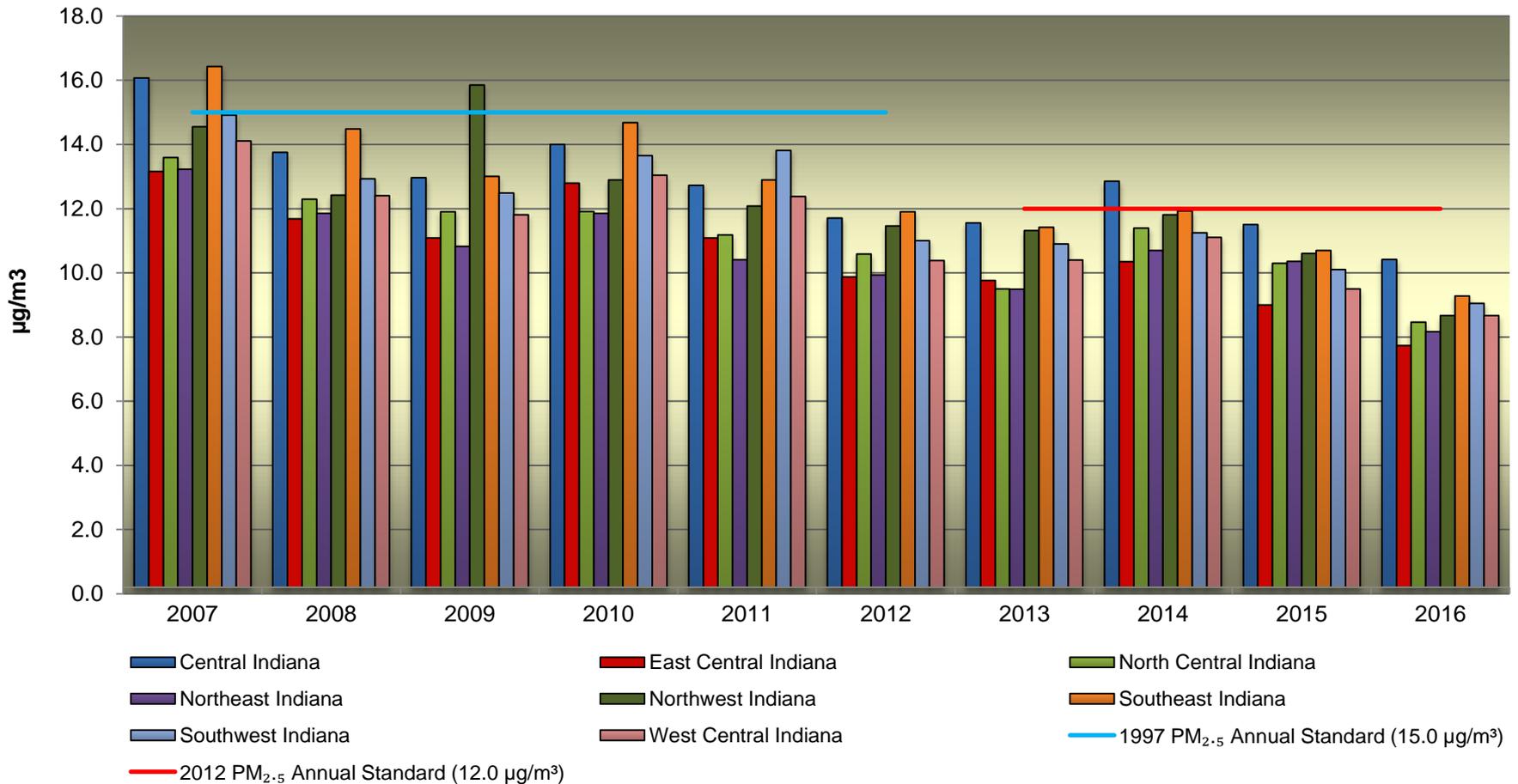
PM_{2.5} Air Quality Trends

Monitoring data shows significant improvements in Indiana's air quality over the past 10 years. The following four slides provide illustrations.



PM_{2.5} Air Quality Trends – Annual NAAQS

Annual Average Mean Values (2007-2016)



µg/m³ = micrograms per cubic meter



PM_{2.5} Air Quality Trends – Annual NAAQS Three-Year Design Values (2007-2016)

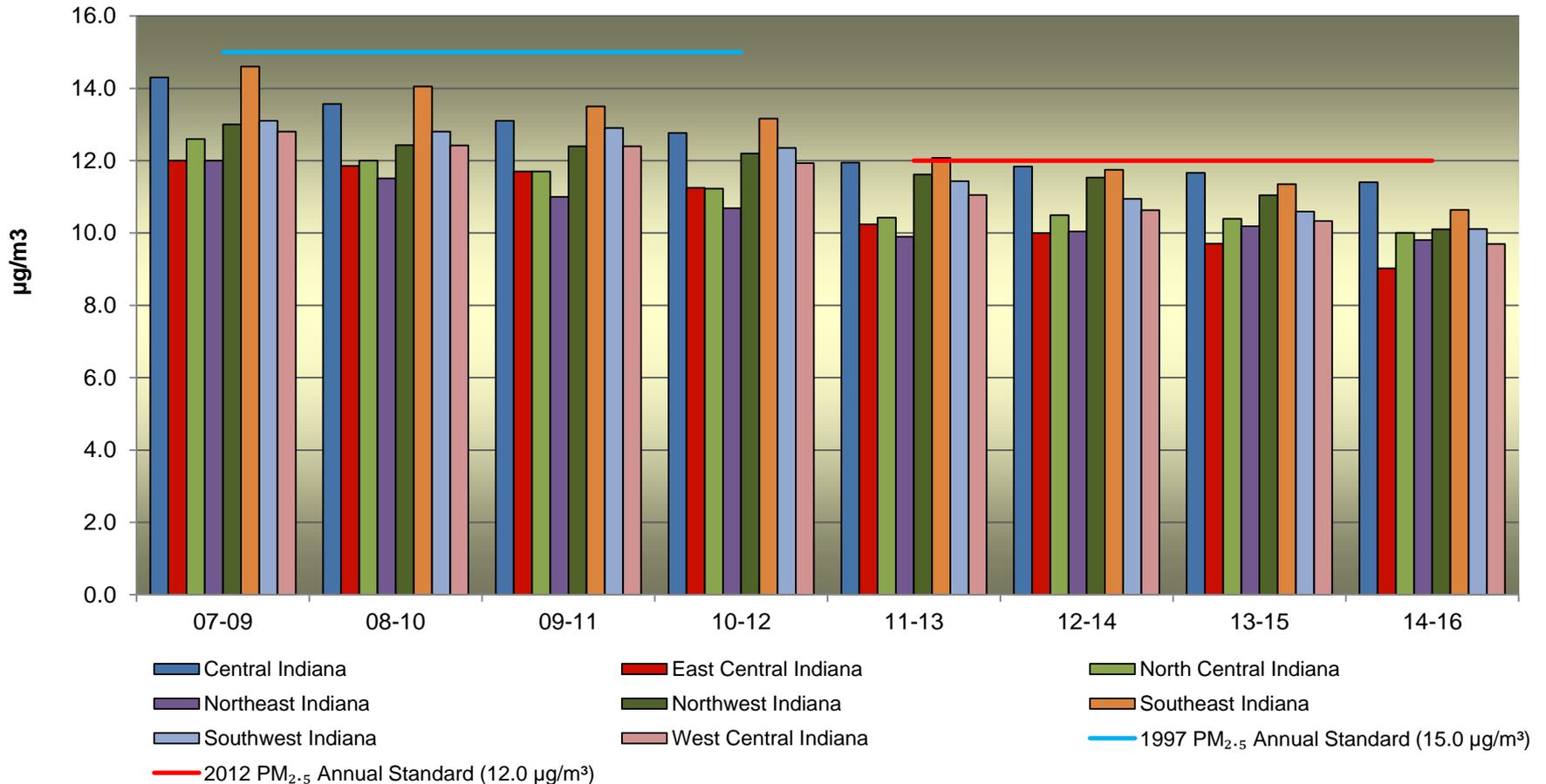
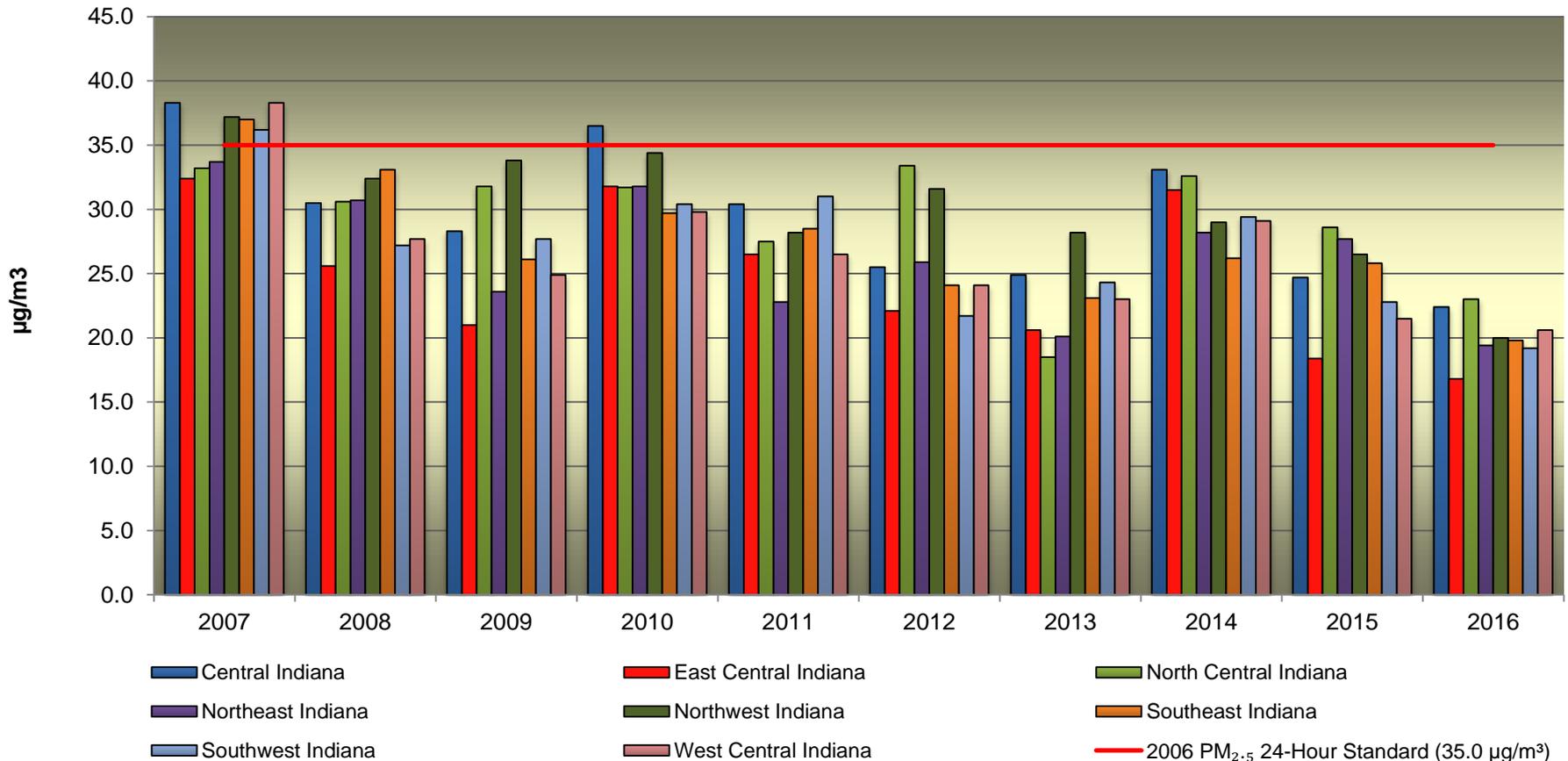


Chart excludes monitors with incomplete data and/or less than three full years of monitoring data.
µg/m³ = micrograms per cubic meter



PM_{2.5} Air Quality Trends – 24-hour NAAQS 98th Percentile Values (2007-2016)



µg/m³ = micrograms per cubic meter



PM_{2.5} Air Quality Trends – 24-hour NAAQS Three-Year Design Values (2007-2016)

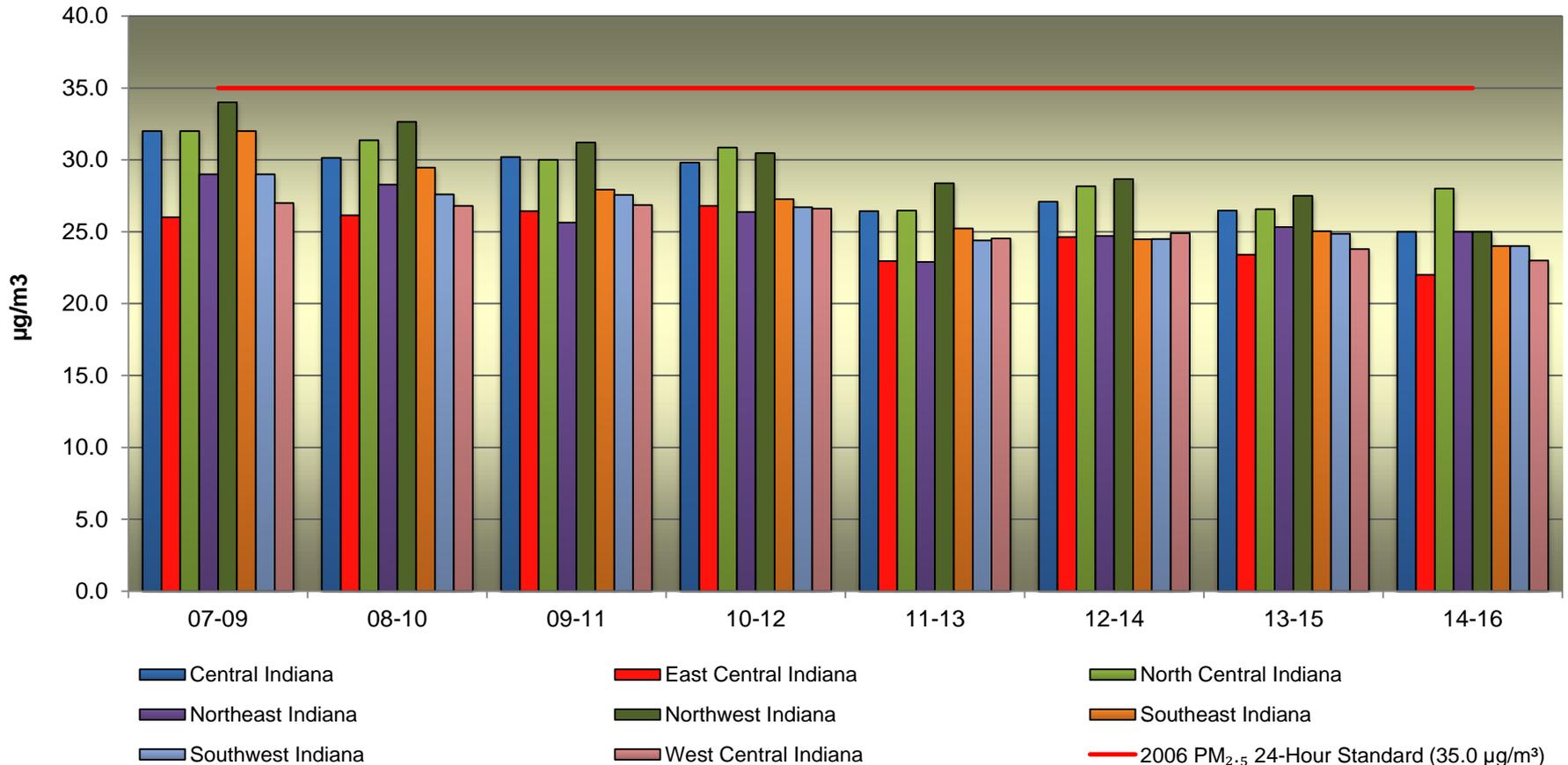


Chart excludes monitors with incomplete data and/or less than three full years of monitoring data.

µg/m³ = micrograms per cubic meter



PM_{2.5} Designations

When a new NAAQS is issued, the implementation process begins. The first step is to identify any areas that do not meet the new standard. This is referred to as the designation process. U.S. EPA is responsible for designating areas that do not meet the standard. IDEM works to ensure that the designations are appropriate and that Indiana receives formal recognition for its achievements under the standards.

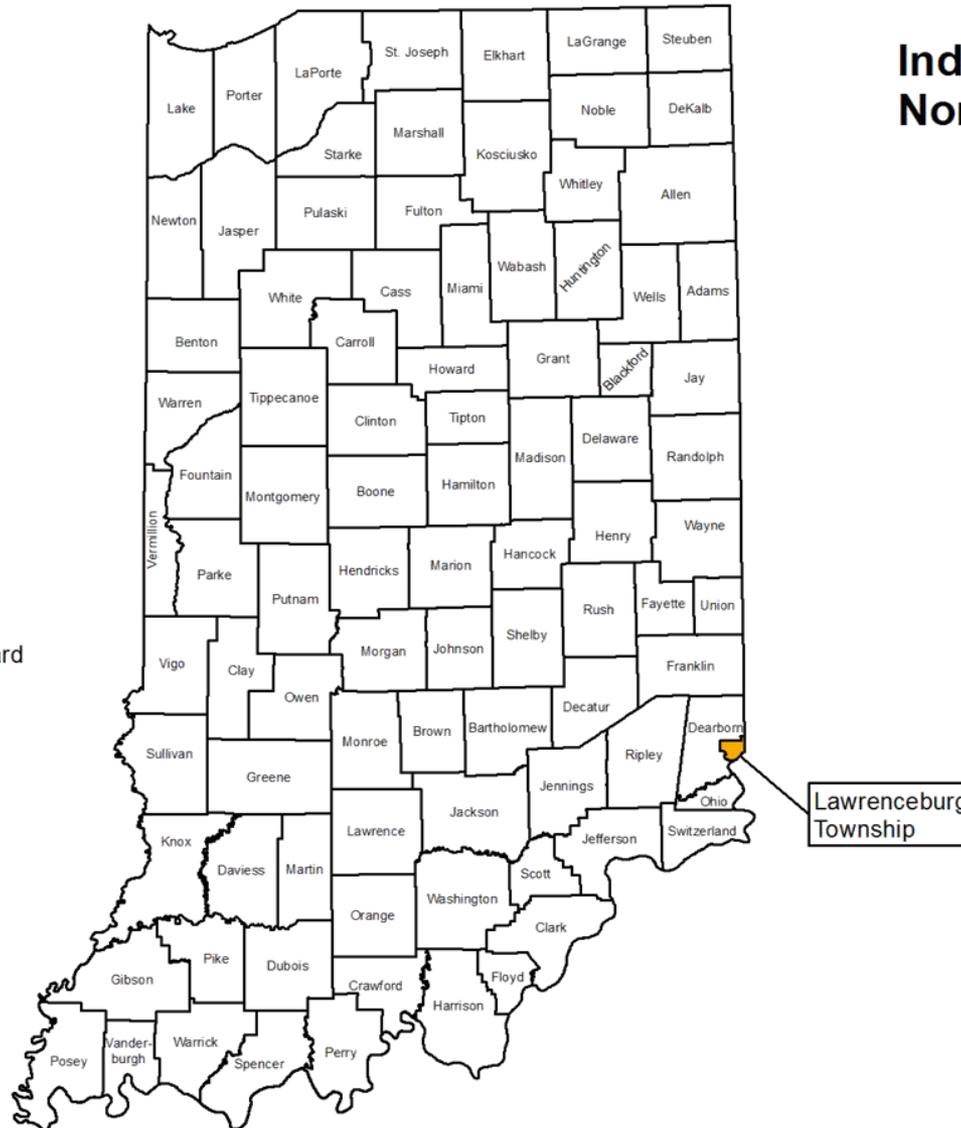
1997 Standards - PM_{2.5} was regulated for the first time under standards issued in 1997. Designations were completed several years later, in April of 2005, following the resolution of legal challenges to the new standards. Although 12 counties and five townships in Indiana were initially designated as nonattainment, subsequent monitoring data showed compliance. Indiana submitted petitions for the redesignation of all 17 areas. To date, all but one area has been reclassified to attainment status. Federal review is pending for Lawrenceburg Township in Dearborn County (Cincinnati metro area).

2006 Standards - The 24-hour standard was strengthened in 2006. No areas of Indiana were designated as “nonattainment.” All areas were designated as unclassifiable/attainment status and remain in compliance today.



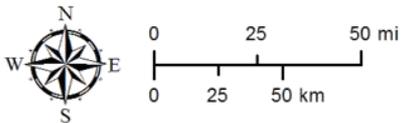
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Indiana's PM_{2.5} Nonattainment Areas



Legend

 Nonattainment for the 1997 Annual Standard
(Redesignation Pending)



Mapped By: C. Mitchell, OAQ
Date: 05/15/2017
Source: IDEM, Air Monitoring
Map Projection: UTM Zone 16 N
Map Datum: NAD83



PM_{2.5} Designations (Cont.)

2012 Standards – U.S. EPA’s most recent revision in 2012 strengthened the annual primary standard. Data for the most recent three-year timeframe indicates that all measured air in Indiana meets the 2012 standards (*see slide 13*). At the time of this report, all Indiana counties are listed as “unclassifiable/attainment”, with the exception of the following two areas.

- Clark and Floyd counties - When U.S. EPA designated areas for the revised PM_{2.5} standard, based on 2012 – 2014 data, Clark and Floyd counties were in attainment of the standard. However, due to uncertainties within the Louisville, KY monitoring network, U.S. EPA was unable to determine whether Clark and Floyd counties were contributing to a potential violation in the Louisville area. As such, U.S. EPA designated them as “unclassifiable”.

In 2013, Kentucky began collecting valid PM_{2.5} data and in 2016 certified monitoring data for the years 2013 – 2015 that demonstrated attainment of the 2012 standard. All monitors in the Louisville area demonstrate attainment of the standard. However, U.S. EPA has no plans to change the attainment status of Clark and Floyd counties as there are no negative implications associated with these counties remaining designated “unclassifiable”. As such, no further state action is planned and/or required for Clark and Floyd counties.



PM_{2.5} Designations (Cont.)

- Lake and Porter counties - When U.S. EPA designated areas for the revised PM_{2.5} standard, based on 2011 – 2013 data, Lake and Porter counties were in attainment of the standard. However, due to uncertainties within the Chicago, IL monitoring network, U.S. EPA was unable to determine whether Lake and Porter counties were contributing to a potential violation in the Chicago area. As such, U.S. EPA designated them as “unclassifiable”.

Indiana continues to demonstrate attainment of the standard for monitors in Lake and Porter counties. However, several monitors within the Chicago, IL monitoring network for the years 2015 and 2016 did not satisfy completeness criteria and are considered invalid. Therefore it is still undetermined whether Lake and Porter counties are contributing to a potential violation in the Chicago area. U.S. EPA has no plans in the future to change the attainment status of Lake and Porter counties when certified monitoring data demonstrates attainment of the 2012 standard as there are no negative implications associated with these areas remaining designated “unclassifiable”. As such, no further state action is planned and/or required.



Additional Information

- For additional PM_{2.5} monitoring information, visit IDEM's website:
www.IN.gov/idem/airquality/2346.htm
- For additional information regarding the designation process or Indiana's redesignation petitions and maintenance plans, visit
www.IN.gov/idem/airquality/2342.htm
- For additional information regarding the NAAQS for fine particles, visit U.S. EPA's Particulate Matter (PM) Standards website:
<https://www.epa.gov/naaqs>



Contact

Please feel free to direct questions or comments to Ms. Catherine Mitchell with IDEM's Office of Air Quality at (800) 451-6027 (*toll free*), (317) 234-6530 (*direct*), or cmitchel@idem.IN.gov.