



Indiana Department of Environmental Management

2015 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 **2015 Fine Particles (PM_{2.5}) Summary Report** provides an overview of PM_{2.5}, including 2015 data and air quality trends over the past 10 years (2006-2015).

The following information is included in this report:

- General information about PM_{2.5} (*slides 3-4*)
- Overview of PM_{2.5} air health standards and requirements (*slides 5-7*)
- Overview of Indiana's PM_{2.5} monitoring network (*slides 8-11*)
- Summary of 2015 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 PM_{2.5}?

Particulate matter (PM) is a complex mixture of small particles found in the air, including dust, dirt, smoke, and liquid droplets. Particulate matter includes **PM_{2.5}**, which are very small particles that are **2.5 micrometers**, or microns, in diameter or smaller.

Where does PM come from?

Sources of 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?

Fine particles are small enough to be inhaled deep into the lungs and 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.



How Big Is PM_{2.5}?

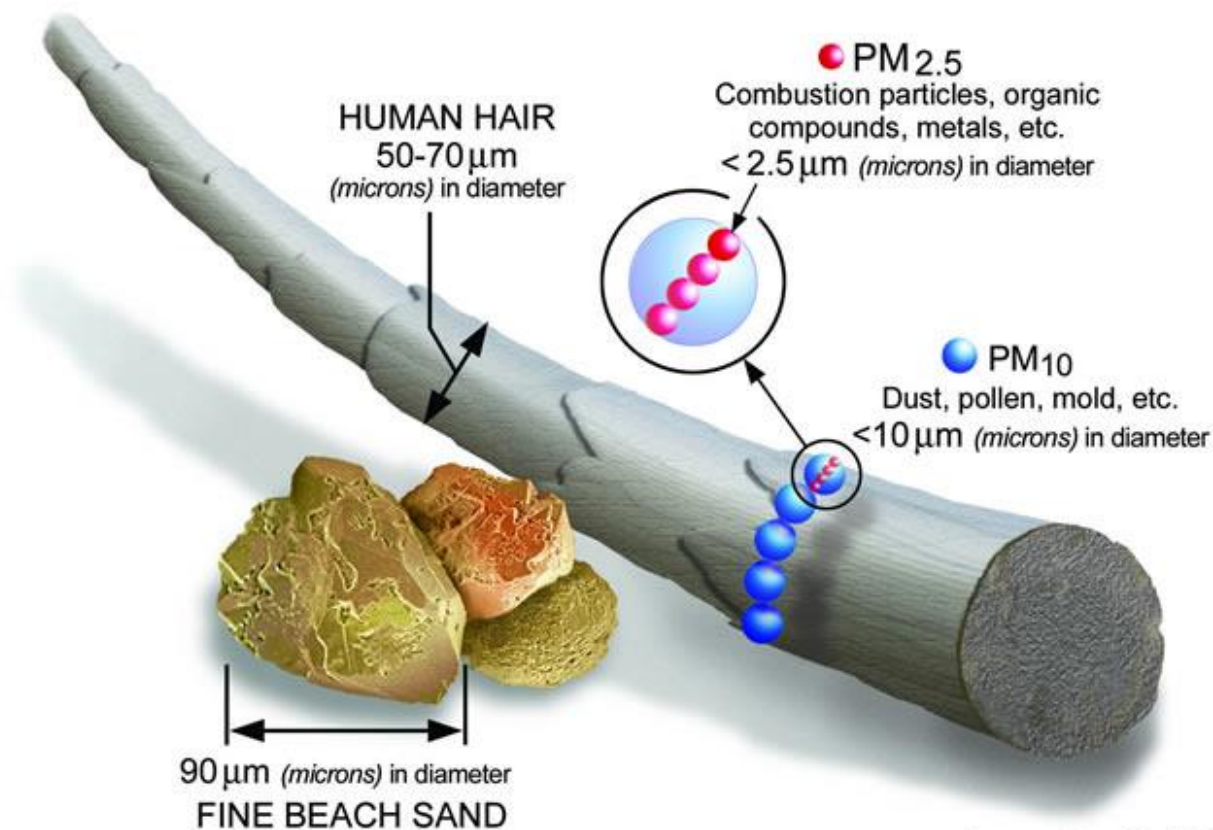


Image courtesy of the U.S. EPA



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.

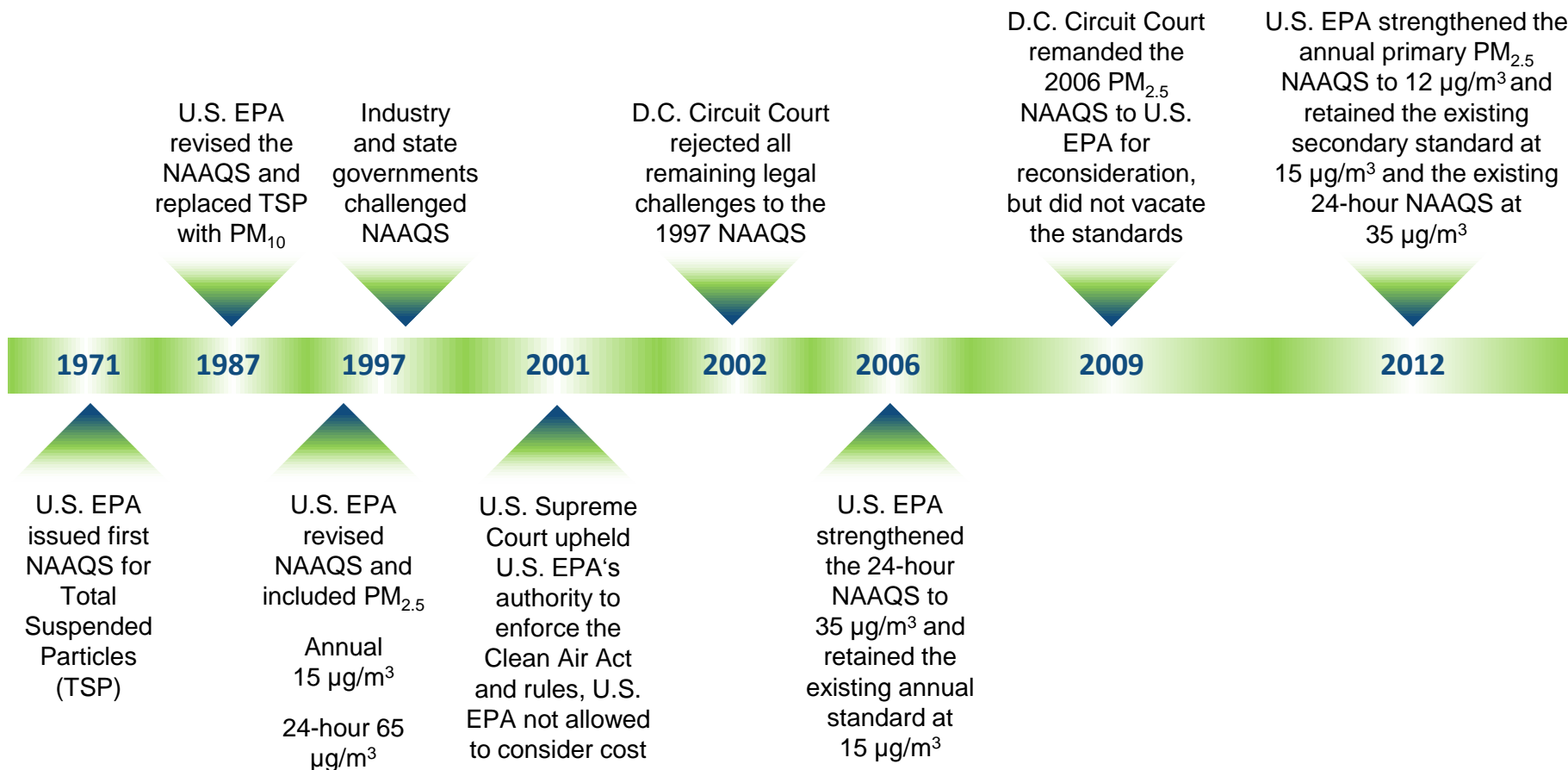
Primary and secondary NAAQS established in 1971 set the first limits for total suspended particles (TSP). Since then, the NAAQS for fine particles have been reviewed periodically and revised. Standards for particles 10 microns in diameter and smaller, referred to as PM₁₀, were established in 1987. Standards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





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 2016 will be based on data from 2013 to 2015.

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**.



2015 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

- 32 annual fine particle monitors in 23 counties across Indiana.
- 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.



2015 PM_{2.5} Monitoring Network (Cont.)

Monitors are located in the following regions. Maps on the following two slides provide additional location information.

Region	Counties
Northwest	Lake, LaPorte, Porter
North Central	Elkhart, St. Joseph
Northeast	Allen, Whitley
West Central	Greene, Tippecanoe, Vigo
Central	Bartholomew, Hamilton, Howard, Madison, Marion, Monroe
East Central	Delaware, Henry
Southwest	Dubois, Spencer, Vanderburgh
Southeast	Clark, Floyd



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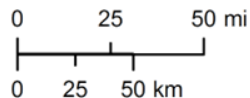
Legend



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

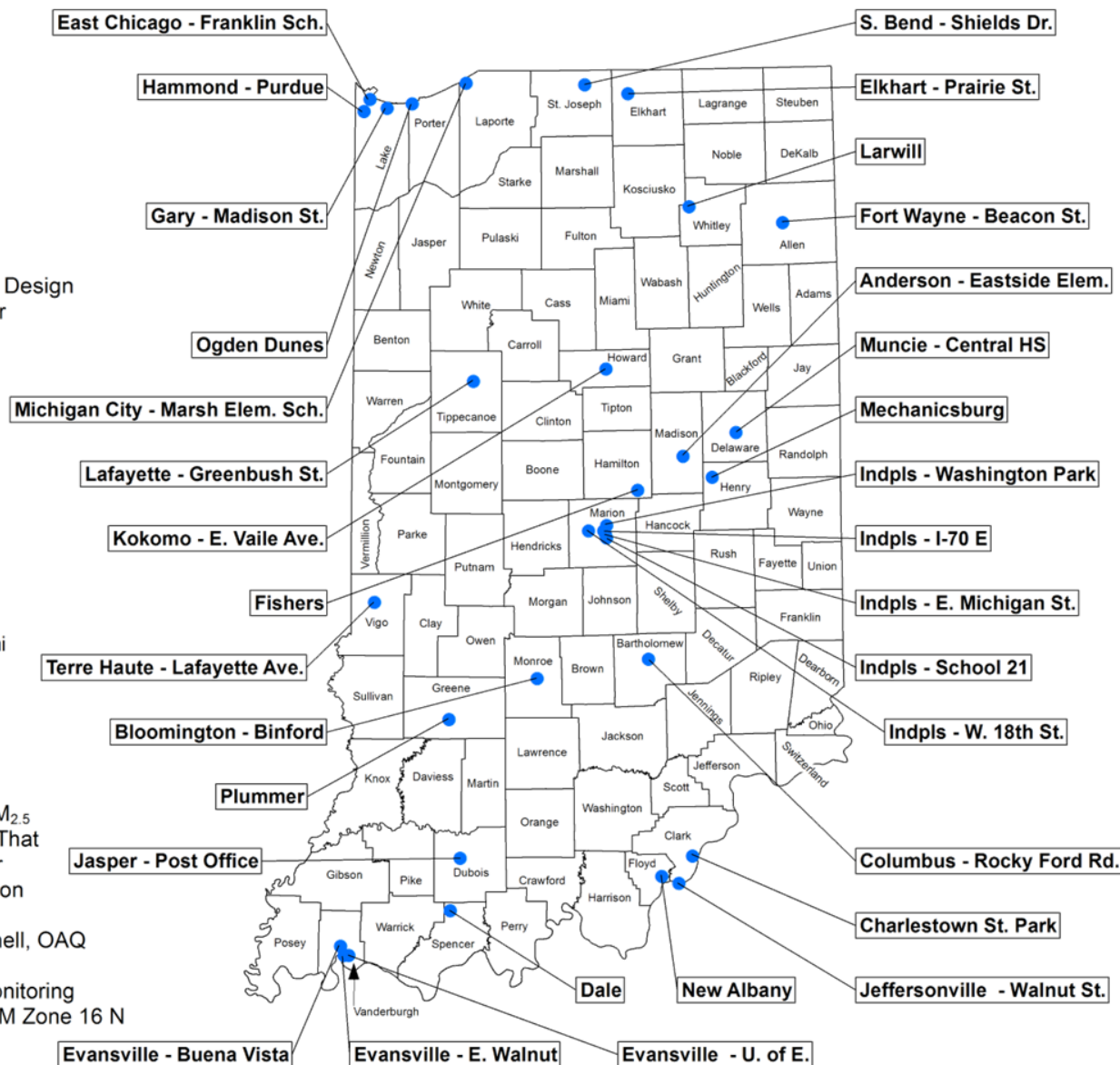
Mapped By: C. Mitchell, OAQ

Date: 02/12/2016

Source: IDEM Air Monitoring

Map Projection: UTM Zone 16 N

Map Datum: NAD83



2015 PM_{2.5} Annual Ambient Air Monitoring Network

Office of Air Quality

Legend

PM_{2.5} 24-Hour Monitor

County



Notes:

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

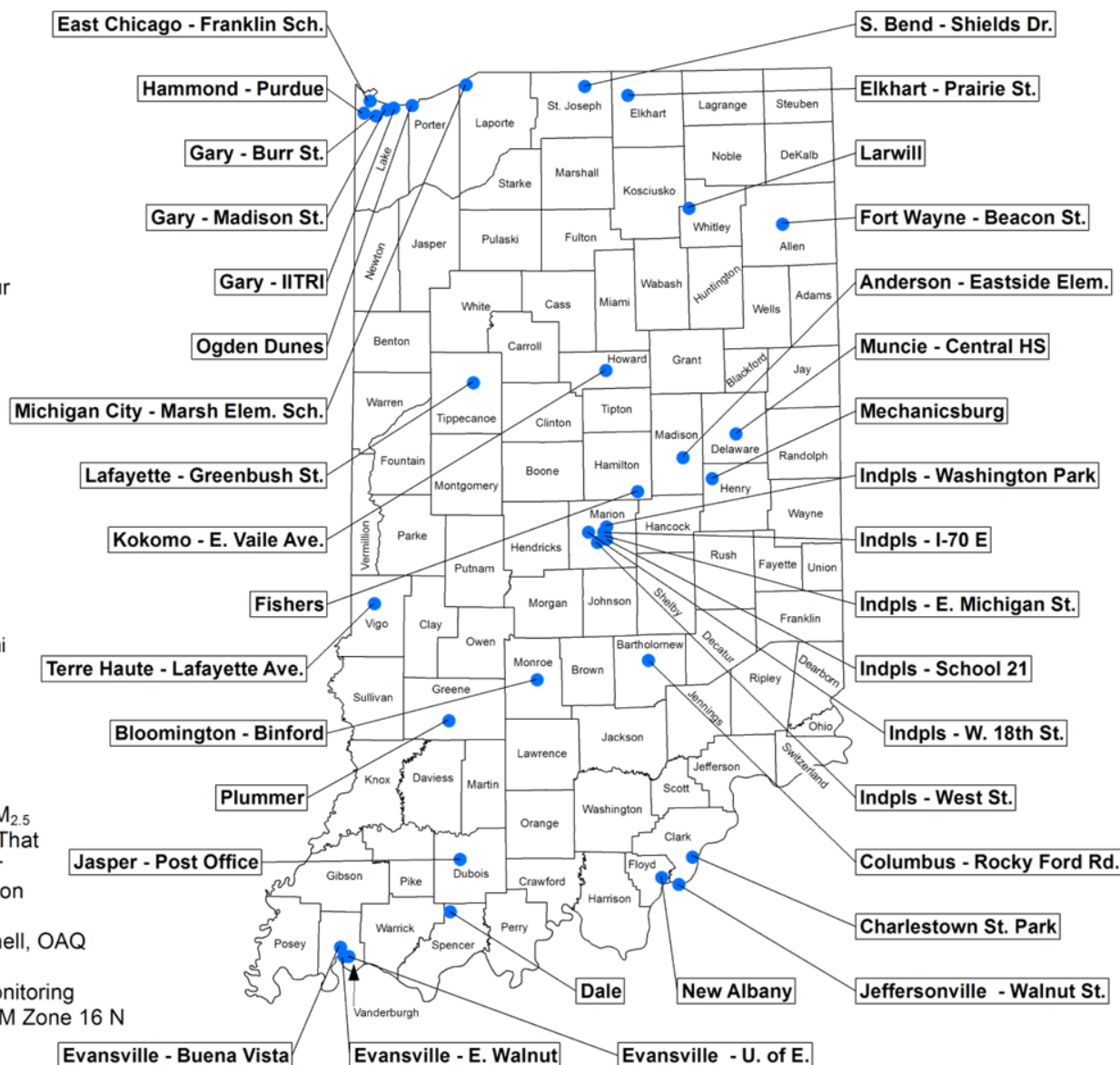
Mapped By: C. Mitchell, OAQ

Date: 02/12/2016

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Map Datum: NAD83



**2015
PM_{2.5}
24-Hour
Ambient Air
Monitoring
Network**



2015 PM_{2.5} Monitoring Data Summary

Air Quality Action Days in 2015. 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 in 2015. Exceedances were recorded on six days. Exceedance is the term for a concentration that is recorded above the standard.

Quality assured monitoring data for 2015



- 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 found on slides 5 through 7.

Quality assured monitoring data for the 2013–2015 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 13 and 14.



Legend

-  PM_{2.5} Design Value Less Than or Equal to 12.0 $\mu\text{g}/\text{m}^3$
-  Indiana County Borders



0 25 50 mi
0 25 50 km

Notes:

Posted Data Are in Units of Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

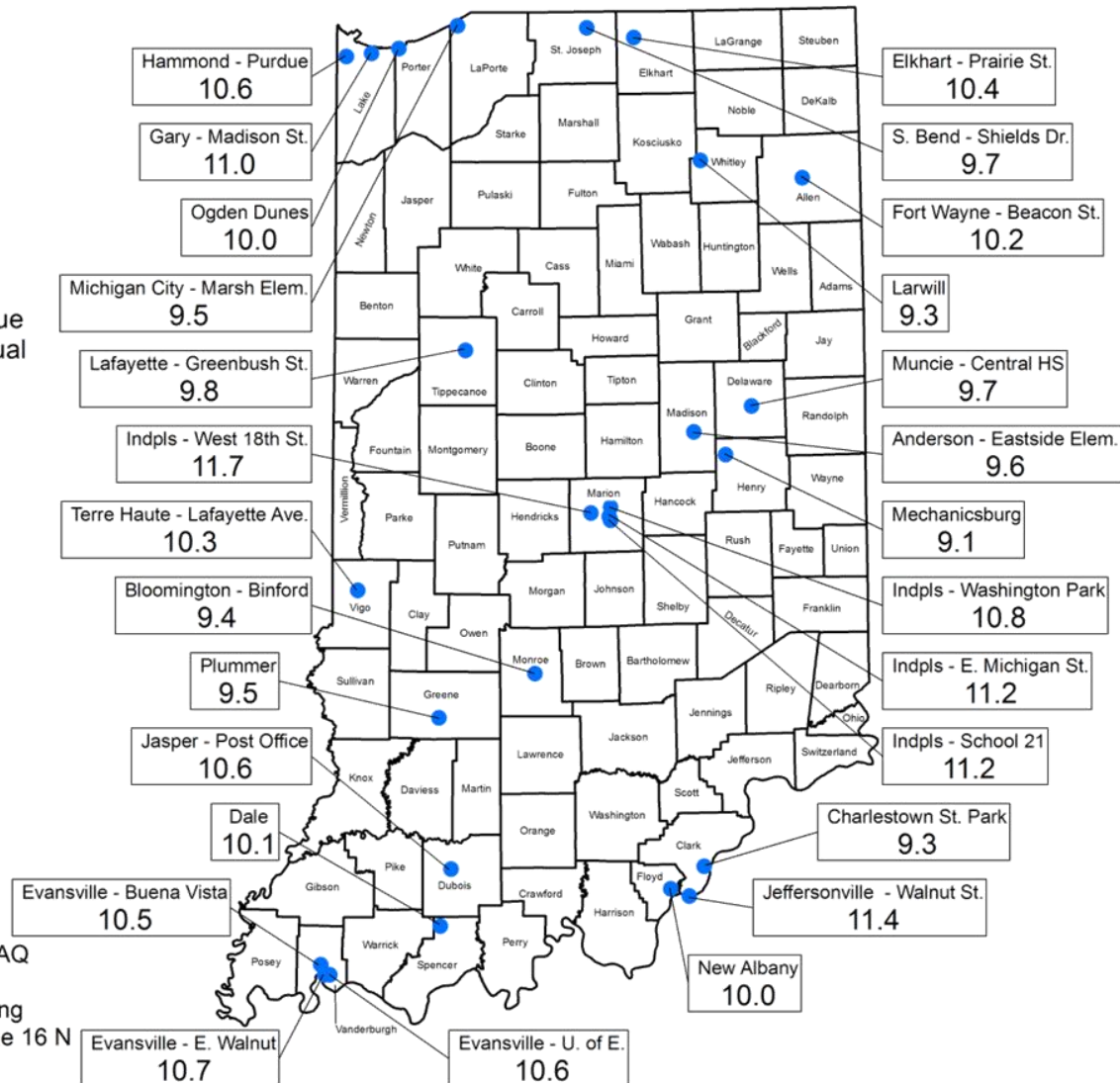
Mapped By: C. Mitchell, OAQ

Date: 03/04/2016

Source: IDEM, Air Monitoring

Map Projection: UTM Zone 16 N

Map Datum: NAD83



PM_{2.5} Annual Design Values 2013 - 2015

Standard set
at 12.0 $\mu\text{g}/\text{m}^3$

1997:
U.S. EPA
Established This
Standard at
15.0 $\mu\text{g}/\text{m}^3$

2006:
U.S. EPA
Retained This
Standard at
15.0 $\mu\text{g}/\text{m}^3$

2012:
U.S. EPA
Revised This
Standard to
12.0 $\mu\text{g}/\text{m}^3$





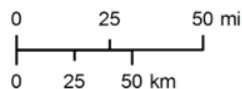
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**PM_{2.5} 24-Hour
Design Values
2013 - 2015**

Standard set at
35.0 $\mu\text{g}/\text{m}^3$

Legend

-  PM_{2.5} Design Value
Less Than or Equal to
35 $\mu\text{g}/\text{m}^3$
-  Indiana County
Borders



Notes:

Posted Data Are in Units
of Micrograms Per Cubic
Meter ($\mu\text{g}/\text{m}^3$)

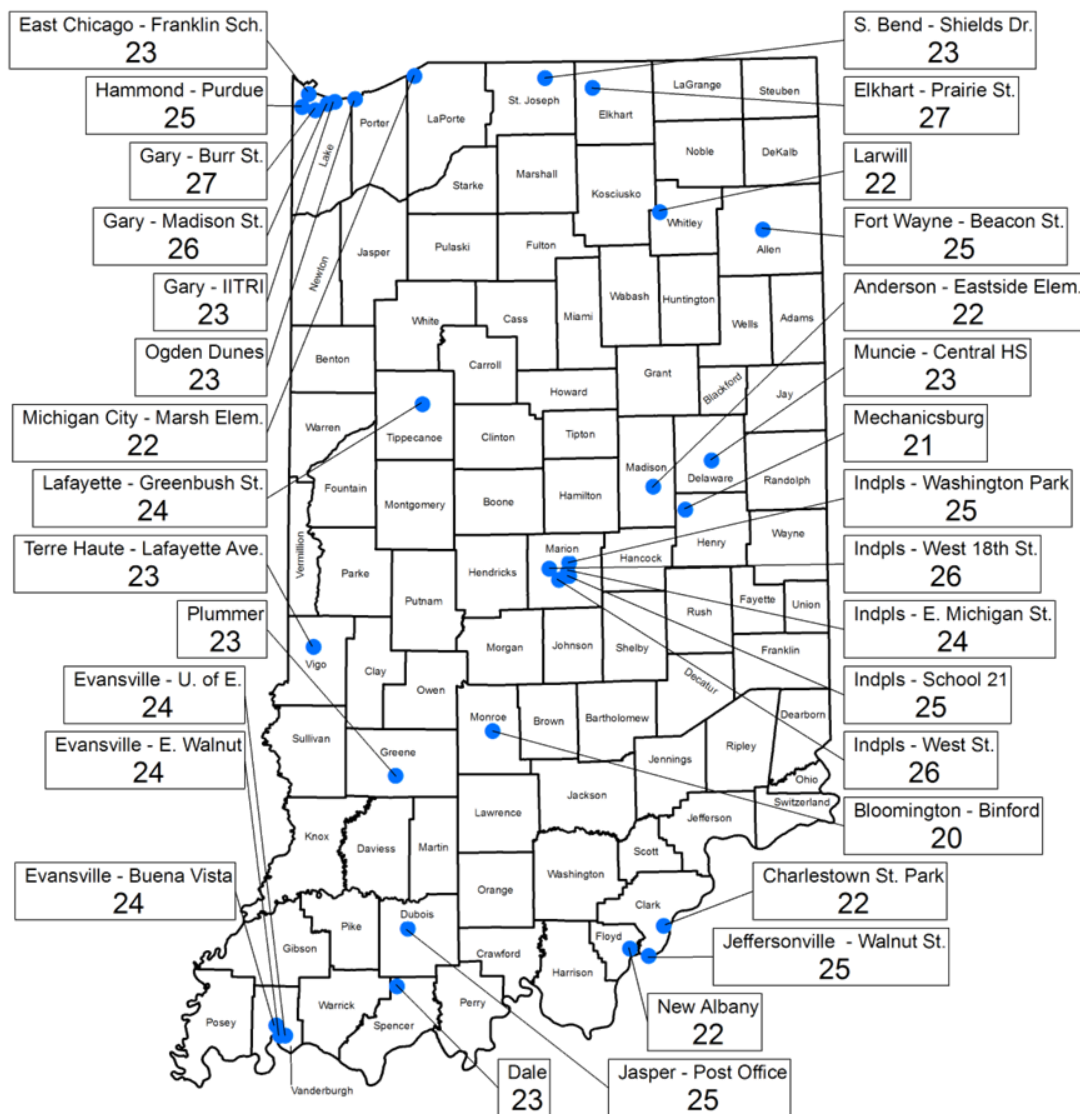
Mapped By: C. Mitchell, OAQ

Date: 04/14/2016

Source: IDEM, Air Monitoring

Map Projection: UTM Zone 16 N

Map Datum: NAD83





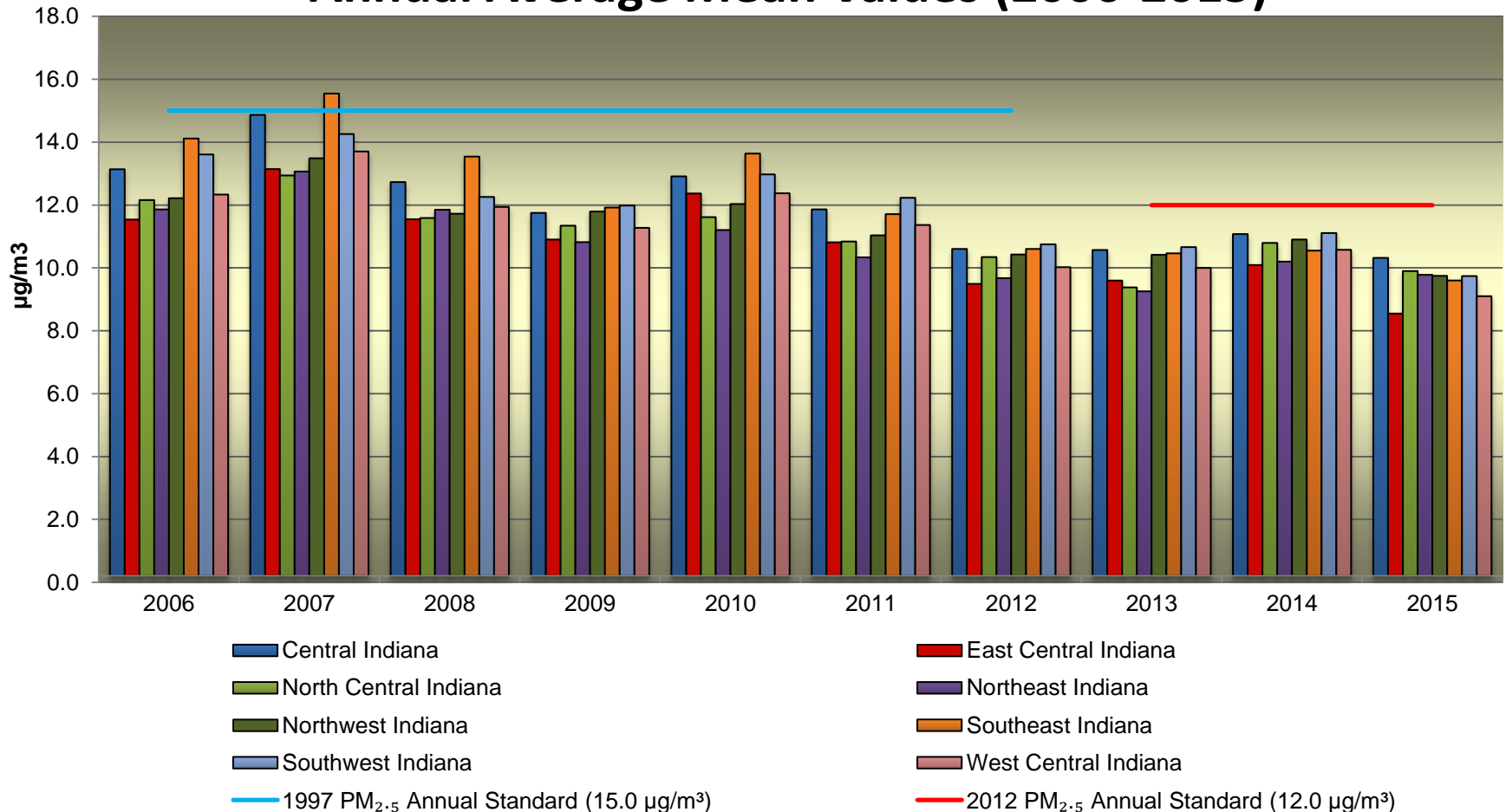
PM_{2.5} Air Quality Trends

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 (2006-2015)





PM_{2.5} Air Quality Trends – Annual NAAQS Three-Year Design Values (2006-2015)

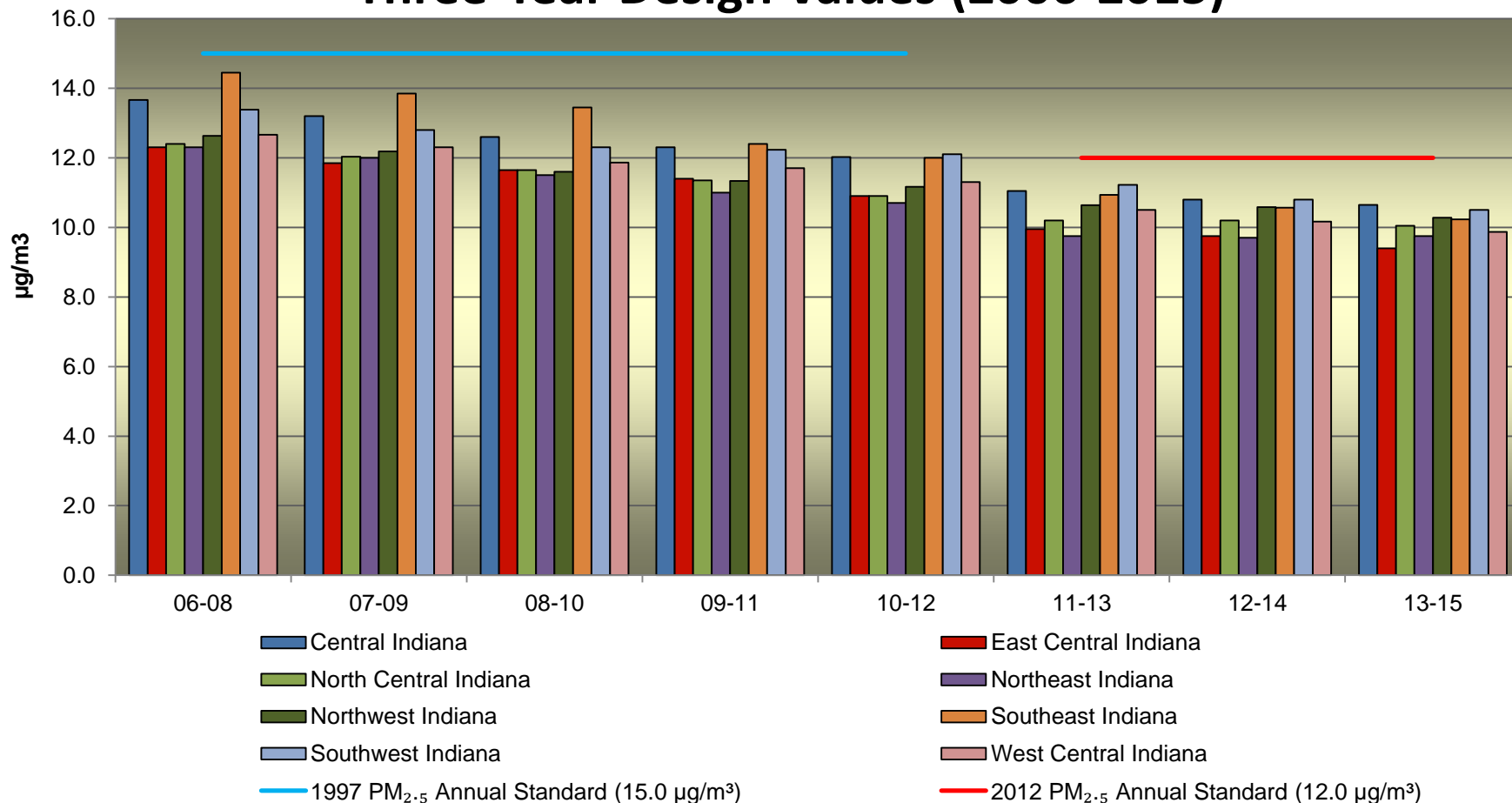


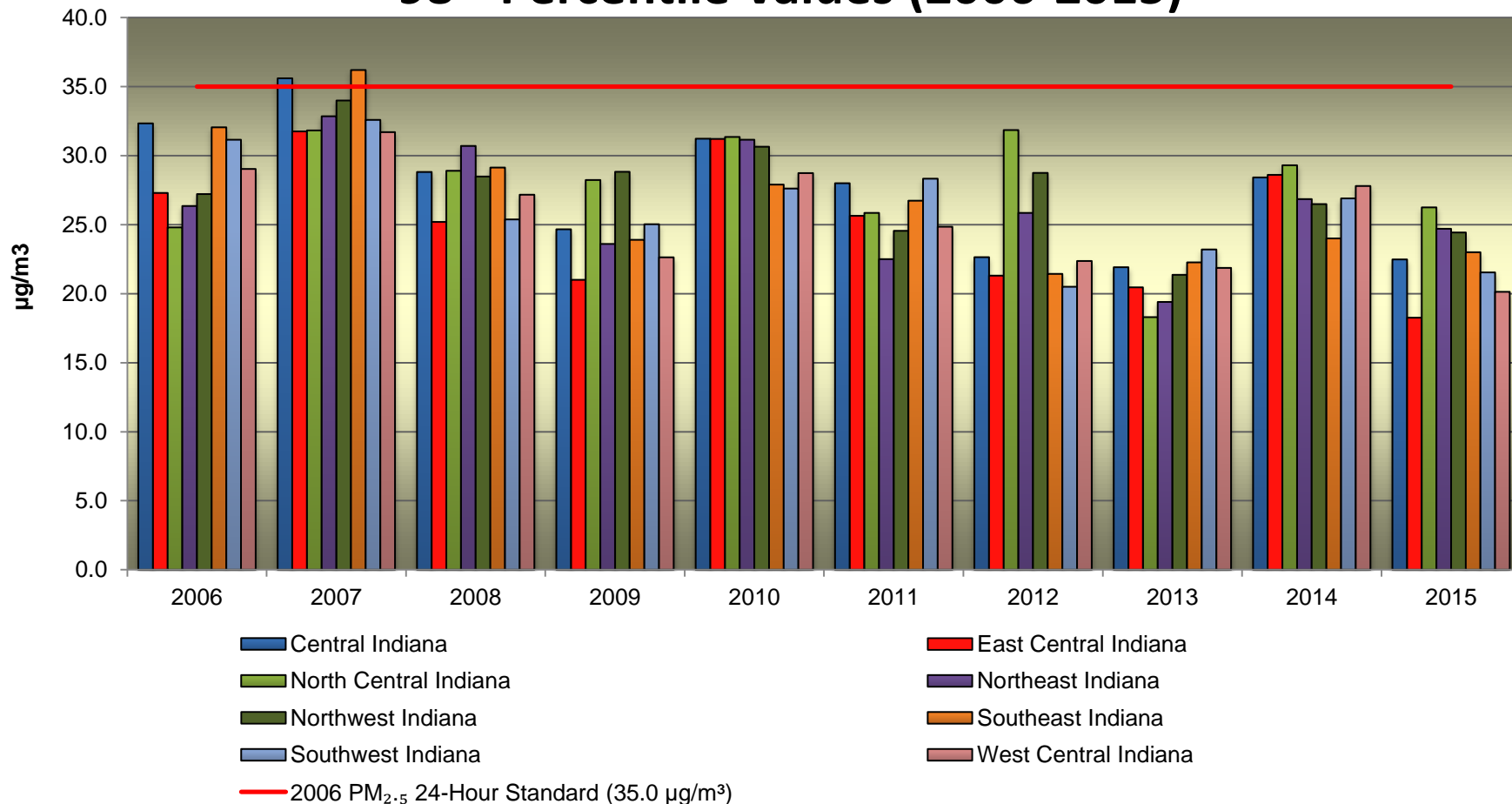
Chart excludes monitors with incomplete data and/or less than three full years of monitoring data.

µg/m³ = micrograms per cubic meter



PM_{2.5} Air Quality Trends – 24-hour NAAQS

98th Percentile Values (2006-2015)



µg/m³ = micrograms per cubic meter



PM_{2.5} Air Quality Trends – 24-hour NAAQS

Three-Year Design Values (2006-2015)

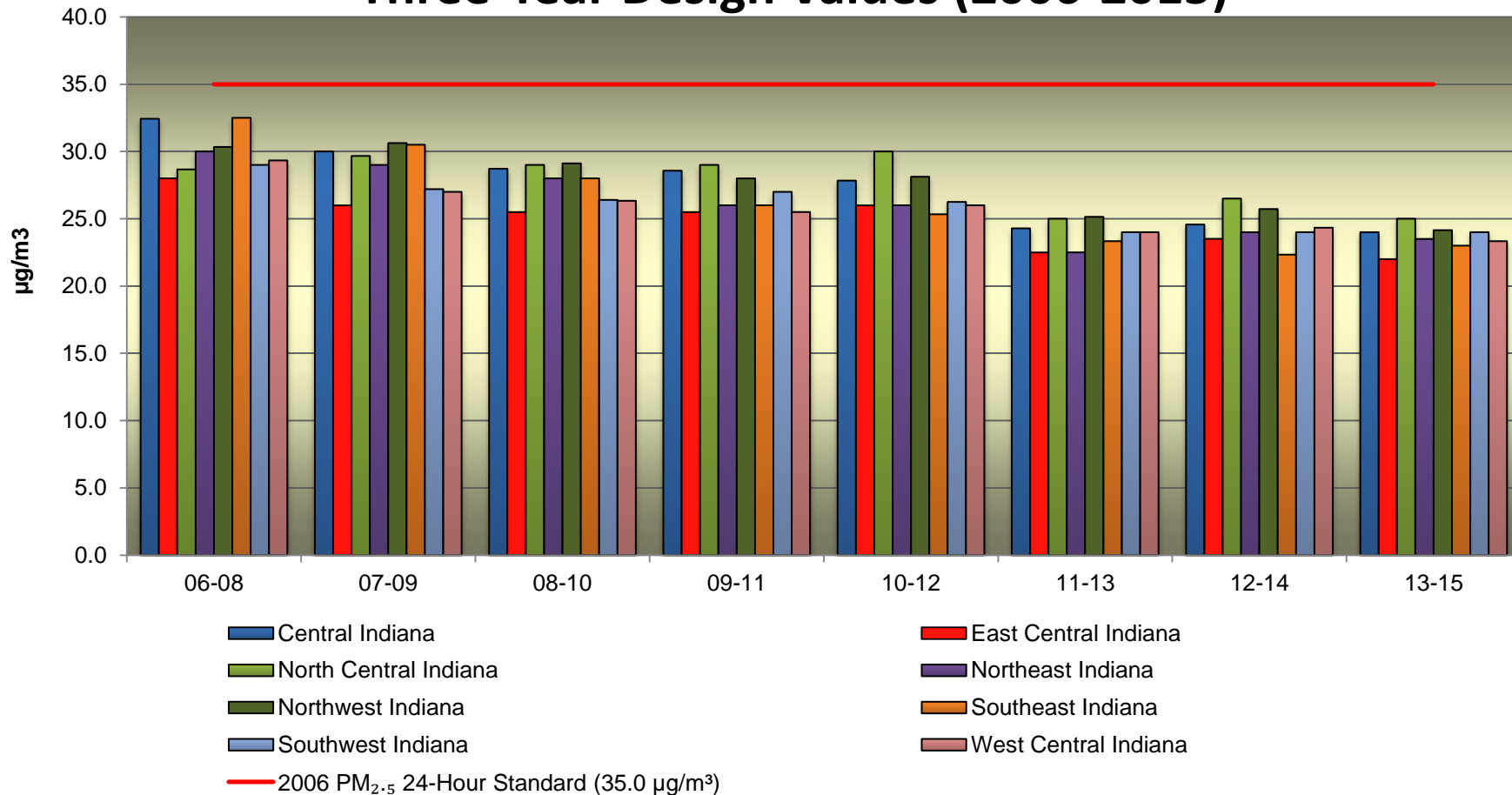


Chart excludes monitors with incomplete data and/or less than three full years of monitoring data.

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 “nonattainment 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. All but two areas have been reclassified to attainment status. Federal review is pending for Lawrenceburg Township in Dearborn County (Cincinnati metro area), and Clark County, Floyd County and Madison Township in Jefferson County (Louisville 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.



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*). When U.S. EPA initially issued designations in December 2014, its decisions were based on current data at the time (2011-2013), which showed a violation at a single monitor in Clark County. However, 2014 monitoring data was certified prior to the effective date of designation for the area and because the 2012-2014 design value was below the standard, U.S. EPA revised the classification to unclassifiable prior to the effective date of the December 2014 action. 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 - 2011-2013 data showed a single monitor in Clark County slightly over the standard; however, IDEM submitted 2014 data showing the monitor is in compliance. Based on 2012-2014 data, U.S. EPA has included these areas in the Louisville Combined Statistical Area (CSA) boundaries, and has designated them as unclassified pending further review of data from the Louisville portion of the CSA.



PM_{2.5} Designations (Cont.)

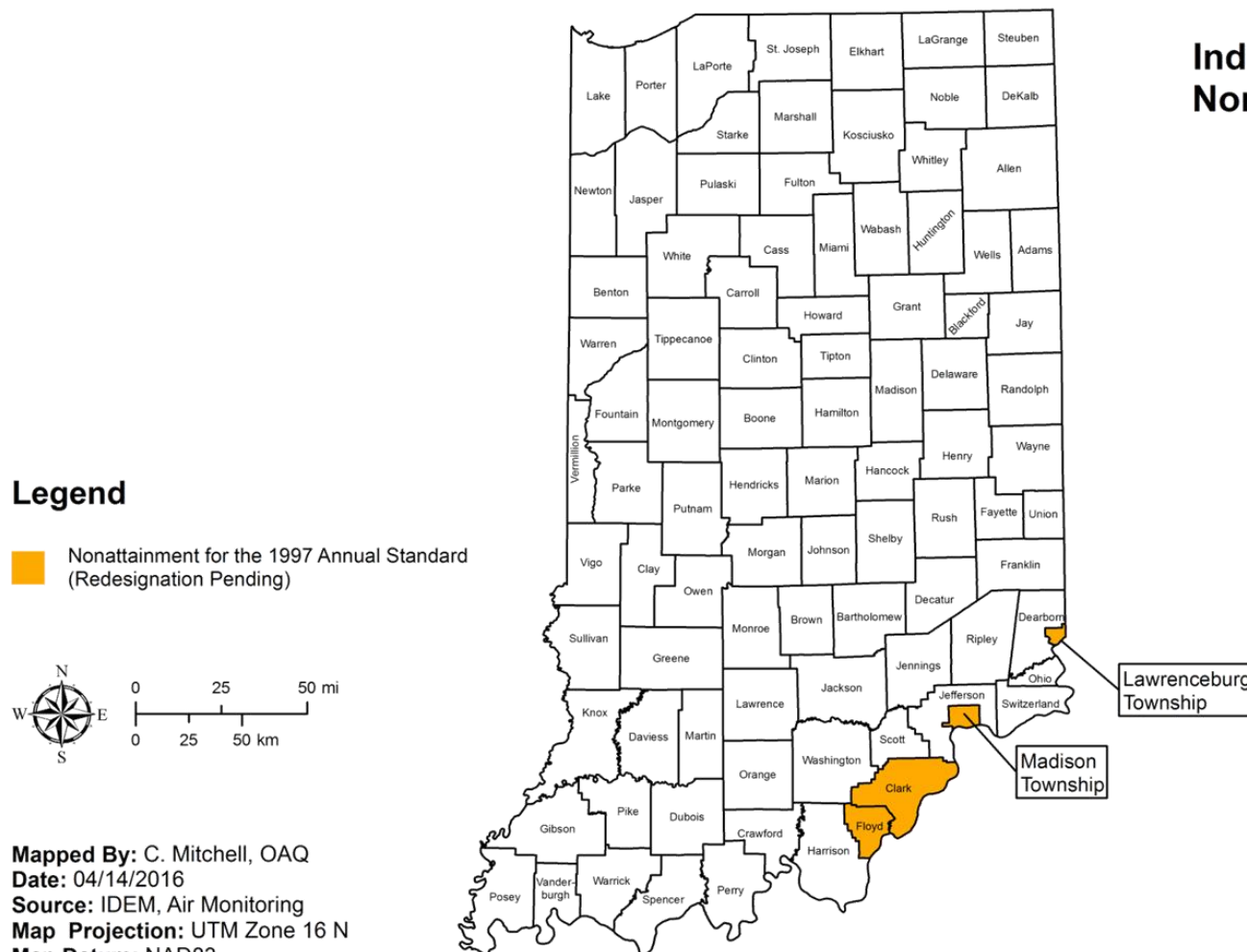
- Lake and Porter counties show compliance with the standard based on data for 2011-2013, as well as 2012-2014 and 2013-2015. However, U.S. EPA has included these counties in the Chicago Combined Statistical Area (CSA) boundaries, and has designated them as unclassified pending further review of data from Illinois 'and Wisconsin's portions of the CSA.

IDEM is continuing to work on resolving these matters and will keep the public informed.

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PM_{2.5} Designations (Cont.)

Indiana's PM_{2.5} Nonattainment Areas



Mapped By: C. Mitchell, OAQ
Date: 04/14/2016
Source: IDEM, Air Monitoring
Map Projection: UTM Zone 16 N
Map Datum: NAD83



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://www3.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html



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.