Commonwealth of Pennsylvania
Department of Environmental Protection

Recommendations to the U.S Environmental Protection Agency For Fine Particulate ($PM_{2.5}$) Attainment/Nonattainment Areas

February 20, 2004

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Table of Contents

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What is this Document?

The federal Clean Air Act (CAA) provides a mechanism for states to make recommendations to the U.S. Environmental Protection Agency (EPA) on the designation of areas not meeting the health-based National Ambient Air Quality Standards (NAAQS). In this document, the Pennsylvania Department of Environmental Protection (Department or DEP) makes preliminary recommendations to EPA concerning attainment/nonattainment designations in the Commonwealth of Pennsylvania for the fine particulate NAAQS adopted by EPA in 1997. The designation recommendations are based on air quality monitoring data for 2000-2002 and other available information including particulate-forming emissions, meteorology and demographics. Because the implications of designations have not been fully established by EPA, DEP intends to continue to work with EPA to revise these recommendations, as appropriate, prior to the promulgation of final designations. EPA will make final designations in December 2004 based on air quality monitoring data for 2001-2003.

What is Fine Particulate?

Particulate matter (PM) includes both solid and liquid particles suspended in the air. PM is chemically and physically diverse and originates from a variety of human and natural activities. PM is composed of particles in a wide range of sizes. Particles less than 10 micrometers in diameter (PM_{10}) pose a health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter ($PM_{2.5}$) are referred to as fine particles and generally pose the largest health risks. Because of their small size, fine particles can penetrate deeply into the lungs. The characteristics and origin of PM_{10} and $PM_{2.5}$ are very different. PM_{10} comes from sources such as unpaved roads, crushing and grinding operations, and windblown dust. $PM_{2.5}$ may either be directly emitted from a source (primary particulate) or formed in the atmosphere by chemical reaction of gaseous precursors (secondary particulate). $PM_{2.5}$ is primarily composed of sulfates, nitrates, organic carbon, elemental carbon and crustal material. $PM_{2.5}$ results mainly from the pollutants emitted when fuel is combusted. Fossil fuel fired power plants and motor vehicles are important sources of primary $PM_{2.5}$ and the gaseous precursors that form additional $PM_{2.5}$ in the atmosphere.

In Pennsylvania, $PM_{2.5}$ is a significant air pollution problem. Reducing concentrations of $PM_{2.5}$ is important because levels above the health-based standard are a serious human health threat and also can cause or contribute to other negative environmental impacts.

Health Effects. Fine particles generally pose greater health risks than larger particles. Because of their small size (less than one-seventh the average width of a human hair), fine particles can lodge deeply into the lungs. Health studies have shown a significant association between exposure to $PM_{2.5}$ and premature mortality. Studies have also linked exposure to $PM_{2.5}$ with other significant health problems including

aggravation of respiratory and cardiovascular disease, lung disease, decreased lung function, asthma attacks, increases in respiratory symptoms like coughing and difficult or painful breathing, chronic bronchitis, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia. Individuals particularly sensitive to $PM_{2.5}$ exposure include older adults, people with heart and lung disease, and children. Millions of Pennsylvanians live in areas where the $PM_{2.5}$ health-based standards are exceeded.

Environmental Effects. Fine particles are the major cause of reduced visibility (haze) in certain parts of the United States, including many national parks. Fine particles cause visibility impairment by scattering and absorbing light before it reaches an observer. In the Eastern United States, haze has reduced the average visual range from approximately 90 miles in the absence of manmade pollution to 15 – 25 miles. In addition, components of $PM_{2.5}$, such as nitrates and sulfates, contribute to acid rain formation that makes lakes, rivers, and streams unsuitable for many fish, and erodes buildings, historical monuments, and paint on cars. $PM_{2.5}$ and its precursor pollutants can be carried over long distances by wind and then settle on ground or water. This changes the nutrient balance in coastal waters and large river basins, contributing to fish kills and algae blooms in sensitive waterways, such as the Chesapeake Bay. The settling of $PM_{2.5}$ also depletes the nutrients in soil, damages sensitive forests and farm crops, and affects the diversity of ecosystems. Soot, a type of $PM_{2.5}$, stains and damages stone and other materials.

Where does $PM_{2.5}$ come from? Fine particles are primarily composed of sulfates, nitrates, organic carbon, elemental carbon and crustal material. These particles may either be directly emitted from a source (primary PM) or formed in the atmosphere by chemical reaction of gaseous precursors (secondary PM). Precursors of $PM_{2.5}$ include sulfur dioxide, nitrogen oxides, volatile organic compounds, and ammonia. $PM_{2.5}$ and its precursors result mainly from fuel combustion (motor vehicles, power plants and non-road engines) and industrial processes.

What is the NAAQS for $PM_{2.5}$? EPA sets NAAQS for PM based on its review of existing scientific knowledge about the adverse health and welfare effects. The CAA requires EPA to review public health standards for major air pollutants every five years and update the NAAQS, if necessary, to "protect public health with an adequate margin of safety" based on the latest, best-available science. Originally, the NAAQS for PM was based on the level of Total Suspended Particulates. As the body of scientific knowledge grew, it became clear that the primary health effects of PM are caused by particles that are smaller than 10 micrometers in diameter because these have greater potential to enter the lower portions of the lungs. In 1987, based on these studies demonstrating the health effects of smaller particles, EPA revised the NAAQS for PM to cover only particles smaller than 10 micrometers, or PM_{10}.

After its next review, in 1997, EPA revised the NAAQS to reflect the growing body of scientific knowledge that links exposure to fine particles to serious health effects. On July 18, 1997, EPA promulgated two new $PM_{2.5}$ standards – an annual average of 15 ug/m^3, and a 24-hour average of 65 ug/m^3. At that time, EPA proposed to also keep the

PM_{10} standards as an indicator for coarse PM. However, a standard for coarse particles (those with a diameter between 2.5 and 10 micrometers) is likely to replace the PM_{10} standard in order to avoid double counting of the fine particles. A number of petitions were filed challenging the new annual and 24-hour $PM_{2.5}$ standards in the U.S. Court of Appeals for the D.C. Circuit. The Court subsequently held, in a split decision, that the CAA provisions for setting the health-based ozone and particulate matter standards were unconstitutional because EPA's authority was an improper delegation of legislative authority. The Court also ruled that EPA could not enforce the standards. Subsequently, EPA sought review of the D.C. Circuit Court's decision by the U.S. Supreme Court. In February 2001, the U.S. Supreme Court upheld EPA's authority under the CAA to set national air quality standards for the protection of public health. In March 2002, the D.C. Circuit Court rejected the remaining claims that EPA's decision was arbitrary and capricious and not supported by the evidence.

With the legal challenges resolved, EPA began developing new strategies for implementation of the $PM_{2.5}$ standards. According to EPA, an implementation regulation for the fine particulate matter standard should be proposed in March 2004. The final $PM_{2.5}$ implementation regulation is expected in December 2004. EPA's new fine particulate standards will provide significantly increased health and environmental protection nationally beyond that provided by the PM_{10} standard.

An area does not attain the annual standard if the 3-year average of annual averages is more than 15 micrograms per cubic meter. An area does not attain the 24-hour standard if the 98^{th} percentile 24-hour concentration averaged over 3 years is more than 65 micrograms per cubic meter.

What is the Process for Designating Areas that Do Not Attain a NAAQS?

Section 107(d)(1)(B) of the CAA requires EPA to designate areas after promulgating a new NAAQS. Following promulgation of new or revised air standards, Governors are given the opportunity to submit recommendations for attainment/nonattainment areas, supported by most recent quality-assured monitoring data. EPA provides criteria for states' recommendations for designating areas.

EPA has requested that Governor's recommendations for $PM_{2.5}$ attainment and nonattainment designations be submitted by February 15, 2004. EPA may make modifications and promulgate all or part of the Governor's recommendations. If EPA determines that a modification to the recommendation is necessary, EPA will notify the state no later than 120 days prior to promulgating the designation. This 120-day notice provides an opportunity for states to work with EPA if the state believes EPA's decisions are not appropriate. EPA will make final $PM_{2.5}$ designations in December 2004. The $PM_{2.5}$ State Implementation Plan (SIP) revisions will be due to EPA in February 2008, three years after final designations are effective. The CAA presumptive attainment date is five years after final designations, which would be February 2010. There is the possibility of up to a five-year extension for the attainment date, if the state demonstrates

the need for an extension based on the severity of the nonattainment problem and the availability and feasibility of control measures.

EPA Guidance for $PM_{2.5}$ Nonattainment Boundaries. On April 1, 2003, EPA issued a general guidance memorandum, "Designations for the Fine Particulate National Ambient Air Quality Standards." The guidance memorandum explains that EPA intends to apply a presumption that the boundaries of nonattainment areas should be based on Metropolitan Area boundaries. A metropolitan area may consist of a single Metropolitan Statistical Area (MSA) or a Consolidated Metropolitan Statistical Area (CMSA). The guidance memorandum describes criteria that states can examine when suggesting nonattainment boundaries that are either larger or smaller than the metropolitan area. Some of the critical factors recommended for consideration include population density similarities, emission levels, air quality, and meteorology.

Discussion about Statistical Areas (SAs). The Office of Management and Budget (OMB) defines, and periodically updates, Metropolitan Statistical Areas (MSA). As stated above, the April 1, 2003 EPA guidance recommends using the definition of Metropolitan Statistical Areas as released by OMB in the report dated June 30, 1999 as the presumptive boundaries for PM2.5 nonattainment areas. Figure 2a shows the 1999 MSAs for Pennsylvania and adjacent areas. OMB published updated areas based on 2000 Census data on June 10, 2003. These areas are shown in Figure 2b.

Available Data. Appendix I includes maps and tables that describe the proposed $PM_{2.5}$ planning areas. Appendix II includes documenting material that addresses EPA's designation criteria, pertaining to air pollution emissions and population densities. These include manmade annual emissions of SO_2, NOx, VOC, $PM_{2.5}$ and NH_3. A map of large SO_2 sources and a chart displaying Pennsylvania speciated monitoring data are also included in Appendix II.

What Would be the Effects of a Nonattainment Designation?

States have the primary responsibility for determining how the $PM_{2.5}$ NAAQS will be achieved and maintained. Section 110 of the Clean Air Act requires states to submit SIP revisions within three years after designation of new nonattainment areas. States must demonstrate how the standard will be attained in each nonattainment area. Therefore, Pennsylvania expects to develop and submit $PM_{2.5}$ attainment SIP revisions by February 2008, three years after EPA is expected to make final designations.

Measures adopted by states to attain the ozone standards will also help states to attain the $PM_{2.5}$ standard because the pollutants that produce ozone (NOx and VOC) also contribute to $PM_{2.5}$ formation. Therefore, the ongoing efforts to achieve and maintain the one-hour and eight-hour ozone standards will also help to attain the $PM_{2.5}$ standard.

Dates for $PM_{2.5}$ attainment, rate of progress requirements, mandatory measures, how transport will be considered, technical demonstration requirements, transportation conformity and many other important issues will not be known until EPA promulgates $PM_{2.5}$ implementation regulations.

Tentative schedule:

January 10, 2004	– Open comment period on $PM_{2.5}$ designation recommendations
February 6, 2004	– Close comment period on $PM_{2.5}$ designation recommendations
February 20, 2004	– Submit designation recommendations to EPA
May 2004	– EPA proposes $PM_{2.5}$ implementation rule
December 2004	– EPA makes final $PM_{2.5}$ designations
Winter 2004	– EPA finalizes implementation rule
February 2008	– $PM_{2.5}$ SIP revision due
February 2010	– $PM_{2.5}$ attainment date with possibility of five-year extension

Transport of $PM_{2.5}$ and Multi-state/National Control Measures. A combination of regional controls supplemented by local controls will be necessary for attainment of the annual $PM_{2.5}$ standard. Monitoring data provides evidence that $PM_{2.5}$ concentrations have a significant regional component that can be attributed to the emissions from large point sources, such as power plants. Emissions from these large point sources must be addressed on a national or regional level. A number of national multi-pollutant strategies for reducing power plant emissions of the $PM_{2.5}$ precursors, NOx and SOx, are being considered by Congress. In the event that multi-pollutant legislation is not enacted in time to assist in attainment of the $PM_{2.5}$ standard, EPA proposed the Interstate Air Quality rule that will require reductions of NOx and SOx as necessary to control transport and provide downwind states the ability to attain the $PM_{2.5}$ standards. The Interstate Air Quality rule was published in the Federal Register on January 30, 2004 (69 FR 4566).

The monitoring data also shows urban enhancement of $PM_{2.5}$ concentrations. This effect appears to be much more localized for $PM_{2.5}$ than ozone. The local or urban component of $PM_{2.5}$ will need to be addressed by local control measures. These measures will be developed by Pennsylvania through a public process as the implementation plan is developed. Pennsylvania will derive additional emission reduction benefits from nationwide mobile measures such as cleaner new cars, cleaner new diesel vehicles and cleaner fuels. Local measures and statewide measures adopted for the purpose of ozone attainment, including implementation of regional NOx controls and reduced VOC emissions from consumer products, solvent cleaning, and the like, will also assist in attaining the $PM_{2.5}$ standard and reducing downwind contributions. With the successful and timely implementation of a combination of strong national multi-pollutant legislation or transport rule, nationwide mobile measures, and additional local measures, we expect that most areas of the Commonwealth should attain the $PM_{2.5}$ standard.

However, Pennsylvania is highly concerned that EPA's transported air pollution requirements will not be sufficient for all areas of the Commonwealth to achieve the

$PM_{2.5}$ standard within the CAA mandated timeframe, even with additional local measures.

Pennsylvania's $PM_{2.5}$ Designation Recommendations

The Commonwealth's $PM_{2.5}$ designation recommendations are based primarily on the June 30, 1999, issued definitions of Metropolitan Statistical Areas (MSAs) and Consolidated Metropolitan Statistical Areas (CMSAs). CMSAs and MSAs would be similar to the areas that were designated for the 1-hour ozone standard, and would preserve existing working relationships and political boundaries. The Commonwealth recommends following existing ozone nonattainment area boundaries and utilizing existing planning areas wherever possible. For reference, the current annual $PM_{2.5}$ design values for monitored counties are shown in Figure 1 of Appendix I.

An entire CMSA or CSA with one or more $PM_{2.5}$ monitors measuring a violation of the $PM_{2.5}$ standard would generally be designated as a nonattainment area for all counties. Counties not in a CSA with a $PM_{2.5}$ monitor measuring a violation of the $PM_{2.5}$ standard would also be designated nonattainment.

A county-by-county list of designation recommendations is included in Appendix I as Table I. All areas of the Commonwealth currently monitor attainment with the $PM_{2.5}$ 24-hour standard, 65 ug/m^3. The 1999 and 2003 Metropolitan Areas for Pennsylvania and adjacent non-Pennsylvania counties are shown in Figures 2a and 2b. A map of Pennsylvania's recommended boundaries for $PM_{2.5}$ nonattainment areas is shown in Figure 3. Discussion of the basis for DEP's recommendation for specific areas is included below.

Philadelphia Area: The Pennsylvania portion of the existing 1-hour interstate ozone nonattainment area includes Bucks, Chester, Delaware, Montgomery and Philadelphia Counties.

The Commonwealth recommends utilizing existing planning areas, where possible when determining boundaries for $PM_{2.5}$ nonattainment area. This will allow for integrated air quality planning among a group of counties and states that have experience working together to improve air quality. The Commonwealth is recommending that Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties be designated nonattainment for the $PM_{2.5}$ annual standard.

Allentown-Bethlehem-Easton Area: Lehigh County and Northampton County are both monitoring attainment of the $PM_{2.5}$ standard. Since this area is currently monitoring attainment, no nonattainment designation is necessary.

Reading Area: Berks County should be the planning area.

Lancaster Area: Lancaster County should be the planning area.

York Area: York County is recommended as the nonattainment planning area.

Harrisburg Area: The MSA includes Cumberland, Dauphin, Perry and Lebanon Counties. DEP recommends that the nonattainment planning area be limited to Cumberland, Dauphin, and Lebanon Counties. Perry County is monitoring attainment, has no significant sources of emissions contributing to nonattainment in the planning area and generally ranks low on all other EPA guidance factors including population density.

Scranton/Wilkes-Barre Area: Since this area is currently monitoring $PM_{2.5}$ attainment, no nonattainment designation is necessary.

State College Area: Since this area is currently monitoring $PM_{2.5}$ attainment, no nonattainment designation is necessary.

Williamsport-Lock Haven Area: This area does not have a $PM_{2.5}$ monitor but based on nearby $PM_{2.5}$ levels, this area should be designated attainment.

Altoona Area: This area does not have a $PM_{2.5}$ monitor but based on nearby $PM_{2.5}$ levels, this area should be designated attainment.

Johnstown Area: The 1999 Census Report defined Cambria and Somerset Counties as the MSA. The 2003 Census Report includes only Cambria County as the MSA. It is recommended to limit the $PM_{2.5}$ nonattainment planning area to Cambria County. Based on a review of the relevant factors of population density, emissions, and meteorology, Somerset County is highly unlikely to significantly contribute to nonattainment in Cambria County.

Erie Area: Since this area is currently monitoring attainment, no nonattainment designation is necessary.

Mercer Area: The 1999 Census Report defined Mercer County as an MSA. The 2003 Census Report combined Mercer County with the Youngstown-Warren MSA in Ohio. Mercer County is monitoring $PM_{2.5}$ attainment and is downwind of the nonattainment problem. Based on these facts, the Commonwealth recommends that Mercer County be designated attainment.

Pittsburgh Area: Much of the Pittsburgh Area is monitoring $PM_{2.5}$ levels that are very close to the standard. The highest monitor in the area is uniquely affected by local sources and conditions. The 1999 Census Report included Beaver, Butler, Allegheny, Westmoreland, Washington and Fayette Counties in the MSA The 2003 Census added Lawrence and Armstrong Counties to the Combined Metropolitan Area. The Commonwealth recommends Beaver, Allegheny, Westmoreland, and Washington Counties as the $PM_{2.5}$ nonattainment planning area. Based on emissions data, population density and meteorology, Fayette, Butler and Armstrong Counties are not expected to

significantly contribute to the nonattainment problem and are recommended for attainment.

Pike County: The Census Reports include Pike County in the NYC CMSA. In reviewing the population (approximately 44,000) density and emission density data, it is unlikely that this county will have any significant impact on the NYC area now or in the near future. Pike County is not part of the one-hour and not recommended as part of the 8-hour ozone planning area. The Commonwealth recommends that Pike County be removed from the NYC nonattainment area and designated a $PM_{2.5}$ attainment area.

Appendix I: Planning Areas

TABLE I. List of Recommended $PM_{2.5}$ Designations

Pennsylvania Areas	Annual Design Value*	24-Hour Design Value**	Recommended Designation	Comments
	(ug/m^3)	(ug/m^3)		
DEP's Southeast Region				
Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD CMSA				
Bucks County	14.2	39	Nonattainment	
Chester County	16.0	38	Nonattainment	Data 7/2002 – 6/2003
Delaware County	15.5	39	Nonattainment	
Montgomery County	14.2	41	Nonattainment	
Philadelphia County	16.8	45	Nonattainment	
DEP's Southcentral Region				
Altoona MSA				
Blair County	No monitor		Attainment	
Harrisburg-Lebanon-Carlisle MSA				
Cumberland County	14.7	43	Nonattainment	Monitor moved 3/2001
Dauphin County	15.5	46	Nonattainment	
Lebanon County	No monitor		Nonattainment	
Perry County	12.7	34	Attainment	Insignificant contribution
Lancaster MSA				
Lancaster County	17.1	43	Nonattainment	
Reading MSA				
Berks County	16.7	43	Nonattainment	
York MSA				
York County	16.9	43	Nonattainment	

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Pennsylvania Areas	Annual Design Value*	24-Hour Design Value**	Recommended Designation	Comments
	(ug/m^3)	(ug/m^3)		
Remaining counties in DEP's Southcentral Region				
Adams County	13.3	38	Attainment	
Bedford County	No monitor		Attainment	
Franklin County	No monitor		Attainment	
Fulton County	No monitor		Attainment	
Huntingdon County	No monitor		Attainment	
Juniata County	No monitor		Attainment	
Mifflin County	No monitor		Attainment	
DEP's Southwest Region				
Pittsburgh MSA				
Allegheny County	21.7	63	Nonattainment	
Beaver County	15.9	41	Nonattainment	
Butler County (Part of DEP's Northwest Region)	No monitor		Attainment	Insignificant contribution
Fayette County	No monitor		Attainment	Insignificant contribution
Washington County	15.5	41	Nonattainment	
Westmoreland County	15.6	40	Nonattainment	
Lawrence County Area				
Lawrence County (Part of DEP's Northwest Region)	No monitor		Attainment	
Johnstown MSA				
Cambria County	15.9	41	Nonattainment	
Somerset County	No monitor		Attainment	Insignificant contribution
Remaining counties in DEP's Southwest Region				
Armstrong County	No monitor		Attainment	
Greene County	No monitor		Attainment	
Indiana County	No monitor		Attainment	

TABLE I. List of Recommended $PM_{2.5}$ Designations

Pennsylvania Areas	Annual Design Value*	24-Hour Design Value**	Recommended Designation	Comments
	(ug/m^3)	(ug/m^3)		
DEP's Northwest Region				
Erie MSA				
Erie County	13.6	36	Attainment	
Sharon MSA				
Mercer County	14.5	38	Attainment	Downwind of the monitors in the MSA measuring NA
Remaining counties in DEP's Northwest Region				
Clarion County	No monitor		Attainment	
Crawford County	No monitor		Attainment	
Elk County	No monitor		Attainment	
Forest County	No monitor		Attainment	
Jefferson County	No monitor		Attainment	
McKean County	No monitor		Attainment	
Venango County	No monitor		Attainment	
Warren County	No monitor		Attainment	
DEP's Northcentral Region				
State College MSA				
Centre County	12.5	39	Attainment	
Williamsport MSA				
Lycoming County	No monitor		Attainment	

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Pennsylvania Areas	Annual Design Value*	24-Hour Design Value**	Recommended Designation	Comments
	(ug/m^3)	(ug/m^3)		
Remaining counties in DEP's Northcentral Region				
Bradford County	No monitor		Attainment	
Cameron County	No monitor		Attainment	
Clearfield County	No monitor		Attainment	
Clinton County	No monitor		Attainment	
Montour County	No monitor		Attainment	
Northumberland County	No monitor		Attainment	
Potter County	No monitor		Attainment	
Snyder County	No monitor		Attainment	
Sullivan County	No monitor		Attainment	
Tioga County	No monitor		Attainment	
Union County	No monitor		Attainment	
DEP's Northeast Region				
Allentown-Bethlehem-Easton MSA				
Carbon County	No monitor		Attainment	
Lehigh County	14.3	41	Attainment	
Northampton County	14.4	42	Attainment	
Scranton-Wilkes-Barre-Hazleton MSA				
Columbia County (Part of DEP's Northcentral Region)	No monitor		Attainment	
Lackawanna County	12.3	38	Attainment	
Luzerne County	12.8	36	Attainment	
Wyoming County	No monitor		Attainment	
New York City Area				
Pike County	No monitor		Attainment	Part of New York MSA, designate as attainment

TABLE I. List of Recommended $PM_{2.5}$ Designations

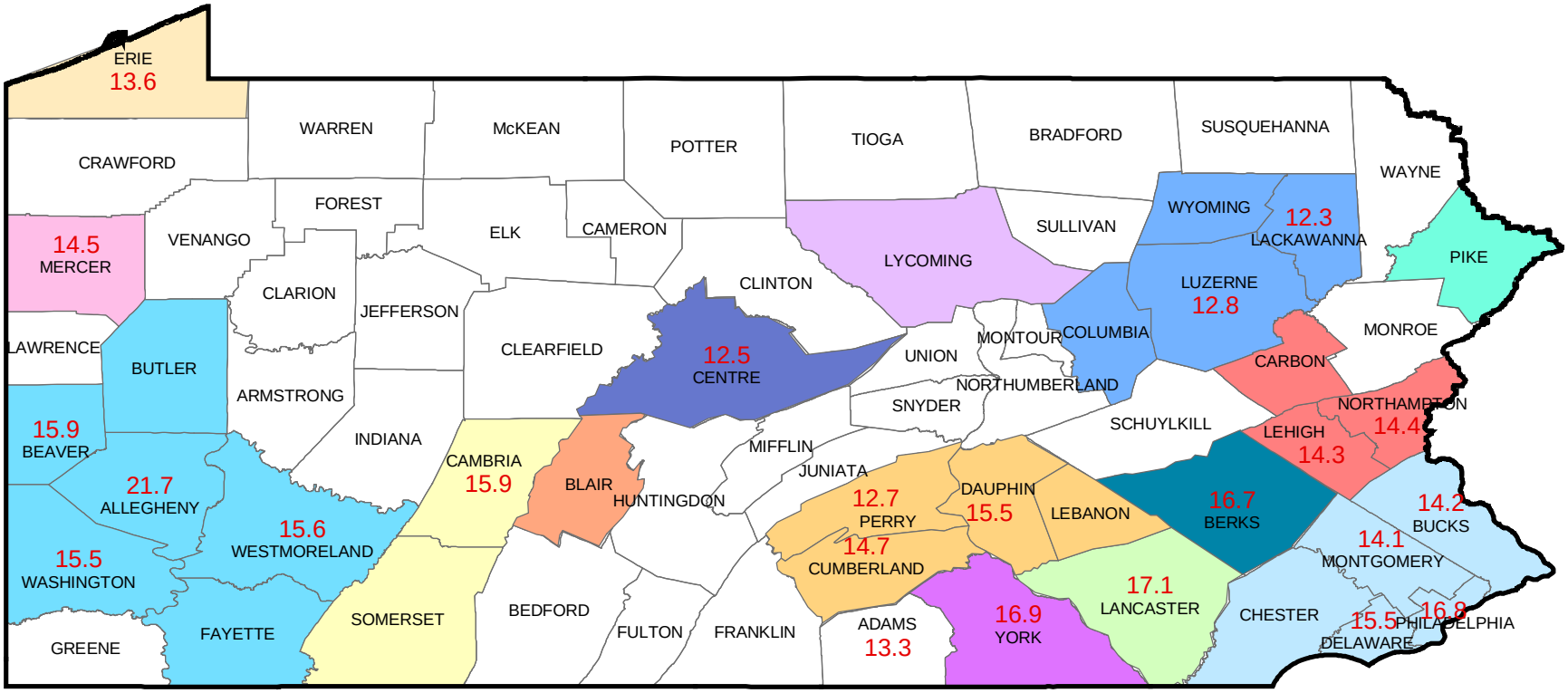
Pennsylvania Areas	Annual Design Value*	24-Hour Design Values**	Recommended Designation	Comments
	(ug/m^3)	(ug/m^3)		
Remaining counties in DEP's Northeast Region				
Monroe County	No monitor		Attainment	
Schuylkill County	No monitor		Attainment	
Susquehanna County	No monitor		Attainment	
Wayne County	No monitor		Attainment	

*Three-Year Average (2000-2002) of the Annual Averages of the $PM_{2.5}$ Concentrations

** Three-Year Average (2000-2002) of the 98^{th} percentile 24-hour $PM_{2.5}$ Concentrations

Figure 1 - Pennsylvania 2000 - 2002 PM 2.5 Annual Design Values Per County

Based on Statistical Areas from 1999 Census Data (Report Dated June 30, 1999)

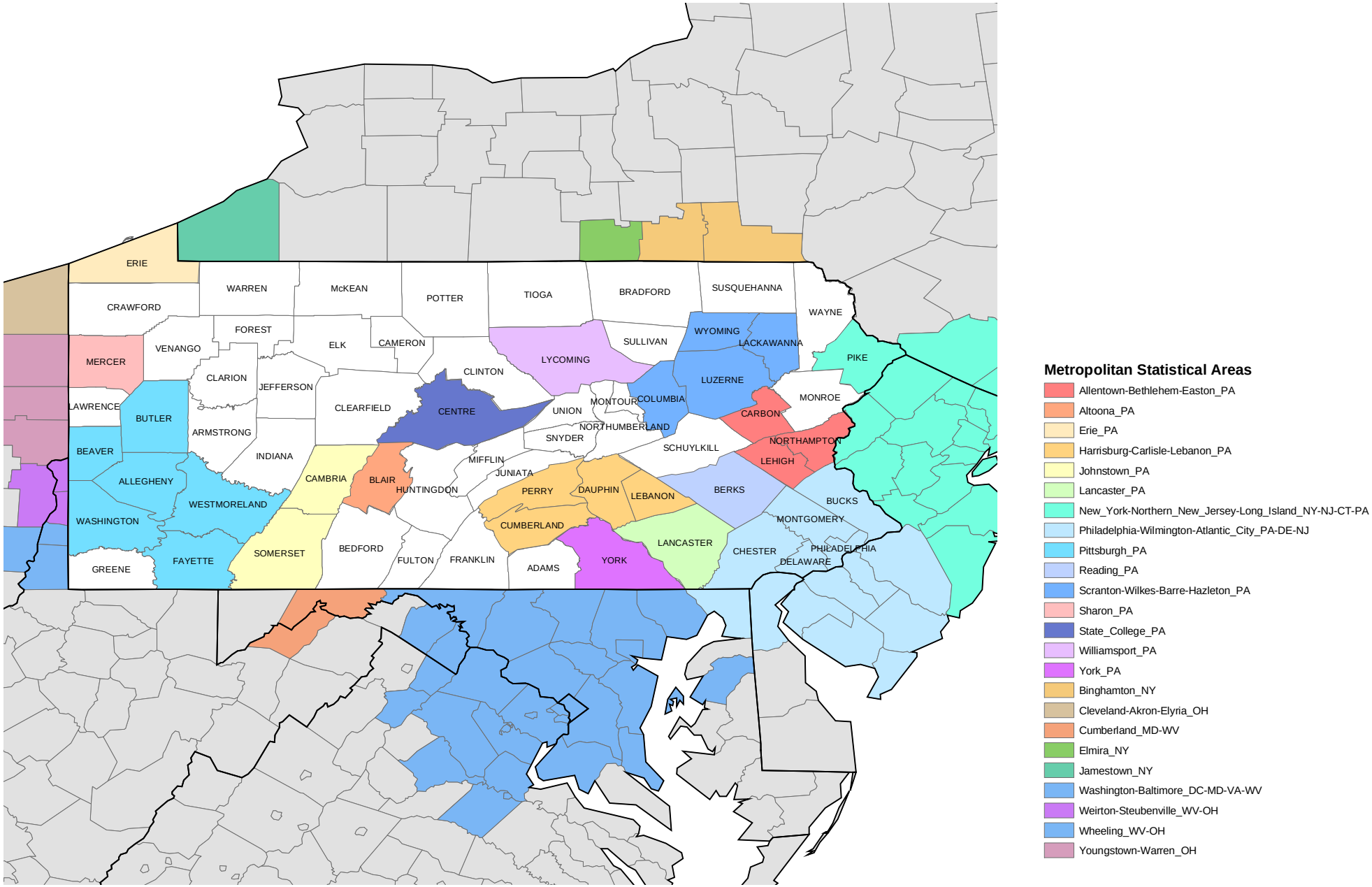


Metropolitan Statistical Areas

- Allentown-Bethlehem-Easton_PA-NJ
- Altoona_PA
- Erie_PA
- Harrisburg-Carlisle-Lebanon_PA
- Johnstown_PA
- Lancaster_PA
- New_York-Northern_New_Jersey-Long_Island_NY-NJ-CT-PA
- Philadelphia-Wilmington-Atlantic_City_PA-NJ-DE-MD
- Pittsburgh_PA
- Reading_PA
- Scranton-Wilkes-Barre-Hazleton_PA
- State_College_PA
- Sharon_PA
- Williamsport_PA
- York_PA

Figure 2a - Metropolitan Statistical Areas

Based on 1999 Census Data (Report Dated June 30, 1999)



Metropolitan Statistical Areas

- Allentown-Bethlehem-Easton_PA
- Altoona_PA
- Erie_PA
- Harrisburg-Carlisle-Lebanon_PA
- Johnstown_PA
- Lancaster_PA
- New_York-Northern_New_Jersey-Long_Island_NY-NJ-CT-PA
- Philadelphia-Wilmington-Atlantic_City_PA-DE-NJ
- Pittsburgh_PA
- Reading_PA
- Scranton-Wilkes-Barre-Hazleton_PA
- Sharon_PA
- State_College_PA
- Williamsport_PA
- York_PA
- Binghamton_NY
- Cleveland-Akron-Elyria_OH
- Cumberland_MD-WV
- Elmira_NY
- Jamestown_NY
- Washington-Baltimore_DC-MD-VA-WV
- Weirton-Steubenville_WV-OH
- Wheeling_WV-OH
- Youngstown-Warren_OH

Figure 2b - Metropolitan Statistical Areas

Based on 2000 Census Data (Report Dated June 10, 2003)

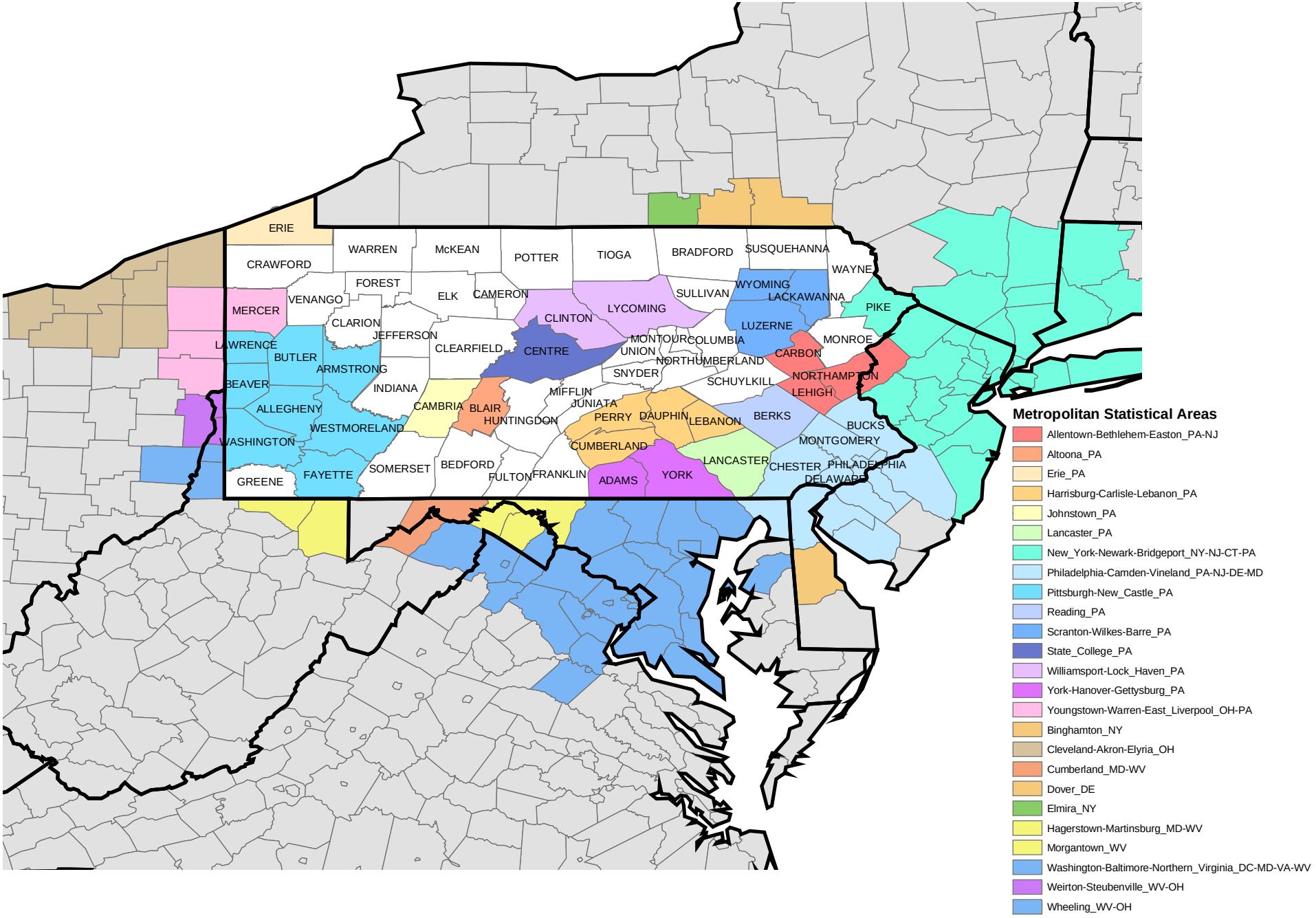
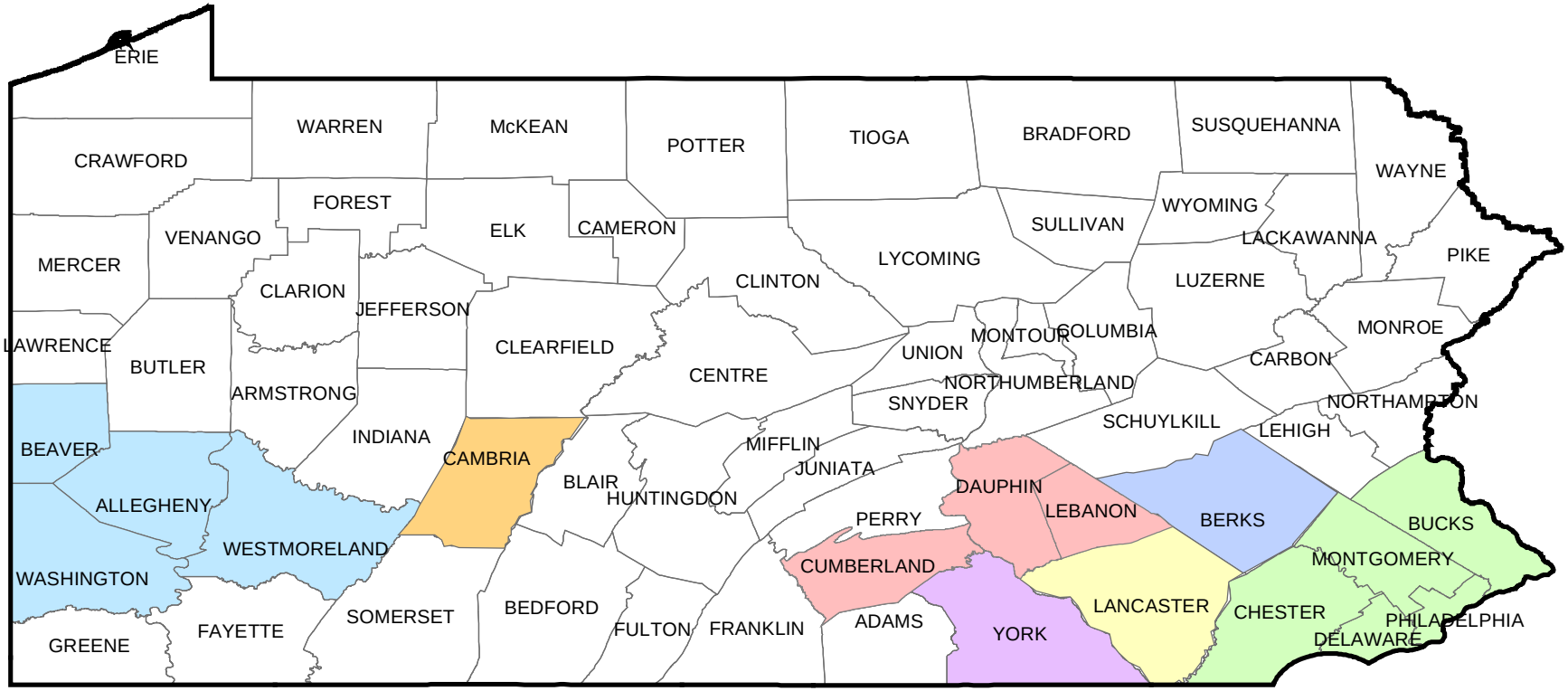


Figure 3 - Recommended PM 2.5 Nonattainment Areas

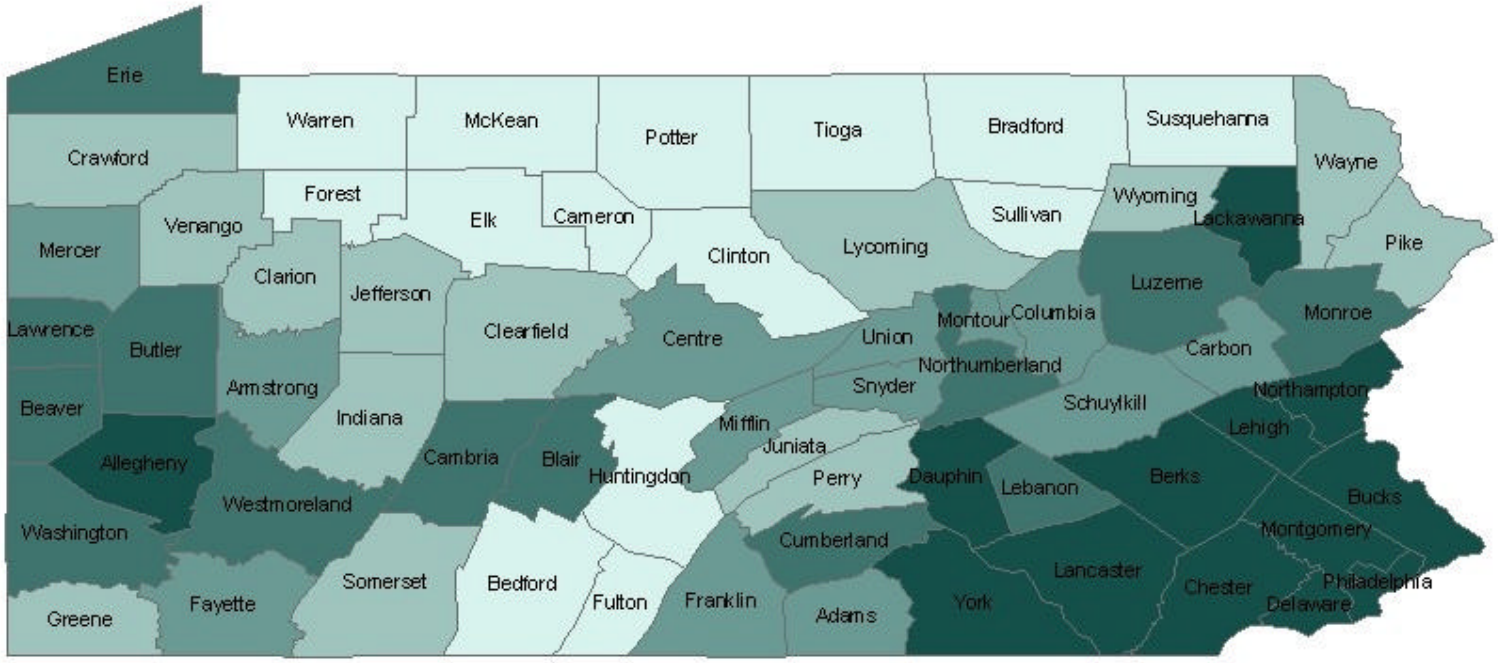


Proposed Nonattainment Areas

Harrisburg-Carlisle-Lebanon | Johnstown | Lancaster | Philadelphia | Pittsburgh | Reading | York

Appendix II: Supporting Documentation

Pennsylvania Population Density



Source: U.S. Census Bureau, 2000

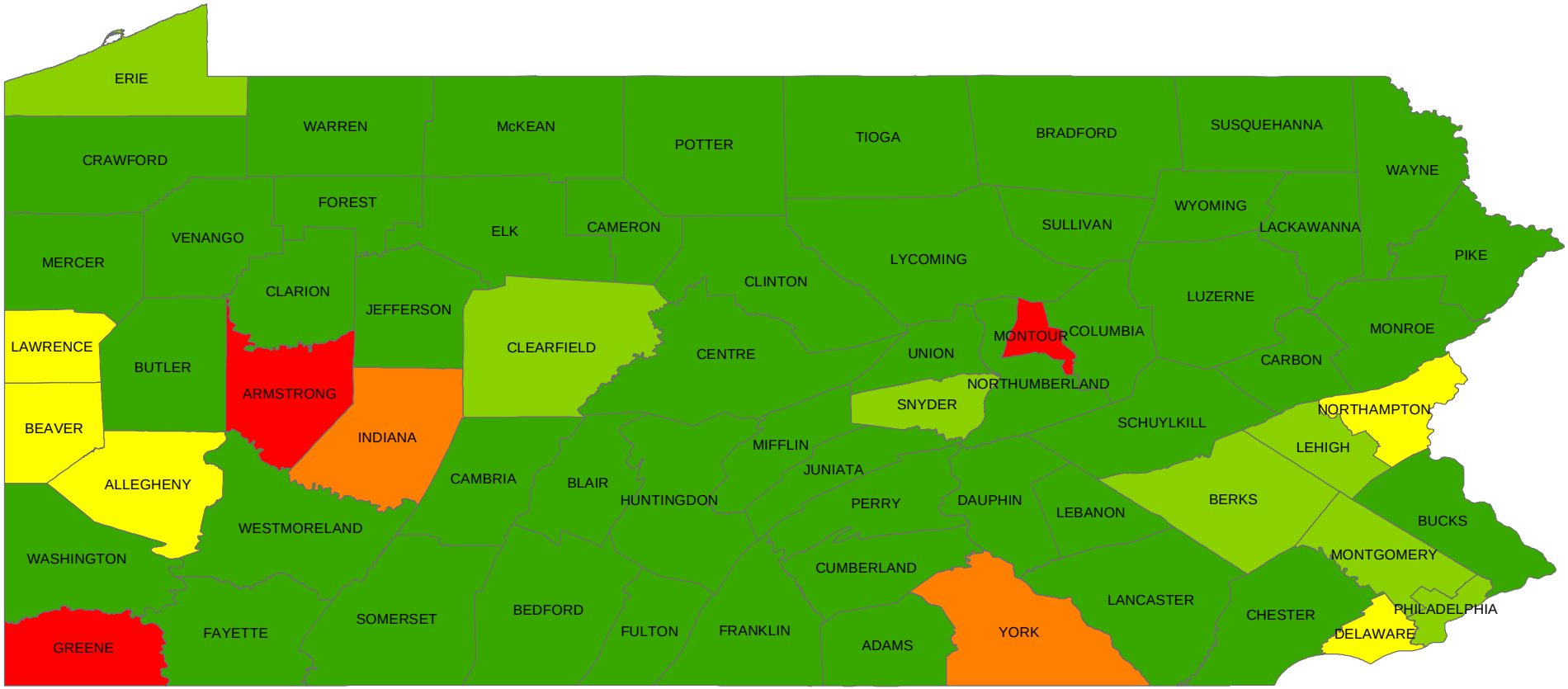
Population / Sq.Mi

- 11 - 54
- 55 - 105
- 106 - 194
- 195 - 404
- 405 - 10345

Figure 4

Figure 5a - 1999 SO2 Emissions Density

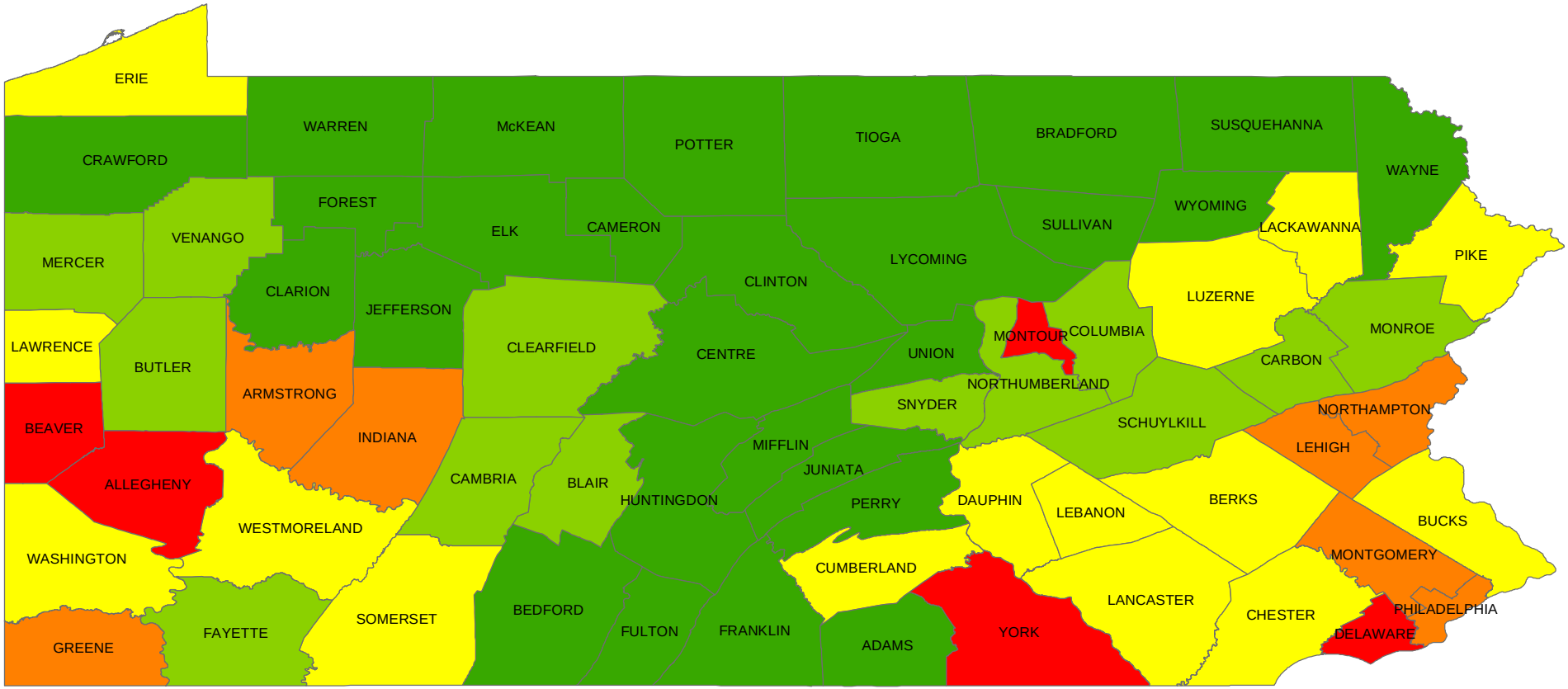
Tons Per Year Per Square Mile



SO2 (tpy) / Sq. Mi. 0.073 - 12.436 | 12.436 - 45.963 | 45.963 - 152.847 | 152.847 - 240.043 | 240.043 - 862.207

Figure 5b - 1999 NOx Emissions Density

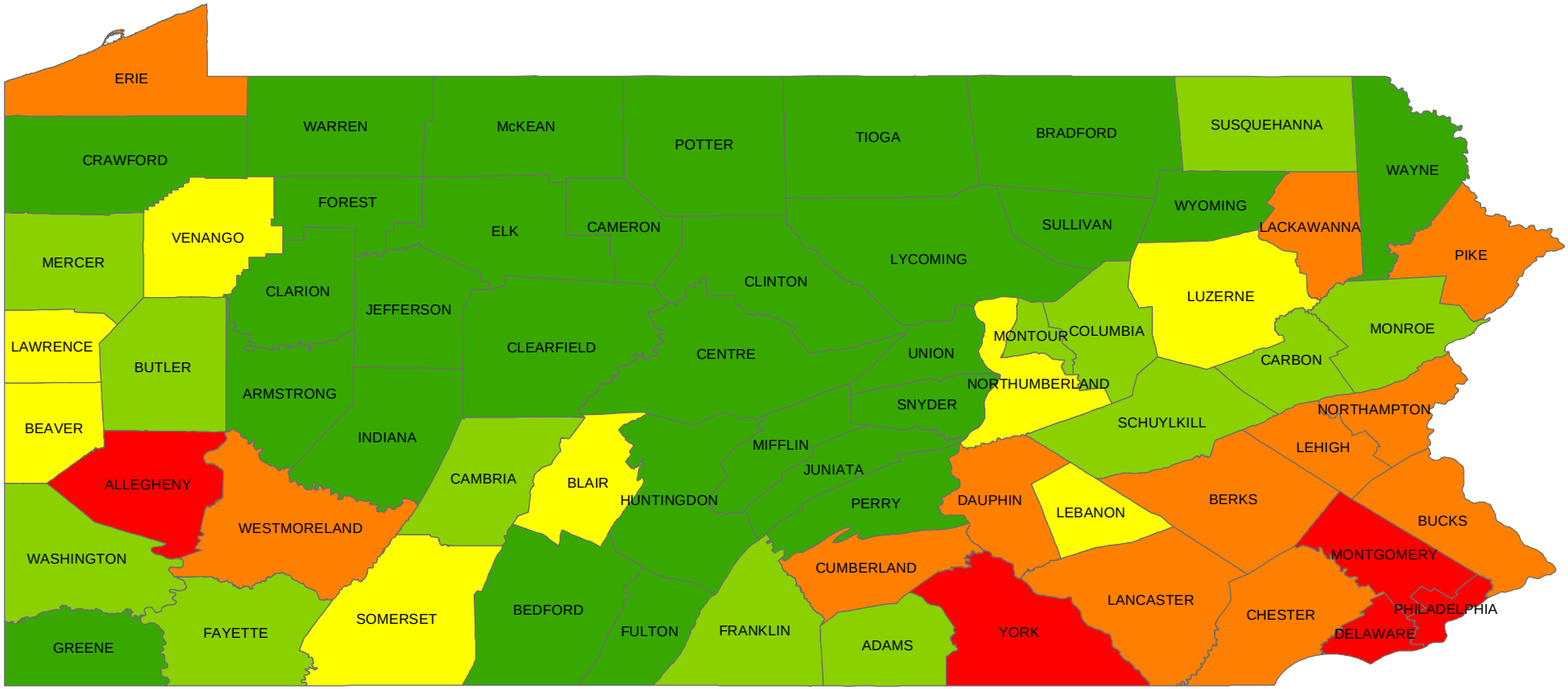
Tons Per Year Per Square Mile



NOx (tpy) / Sq. Mi. 0.275 - 9.255 | 9.255 - 19.076 | 19.076 - 35.586 | 35.586 - 66.211 | 66.211 - 157.502

Figure 5c - 1999 VOC Emissions Density

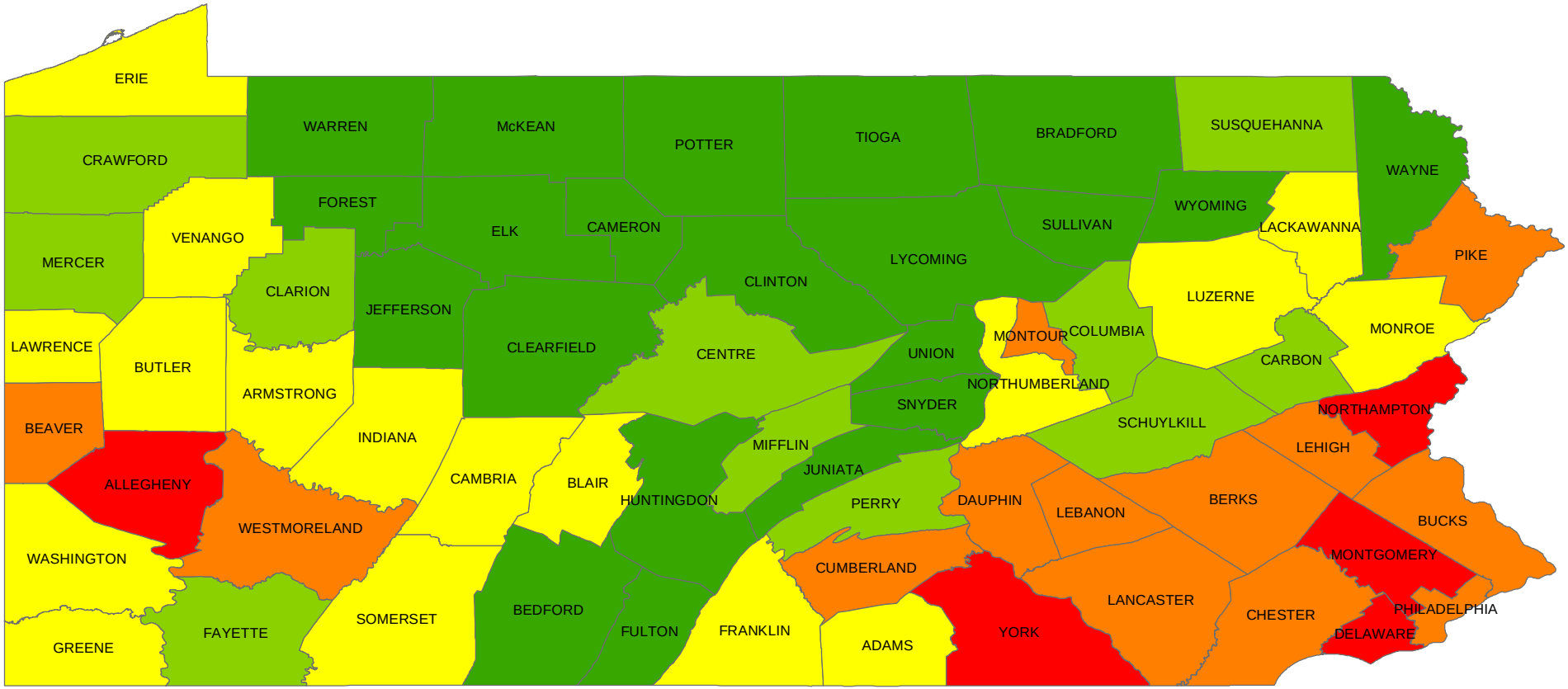
Tons Per Year Per Square Mile



VOC (tpy) / Sq. Mi. 1.547 - 6.838 | 6.839 - 12.451 | 12.452 - 20.828 | 20.829 - 44.718 | 44.719 - 111.698

Figure 5d - 1999 PM 2.5 Emissions Density

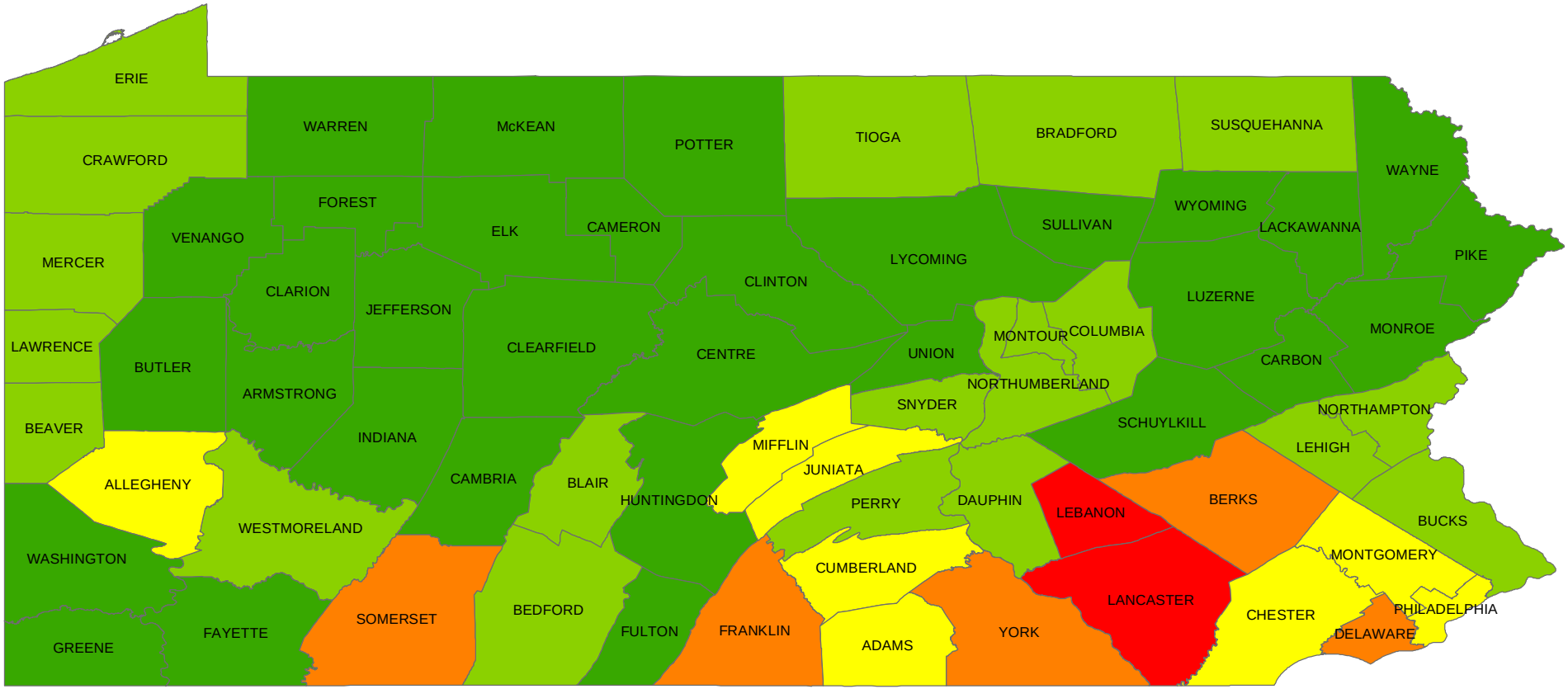
Tons Per Year Per Square Mile



PM 2.5 (tpy) / Sq. Mi. 0.251 - 1.680 | 1.680 - 3.057 | 3.057 - 5.535 | 5.535 - 10.757 | 10.757 - 25.487

Figure 5e - 1999 NH3 Emissions Density

Tons Per Year Per Square Mile

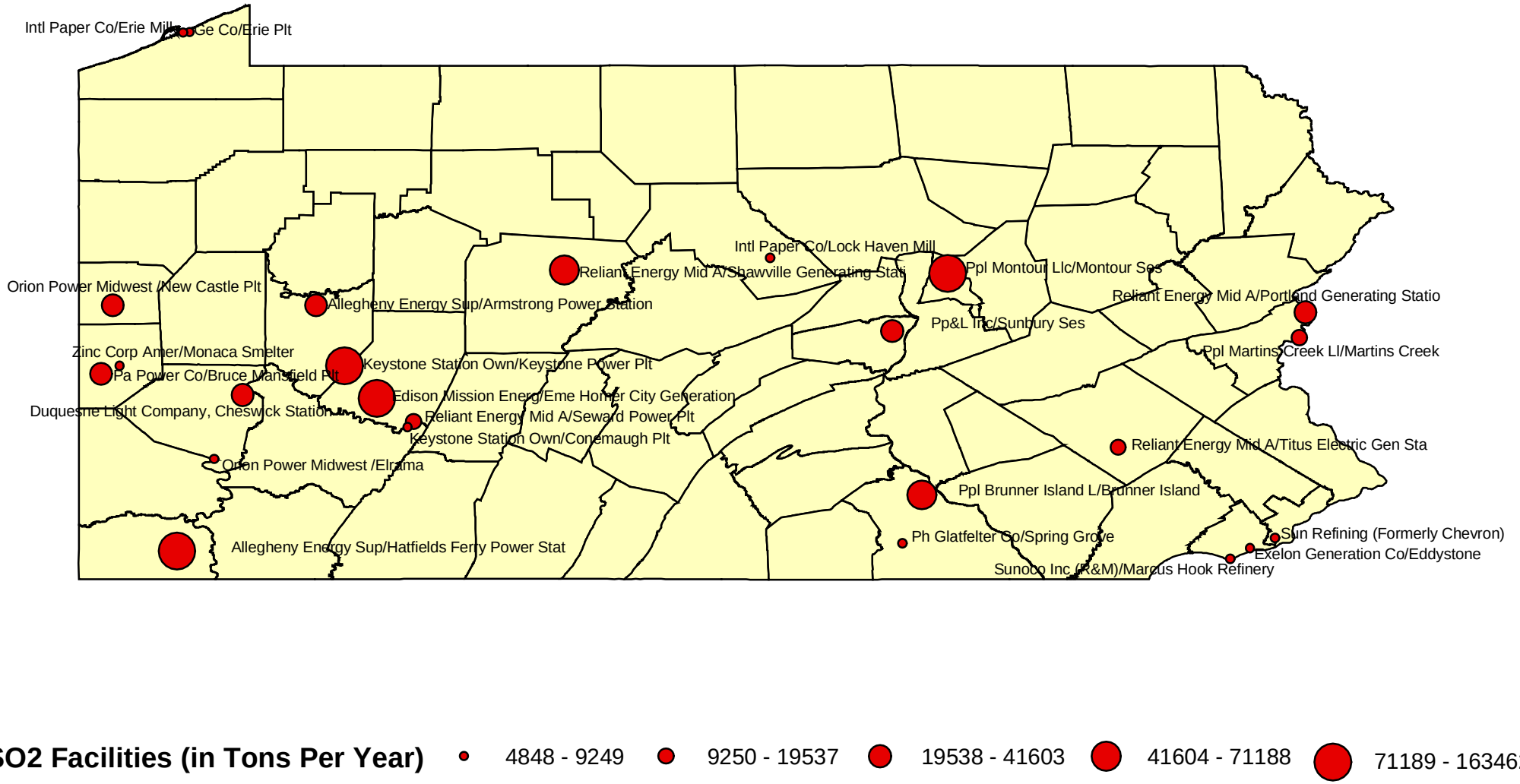


NH3 (tpy) / Sq. Mi. 0.190 - 1.346 | 1.346 - 2.615 | 2.615 - 4.212 | 4.212 - 7.682 | 7.682 - 15.325

Figure 6

Top 25 SO2 Emitting Facilities in Pennsylvania based on Calendar Year 1999 Emissions Data

Accounts for 91% of Major Industrial Sources, 82% of all Emission Sources



SO2 Facilities (in Tons Per Year) 4848 - 9249 | 9250 - 19537 | 19538 - 41603 | 41604 - 71188 | 71189 - 163462

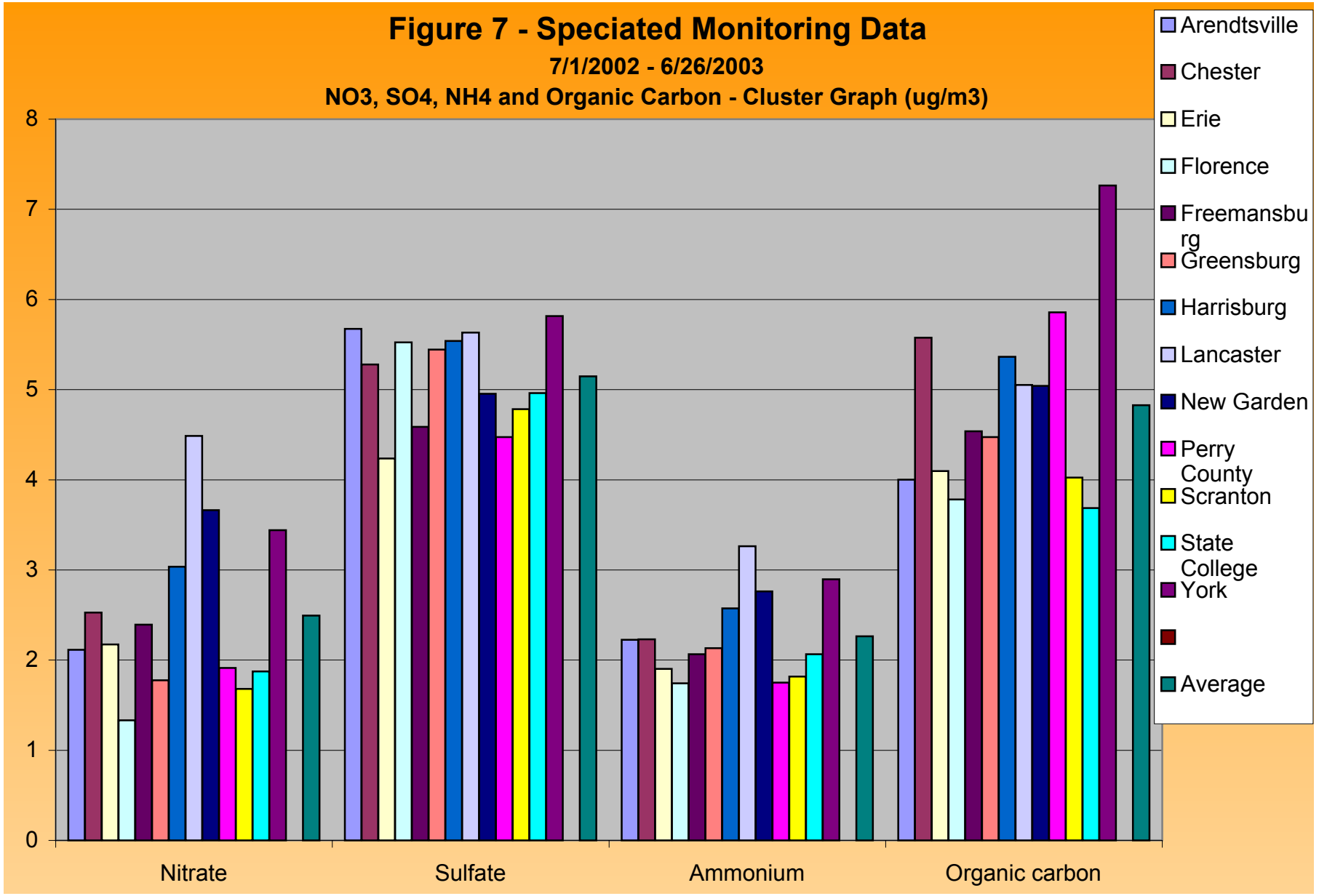


Figure 7 - Speciated Monitoring Data
7/1/2002 - 6/26/2003
NO3, SO4, NH4 and Organic Carbon - Cluster Graph (ug/m3)
8
7
6
5
4
3
2
1
0
Nitrate
Sulfate
Ammonium
Organic carbon
Arendtsville
Chester
Erie
Florence
Freemansburg
Greensburg
Harrisburg
Lancaster
New Garden
Perry County
Scranton
State College
York
Average

Appendix III: Key Terms

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KEY TERMS

Air Quality Monitoring – a program through which air quality samples are collected to judge attainment of ambient air quality standards, to prevent or alleviate air pollution emergencies, to observe pollution trends throughout regions, and to evaluate the effects of urban, land-use, and transportation planning relating to air pollution. The Ambient Air Monitoring Program in Pennsylvania is run by DEP and two local independent health departments (Allegheny and Philadelphia counties). Measurements are taken in areas of high population density, high expected levels of pollution, or both.

Ambient air quality – concentration of pollutants in the air around us, generally expressed in parts of pollutant per volume of air (contrasted with emissions)

Area sources of air pollution – usually refers to smaller commercial sources that are not required to be permitted, residential and other miscellaneous sources (ex. fires).

Biogenic sources – natural sources of air pollution, for example, trees.

Emissions – for purposes of $PM_{2.5}$, the sulfur dioxide, nitrogen oxide, organic compounds, soot and ammonia pollution coming directly from area, mobile, nonroad and stationary facilities, estimated before dilution in the ambient air. Generally expressed in mass over a time period, ex. tons per day or tons per year.

Core Based Statistical Area – a central county or group of counties with at least one population core and a high degree of social and economic integration. Criteria are set by the U.S. Office of Management and Budget.

Designation - the process by which the U.S. Environmental Protection Agency identifies the areas which do not meet the NAAQS.

Design Value - the value for a monitor or a nonattainment area that, for legal purposes, determines whether the monitor or area violates the standard. The annual $PM_{2.5}$ design value for a monitor is the three year average of the annual averages. The 24-hour design value for a monitor is the 98^{th} percentile 24-hour concentration averaged over 3 years. The design value for an area with more than one monitor is the highest monitor design value.

Metropolitan Statistical Area - a CBSA with a minimum population of at least 50,000.

Micropolitan Statistical Area – a CBSA with a population of at least 10,000 but less than 50,000.

Mobile sources of air pollution – highway vehicles, including cars, motorcycles, trucks and buses.

National Ambient Air Quality Standards (NAAQS)– established by EPA. Primary standards protect public health with a margin of safety, secondary standards protect the environment.

New Source Review – the process by which new or modified major sources are reviewed in nonattainment areas to determine whether or not they must obtain compensating emission reductions to ensure overall pollution decreases.

Nonattainment – if an area (boundaries determined by EPA) is violating a NAAQS or has not completed all requirements to be removed from this status, it is designated nonattainment.

Nonroad (off-road) sources of air pollution – construction, farming, lawn and garden, industrial plant vehicles, airport service equipment, locomotives, airplanes, etc.

Nitrogen oxides (NOx) - Chemical compounds containing nitrogen and oxygen. NOx contributes to $PM_{2.5}$, ozone, haze, acid rain, and the nitrification of waterways and soils.

Ozone – a gas composed of three oxygen atoms. It is not usually emitted directly into the air, but at ground level is created by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of heat and sunlight. Ozone has the same chemical structure whether it occurs miles above the earth (stratospheric) or at ground level (tropospheric) and can be good or bad, depending on its location in the atmosphere.

Particulate Matter - includes both solid and liquid particles suspended in the air originating from a variety of human and natural activities

$PM_{2.5}$ - Particles less than 2.5 micrometers in diameter are referred to as fine particles and generally pose the largest health risks. Because of their small size, fine particles can penetrate deeply into the lungs.

PM_{10} - Particles less than 10 micrometers in diameter. Particles of this size pose a health concern because they can be inhaled into and accumulate in the respiratory system

State Implementation Plan (SIP) - Document prepared by states, and submitted to EPA for approval, which identifies actions and programs to be undertaken by the State and its subdivisions to implement their responsibilities under the Clean Air Act. Once approved by EPA, a SIP is federally enforceable.

Stationary (point) sources of air pollution – major industrial facilities with permits that are individually assessed by DEP

Sulfur Oxides (SOx) - Chemical compounds containing sulfur and oxygen. Sulfur oxides contribute to $PM_{2.5}$, haze and acid rain.

Volatile Organic Compounds (VOCs) - A group of chemicals that react in the atmosphere to produce $PM_{2.5}$ and ozone; does not include methane and other compounds determined by EPA to have negligible photochemical reactivity.