2013 Air Quality Monitoring Data Summary

State of Idaho
Department of Environmental Quality

April 2015

The 2013 Air Quality Monitoring Data Summary is available for viewing or downloading on the DEQ website at **http://www.deq.idaho.gov/air-monitoring-network**

Links to additional documents for download are also available at the DEQ website.

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1 Introduction

This annual report is issued by the Idaho Department of Environmental Quality (DEQ) to inform the public of air quality throughout Idaho. The purpose of this report is to summarize regional ambient air quality while presenting air monitoring results for six criteria air pollutants. The United States Environmental Protection Agency (EPA) sets national ambient air quality standards (NAAQS) for these pollutants. These criteria air pollutants include the following:

- Particulate matter (PM_{10} ≤10 micrometers [µm] and $PM_{2.5}$ ≤ 2.5 µm in diameter)
- Carbon monoxide (CO)
- Sulfur dioxide (SO_2)
- Nitrogen dioxide (NO_2)
- Ozone (O_3)
- Lead (Pb)

In Idaho, criteria pollutant monitoring occurs primarily in areas of high population where the potential for human exposure is greatest. Particulate matter is currently the most common criteria air pollutant of concern in Idaho because particulate sources are widespread throughout the state. Common sources include windblown dust, reentrained road dust, smoke (residential, agricultural, and forest fires), industrial emissions, and motor vehicle emissions.

The PM_{10} standard has been in effect since 1987 and historically had been the particulate size of concern. However, $PM_{2.5}$, or fine particulate matter, has been monitored in Idaho since 1998 and has become a pollutant of concern. Numerous studies have associated $PM_{2.5}$ with a variety of respiratory and cardiovascular problems, ranging from aggravated asthma to irregular heartbeats, heart attacks, and early death in people with heart or lung disease. The $PM_{2.5}$ and PM_{10} NAAQS were revised by EPA effective December 17, 2006. Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard of 50 micrograms per cubic meter ($\mu g/m^3$) while retaining the short-term 24-hour standard of 150 $\mu g/m^3$. The 24-hour standard for $PM_{2.5}$ was lowered from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ to provide increased protection against health effects associated with short-term exposure (including premature mortality and increased hospital admissions and emergency room visits). In 2012, the $PM_{2.5}$ annual standard was lowered further to 12 $\mu g/m^3$.

Another historical air pollutant of concern in Idaho is carbon monoxide. The primary source of carbon monoxide is incomplete fossil fuel combustion. Carbon monoxide concentrations have the potential to be high in the urbanized areas where automobile traffic is heavy and cars frequently idle at stoplights. The Boise area (northern Ada County) was the only carbon monoxide nonattainment area in the state. When the State Implementation Plan (SIP) and Maintenance Plan were accepted by EPA on December 27, 2002, it was reclassified as a maintenance area. No violations of the 1-or 8-hour carbon monoxide NAAQS have occurred since 1991.

Sulfur dioxide and nitrogen dioxide sources are few and localized because these air pollutants come primarily from large industrial sources (transportation sources also contribute to nitrogen dioxide). Little heavy industry exists in Idaho, and elevated sulfur dioxide and nitrogen dioxide concentrations in ambient air are typically not found. However, due to potential concerns of some localized sources, DEQ has monitored for one or both of these pollutants in Boise, Pocatello, Moyie Springs, Mountain Home, Coeur d'Alene, Meridian, and Soda Springs. In the past 10 years of targeted monitoring, DEQ has not measured significant concentrations of these pollutants at these monitoring sites.

The fifth criteria air pollutant, ozone, has been monitored by DEQ, in the Treasure Valley since 2002 and in Coeur d'Alene from 2005 to 2011. Ozone is created when combustion by-products (volatile organic compounds [VOCs]) near the ground react with nitrogen oxides and other compounds to create photochemical smog. These reactions are stimulated on days of intense sunlight and warm temperatures. Ozone has become a pollutant of concern since many summertime days are classified as moderate for ozone on the Air Quality Index (AQI). EPA lowered the 8-hour ozone standard on May 27, 2008, from 0.08 parts per million (ppm) to 0.075 ppm. The new standard poses a greater risk of nonattainment for all airsheds but particularly the Treasure Valley airshed. EPA announced it was reconsidering the ozone standard and was expected to release new proposed NAAQS ozone standards in December 2009. In 2011, EPA announced it would postpone any changes to the ozone NAAQS until 2013. This has since been further postponed until 2015.

The sixth criteria air pollutant, lead, is monitored in Meridian. Lead was monitored in the Shoshone County town of Kellogg, near the Bunker Hill superfund site, because lead was a by-product of the smelting process that occurred in the area for decades. Although a significant problem in the 1970s and early 1980s, airborne lead concentrations at this monitoring site were very low through the 1990s. DEQ discontinued monitoring for lead in 2002. EPA reviewed the lead NAAQS and on November 12, 2008, lowered the standard significantly to 0.15 $\mu g/m^3$. The new standard provided different monitoring requirements based on whether sources were emitting significant volumes of lead. Source-oriented monitoring is required for states with sources of lead that emit or have the potential to emit more than 0.5 tons per year (tpy). Nonsource-oriented monitoring is required for urban areas with a population greater than 500,000. The nonsource-oriented requirements were implemented at the NCore multipollutant monitoring station in Meridian. DEQ initiated PM_{10} lead monitoring at the NCore site in Meridian in 2012.

The NCore multipollutant monitoring site in Meridian is part of an EPA network that uses advanced measurement systems to record data for particles, trace gases, and meteorology. The NCore data are used to support air quality forecasting and model evaluation, and to develop emissions strategies. The data are also used to assess compliance with the NAAQS.

DEQ monitored for certain common urban toxic air pollutants in the Treasure Valley from 2003 to the beginning of 2005 to determine if concentrations were at levels that could have adverse health effects. The Community Scale Air Toxics Monitoring Project also measured toxic air pollutants in 2007. Health effects from toxic air pollutants include, but are not limited to, increased cancer risk and respiratory, cardiovascular, and neurological effects. While DEQ has discontinued air toxics monitoring, the data proved valuable toward reconciling EPA's National Air Toxics Assessment (NATA) program to verify prediction models. The NATA models predict cancer and noncancer risk values across Idaho's airsheds using emissions estimates of certain air toxic compounds. The data have also been crucial in developing DEQ's air toxics models. As resources become available, Idaho may resume air toxic monitoring in the future.

While Idaho generally enjoys good air quality, in many ways our airsheds are faced with new challenges. Some of these challenges are related to long-term economic and population growth, particularly in terms of vehicles on roadways and growth in new construction. Each day, DEQ measures the concentration of certain air pollutants throughout the state. DEQ may issue local burn restrictions (voluntary and/or mandatory) when concentrations of these air pollutants reach or exceed the health-based standards or limits established by local ordinance, state law, or federal regulation. Concerned citizens may tune in to the news on their local radio or television station to find out if a burn ban has been issued, or access DEQ's website at http://www.deq.idaho.gov/air-quality.aspx. DEQ issues a news bulletin to local news media, law enforcement, and fire officials each time a burn ban is imposed. Each year a number of voluntary and sometimes mandatory bans are issued due to deteriorated local air quality conditions.

Real-time air monitoring data are available on DEQ's website at http://airquality.deq.idaho.gov/. We encourage you to visit our website at http://www.deq.idaho.gov/ to find more extensive air quality data, educational materials, and discussions of current topics.

We are expanding and refining our website to better serve the residents of Idaho. Improvements are expected to provide the public with better access to real-time monitoring data as well as reorganize publications and other information regarding air quality. We want your feedback on our air quality data and program. Please submit your comments via e-mail to Bruce Louks, Modeling, Monitoring, and Emission Inventory Manager, at Bruce.Louks@deq.idaho.gov or call at (208) 373-0294.

2 Air Quality Standards

The federal Clean Air Act of 1970 (CAA) requires EPA to set NAAQS for air pollutants considered harmful to public health and the environment. The standards are designed to primarily protect the general public, including sensitive populations such as asthmatics, children, and the elderly. They are also intended to safeguard public welfare by reducing effects such as decreased visibility and damage to animals, crops, vegetation, and buildings. EPA established standards for six criteria air pollutants. Table 1 contains seven air pollutants, which include two size ranges of particulate matter.

Idaho adheres to the NAAQS. For more information, EPA air quality standards and supporting rationale are available at http://epa.gov/air/criteria.html.

Table 1. 2013 air quality standards for criteria pollutants.

Pollutant	Level	Averaging Time	Metric
Ozone (O_3)	0.075 ppm	8-hour	The 3-year average of the 4th highest daily maximum 8-hour average concentration cannot exceed the level measured at each monitor within an area over each year. The standard was lowered May 27, 2008, from 0.08 ppm.
Particulate matter, 10 micrometers (PM_{10})	150 $\mu g/m^3$	24-hour	The 24-hour average cannot exceed the level more than once per year on average over 3 years.
Particulate matter, 2.5 micrometers ($PM_{2.5}$)	12 $\mu g/m^3$	Annual (arithmetic average)	The 3-year annual average of the weighted annual mean concentrations cannot exceed the level. The standard was lowered to 15.0 $\mu g/m^3$ on December 17, 2006, from 15.4 $\mu g/m^3$. The standard was lowered further to 12 $\mu g/m^3$ in 2012.
	35 $\mu g/m^3$	24-hour	The 3-year average of the 98th percentile (based on the number of samples taken) of the daily concentrations must not exceed the level. The 24-hour standard was lowered from 65 $\mu g/m^3$ to 35 $\mu g/m^3$on December 17, 2006.
Carbon monoxide (CO)	35 ppm	1-hour	The 1-hour average cannot exceed the level more than once per year.
	9 ppm	8-hour	The 8-hour average cannot exceed the level more than once per year.
Sulfur dioxide (SO_2)	75 ppb	1-hour	The 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years, cannot exceed the level. The 1-hour standard was revised in 2010.
Lead (Pb)	0.15 $\mu g/m^3$	Rolling 3-month average	The rolling 3-month average (12 average periods per year) cannot exceed the level. The standard was lowered October 15, 2008, from 1.5 $\mu g/m^3$.
Nitrogen dioxide (NO_2)	0.053 ppm	Annual (arithmetic average)	The annual mean cannot exceed the level.
	100 ppb	1-hour	The 98th percentile of 1-hour values, averaged over 3 years, cannot exceed the level.

Notes: Hyperlinks to pollutants are shown in blue. Daily concentration is the 24-hour average, measured from midnight to midnight.

The NAAQS for each pollutant may have different averaging periods (e.g., hourly and 8-hour averages). These different forms of the standard are created and enforced to address varied health impacts that result from shorter, high-level exposure versus longer, low-level exposure. These differences are addressed pollutant-by-pollutant in the following sections, and additional information is on the EPA website. A distinction exists between *exceeding* and *violating* a standard; the two are not equivalent. This distinction results from the nature of the standards. In most instances, it is allowable for an area to exceed the standard a few times to allow for possible unusual meteorological circumstances. For example, a carbon monoxide 8-hour average of

15 ppm clearly exceeds the standard; however, it does not violate the standard if it is the only exceedance that year (the standard allows for one exceedance).

The EPA standards typically apply to an *area*, which may be defined in different ways. Data are presented for individual monitoring stations in the following sections because this provides more insight into regional differences in Idaho's ambient air quality. The following summaries show how Idaho's airsheds compared to the standards discussed above for 2013 and in many instances incorporate the AQI and other measures of air quality where appropriate. The AQI color code shading is shown to aid in interpreting air quality but does not imply whether or not standards were met for each air pollutant. An airshed must satisfy the conditions in Table 1 to ensure compliance with the NAAQS.

3 Monitoring Network

The Idaho monitoring network is a composite of meteorological and air pollutant-specific monitoring equipment. DEQ operates most of the monitors while several tribes operate monitors on tribal lands. Data from the network are sent directly to engineers and scientists through a telemetry network.

Table 2 presents a summary of the monitoring stations used and parameters monitored during 2013. Some parameters were monitored for only part of the year.

Figure 1 shows a map of monitoring stations that were active in 2013. Monitoring stations are mainly located in high population areas; however, DEQ does monitor air quality in some rural areas. Some sites are selected to focus on the emissions of a single pollutant or group of sources (e.g., near a high-traffic volume or residential wood burning area). Monitor siting and monitoring objectives are discussed in the pollutant-specific sections of this report.

Criteria pollutants are measured using methods approved by EPA to assess Idaho's compliance with NAAQS. In addition, some pollutants of interest are measured using more than one method. These additional methods help engineers and scientists to better understand the presence and behavior of these pollutants. Table 3 lists the methods used for the various pollutants. A variety of methods allow for continuous monitoring and most can be accessed through telemetry for instantaneous concentration readings. Additional information on measurement methods is available at EPA's website: http://www.epa.gov/ttn/amtic/.

In addition to the criteria air pollutants described in this report, urban air toxic compounds were monitored at a Nampa site from 2003 to 2005 and at five other sites in 2007. If resources become available, DEQ may resume air toxics monitoring in the future. For details on air toxics and chemical toxicity, visit the EPA website at www.epa.gov/ttn/atw/index.html.

Table 2. Monitoring network for 2013.

Site	Location	PM_{10} TEOM	$PM_{2.5}$ FRM	$PM_{2.5}$ TEOM	$PM_{2.5}$ BAM	Pb	O_3	SO_2	NO_2	NO_y	CO
Boise	Fire Station #5—16th and Front Street	●									
Boise	Eastman Building—166 N. 9th Street										●
Boise	White Pine Elementary—401 E. Linden Street						●				
Coeur d'Alene	Lancaster Road			●							
Franklin	East 4800 South		●	●							
Garden Valley	946 Banks-Lowman Road			●							
Grangeville	US Forest Service Compound			●							
Idaho City	3851 Highway 21			●							
Idaho Falls	Hickory and Sycamore			●							
Ketchum	111 W. 8th Street			●							
Lewiston	Sunset Park—1200 29th Street			●							
McCall	US Forest Service—500 North Mission Street			●							
Meridian	St. Lukes—520 E. Eagle Road.		●	●		●	●	● (red)		●	● (red)
Meridian	1311 East Central Drive								● (red)		● (red)
Moscow	1025 Plant Sciences Road			●							
Nampa	Fire Station—923 1st Street	●	●	●							
Pinehurst	Pinehurst School—106 Church Street	●	●	●							
Pocatello	Garrett and Gould	●		●							
Pocatello	Wastewater Treatment Plant—Batiste and Chubbuck							●			
Salmon	618 N. Saint Charles Street		●		●						
Sandpoint	2105 North Boyer Ave.	●		●							
Sandpoint	1601 Ontario	●		●							
Soda Springs	P4/Monsanto—5 Mile Road							●			
St. Maries	9th and Center		●	●							
Twin Falls	1913 Addison Avenue East			●							
Twin Falls	650 Addison Ave. West			●							

Notes: PM_{10} TEOM—particulate matter 10 micrometers, tapered element oscillating microbalance, continuous federal equivalent method; $PM_{2.5}$ FRM—particulate matter 2.5 micrometers, federal reference method; $PM_{2.5}$ TEOM—particulate matter 2.5 micrometers, tapered element oscillating microbalance, continuous special purpose monitor; $PM_{2.5}$ TEOM—particulate matter 2.5 micrometers, tapered element oscillating microbalance, continuous federal equivalent method; $PM_{2.5}$ BAM—particulate matter 2.5 micrometers, beta attenuation monitor, continuous federal equivalent method; Pb—Lead; O_3—ozone, seasonal (May–September); SO_2—sulfur dioxide; NO_2—nitrogen dioxide; NO_y—total reactive nitrogen; CO—carbon monoxide; ● (red)—trace

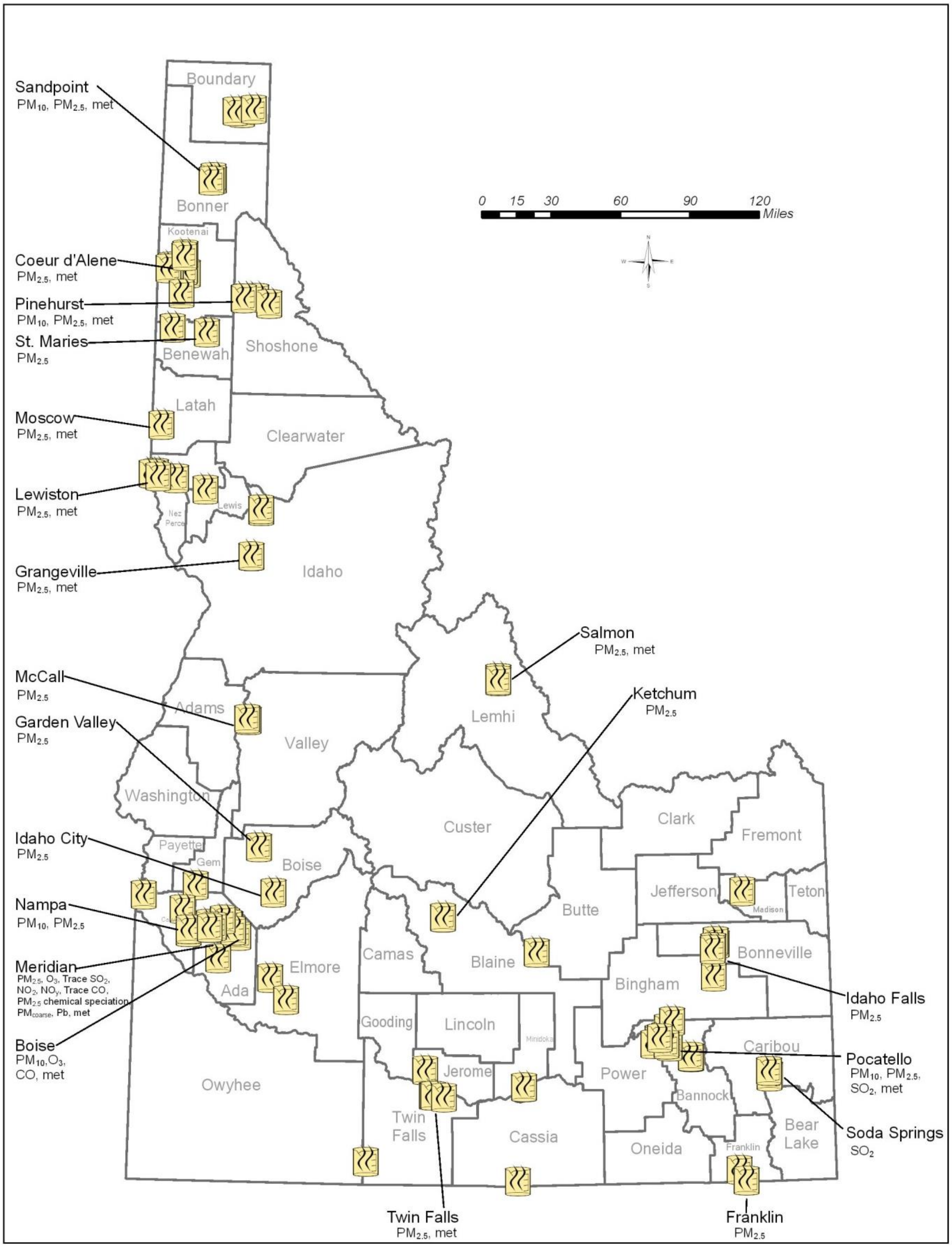


Figure 1. 2013 Idaho ambient air monitoring network.

Table 3. Monitoring methods used in Idaho in 2013.

Pollutant Code	Measurement	Method	Units
CO	Carbon monoxide	Gas filter correlation CO analyzer	Parts per million
NO_x/NO_y	Nitrogen oxides	Gas phase chemiluminescence and photolytic	Parts per billion
O_3	Ozone	Ultraviolet absorption	Parts per million
PM_{10} TEOM (FEM)	PM_{10} TEOM	TEOM gravimetric	Micrograms per cubic meter
$PM_{2.5}$ FRM	$PM_{2.5}$ reference	Gravimetric	Micrograms per cubic meter
$PM_{2.5}$ BAM 1020 (FEM)	$PM_{2.5}$ BAM	Beta attenuation	Micrograms per cubic meter
$PM_{2.5}$ TEOM FDMS (FEM)	$PM_{2.5}$ TEOM	TEOM gravimetric—Filter Dynamics Measurement System	Micrograms per cubic meter
$PM_{2.5}$ TEOM (SPM)	$PM_{2.5}$ TEOM	TEOM gravimetric	Micrograms per cubic meter
SO_2	Sulfur dioxide	Ultraviolet fluorescence	Parts per billion
		Pulsed fluorescence	Parts per billion
Pb	Lead	X-ray fluorescence	Micrograms per cubic meter

Notes: Tapered element oscillating microbalance (TEOM); federal equivalent method (FEM); federal reference method (FRM); beta attenuation monitor (BAM); special purpose monitor (SPM):

3.1 Pollutant Monitoring

Coarse particulate (PM_{10}) and fine particulate ($PM_{2.5}$) are measured using a variety of methods in Idaho. EPA considers the federal reference method (FRM) or the federal equivalent method (FEM) to be most accurate for determining PM_{10} and $PM_{2.5}$ concentrations. The FRM involves pulling in air (at a given flow rate) and trapping particles of a certain size (PM_{10} or $PM_{2.5}$) on a preweighed filter. The filter is weighed again, and the resulting mass is divided by volume of air sampled (determined from flow rate and amount of time) to provide concentration. Particles on the filter can be chemically analyzed later for more information about the sources of particulate matter. Unfortunately, the FRM does not provide continuous or timely information.

EPA has designated the tapered element oscillating microbalance (TEOM) continuous method an FEM for PM_{10}. For $PM_{2.5}$ DEQ uses a specific variation of the TEOM, TEOM-Filter Dynamics Measurement System (FDMS), at the Pinehurst monitoring site. This variation is designated as equivalent method for $PM_{2.5,}$ but the other TEOMs, despite the $PM_{10,}$ are not designated as such. The beta attenuation monitor (BAM) 1020 is designated as an equivalent method for $PM_{2.5.}$ DEQ uses this method at its Salmon monitoring site. DEQ uses the TEOM and TEOM-FDMS continuous methods to provide more time-resolved data (i.e., hourly averages) and to assess and forecast air quality in real-time or near real-time. DEQ also uses a variety of FEM gas analyzers for collecting data to determine compliance to the NAAQS. Some of these analyzers are also used to provide air quality forecasts near real-time. Data collected by methods not designated FRM or FEM cannot be used to determine compliance to NAAQS.

4 Monitoring Results

4.1 Ozone

Ozone, typically a summertime air pollution problem, forms when pollutants from internal combustion engines and industrial sources (e.g., paints, solvents, and gas vapors) react with sunlight. These pollutants are called ozone precursors and include VOCs and nitrogen oxides. Ozone can also be directly emitted by industrial sources. Ozone levels are usually highest in the afternoon because of the intense sunlight, warm temperatures, and the time required for ozone to form. These levels are highly affected by weather. DEQ monitored ozone from May through September 2013, as this is the time period specified by EPA requirements and the most likely time that high ozone levels will be observed.

Ozone is considered beneficial in the upper atmosphere because it helps to protect the earth from the sun's rays; however, ozone formed at ground level is unhealthy. Elevated concentrations of ground-level ozone can cause reduced lung function and respiratory irritation and can aggravate asthma. Ozone has also been linked to immune system effects (www.epa.gov/ttn/oarpg/naaqsfin/o3health.html). The damage ozone causes to the lungs typically heals within a few days, but repeated or prolonged exposure may cause permanent damage. People with respiratory conditions should limit outdoor exertion if ozone levels are high. Even healthy individuals may experience respiratory symptoms on a high ozone day. Ground-level ozone can also damage agricultural crops and forests, interfering with their ability to photosynthesize and grow.

Precursor chemicals that react with sunlight to produce ozone are generated primarily in large metropolitan areas. Because Idaho summers are normally hot and dry, ozone levels typically begin to rise in the late morning and peak in the late afternoon and early evening. This phenomenon follows closely with the time of day that the sun is the highest in the sky and temperatures are the hottest.

The ozone standard is defined so that the three highest ozone concentrations in any particular year can exceed the level of the standard while the area still maintains an *attainment* classification. However, if the 3-year averages of the 4th highest concentration exceed the level of the standard, the area is classified as *nonattainment* (Figure 2). Starting in 2008, the 3-year average (2006–2008) of the 4th highest 8-hour concentration will violate the NAAQS if it exceeds 0.075 ppm (0.076 ppm or higher).

DEQ monitors ozone in Boise and Meridian. Graphs presented in Figure 3–Figure 6 show trends in ozone levels at the monitoring stations in operation during 2013. For each station, the first graph presents daily maximum 8-hour average data for May through September. The shading on each graph corresponds to the AQI categories. The AQI categories of orange and above indicate NAAQS excursions. Concentrations for Boise (Figure 5) show a number of days in the Moderate category and two reaching the Orange category. These may be the result of nearby wildfires that occurred during the summer of 2013. Breaks in the graphs are due to data being discarded as invalid. Data invalidation occurs when an instrument is taken off-line for routine maintenance, or there is a malfunction. Only valid data are shown on the graphs. The second graph presents the four highest concentrations observed during the year. The yellow circle presents the rolling 3-

year average. The 3-year average of the 4th highest concentration is the value used to assess compliance with the NAAQS.

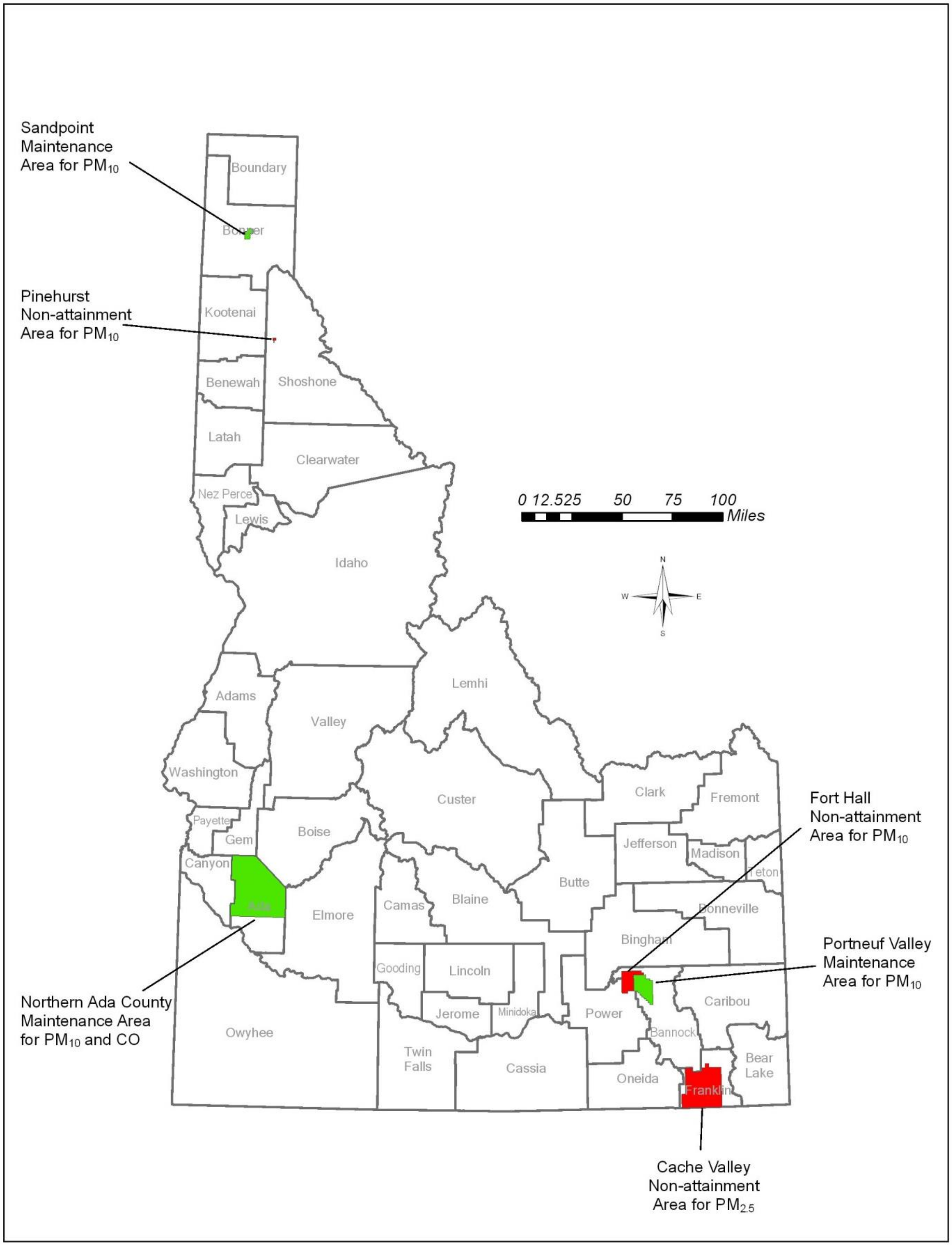
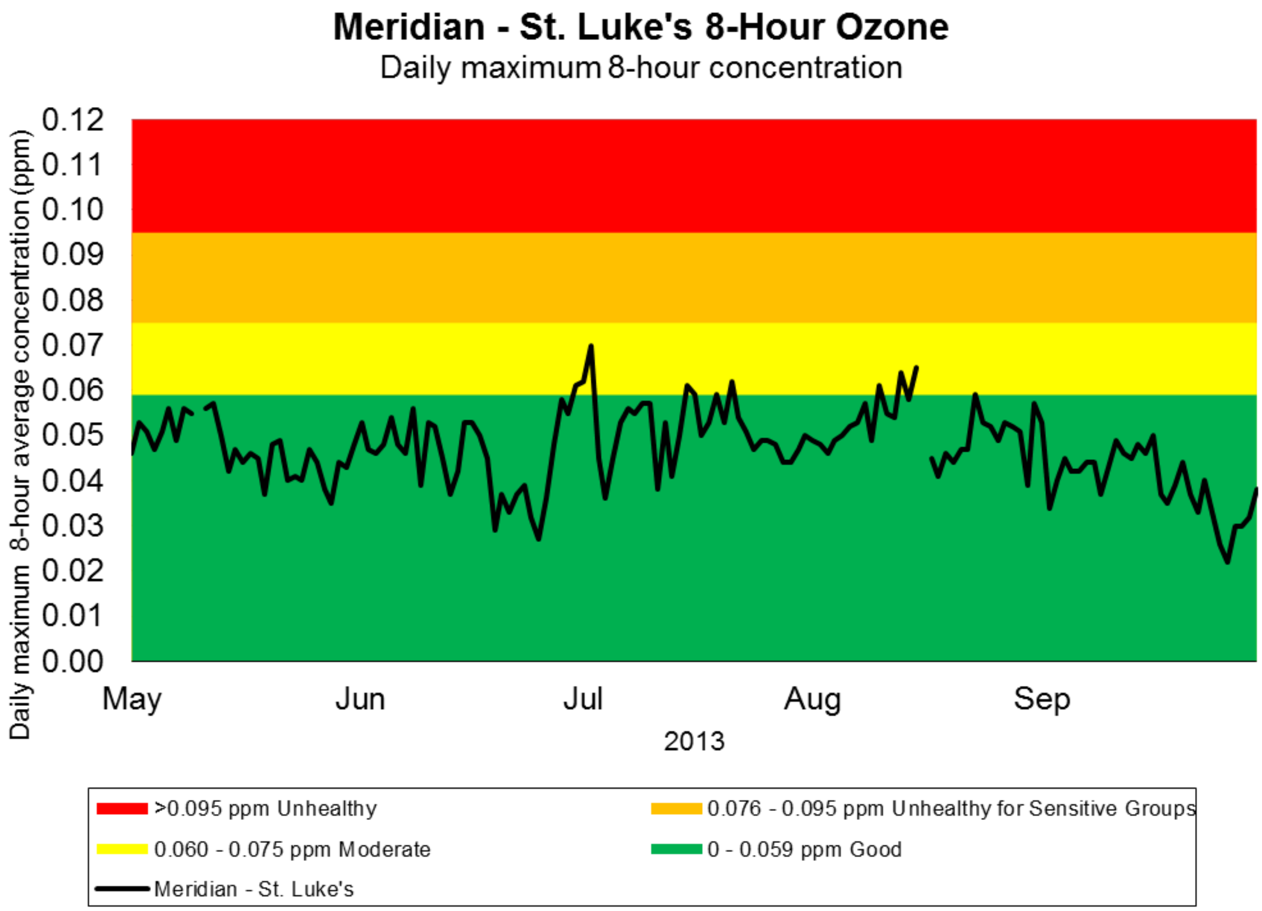


Figure 2. 2013 Idaho nonattainment and maintenance areas.

Figure 7 shows a summary of the ozone monitoring data against the previous and new 8-hour federal standard. The figure shows that the state has remained at or below the previous ozone standard since monitoring began. The current ozone standard is closer to the 8-hour averages in the Treasure Valley, although the values have remained below the standard. For additional information on ozone, refer to Section 7, “Definitions” and Section 9, “Criteria Air Pollutants,” and visit www.epa.gov/air/ozonepollution/.



* Gaps in the charted data reflect times when valid data were not collected either from instrument malfunction, quality assurance failure, or equipment maintenance.

Figure 3. Meridian—St. Luke's 8-hour ozone daily maximum concentration.

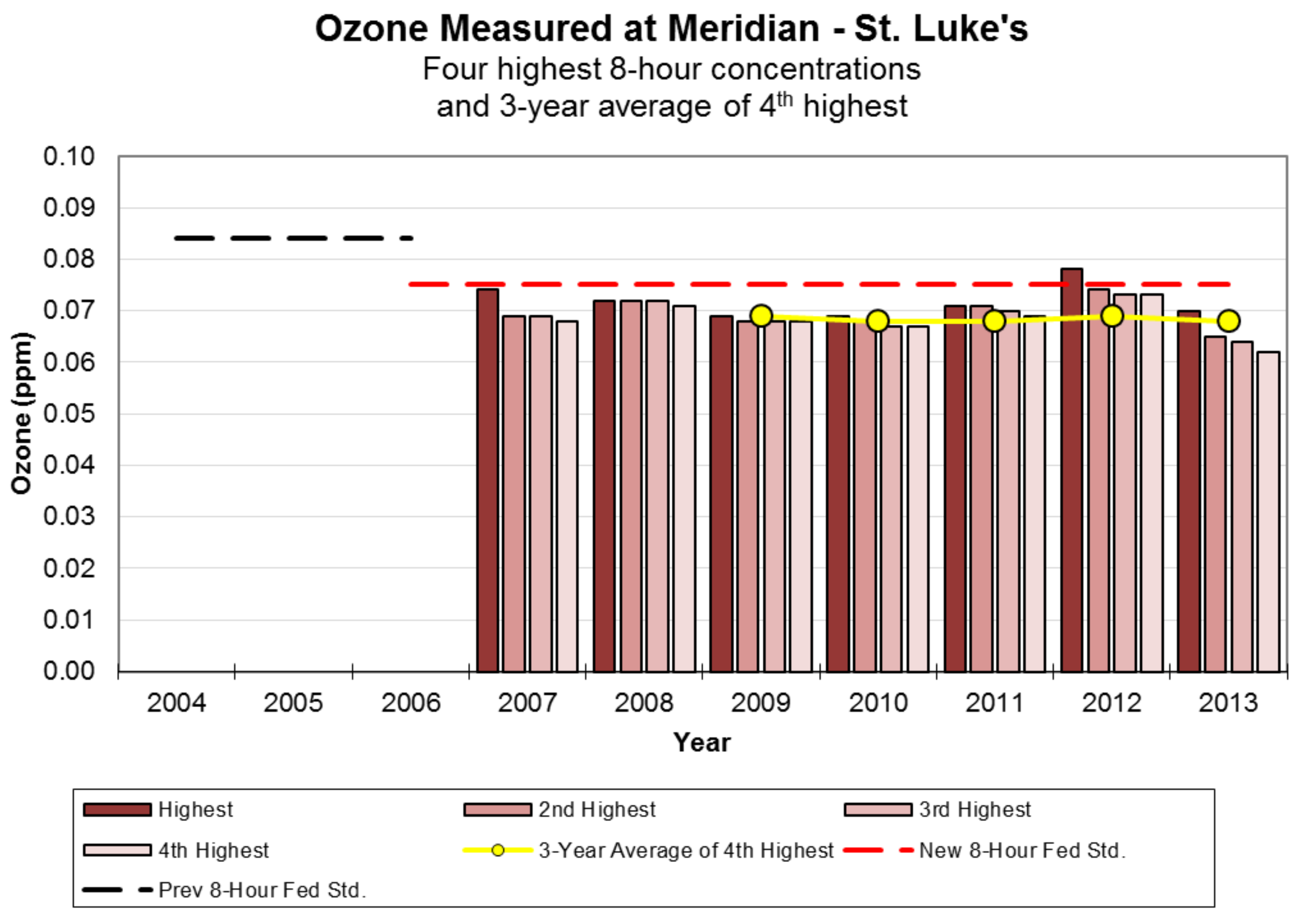


Figure 4. Meridian—St. Luke's highest 8-hour ozone concentrations and 3-year average of the 4th highest concentration.

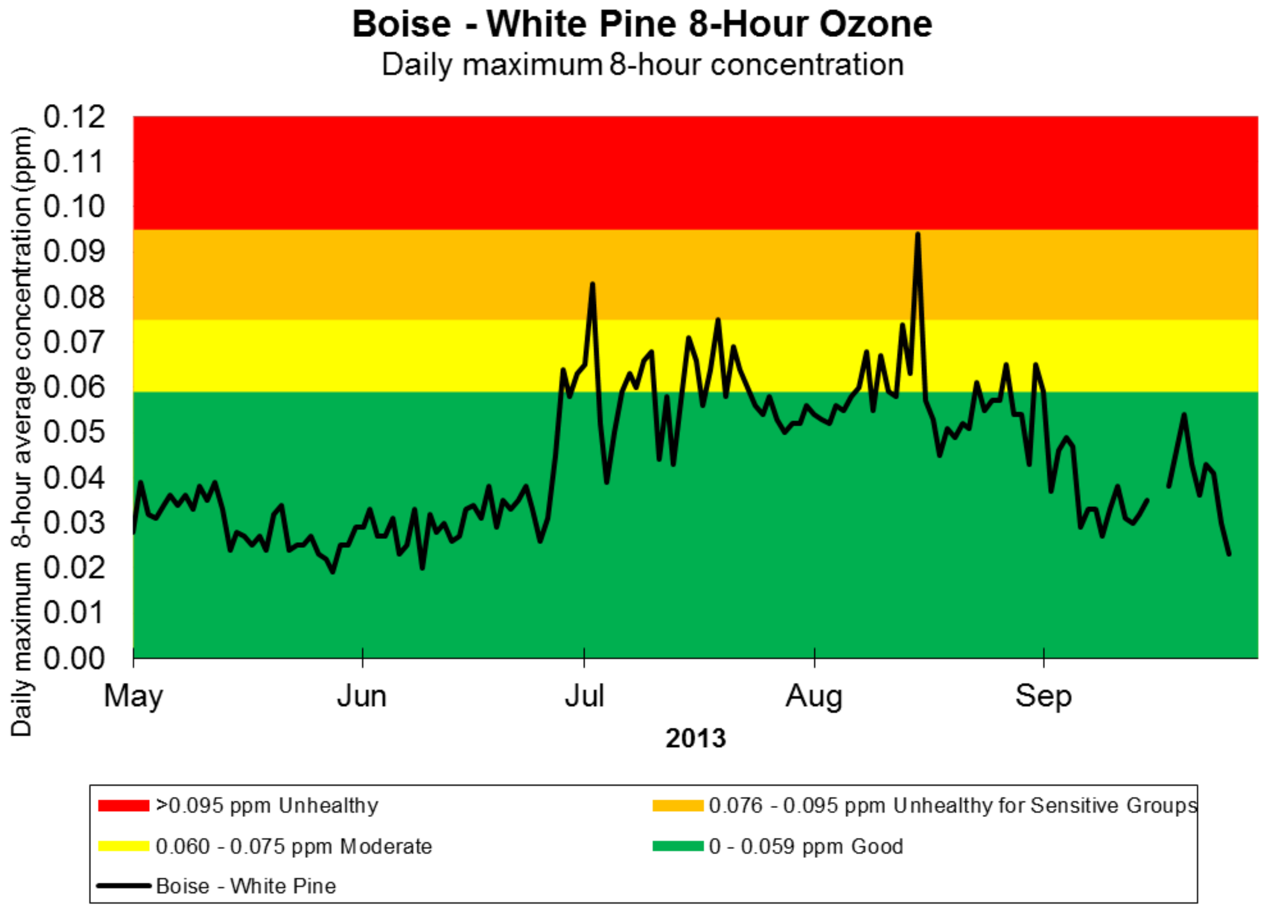


Figure 5. Boise—White Pine 8-hour ozone daily maximum concentration.

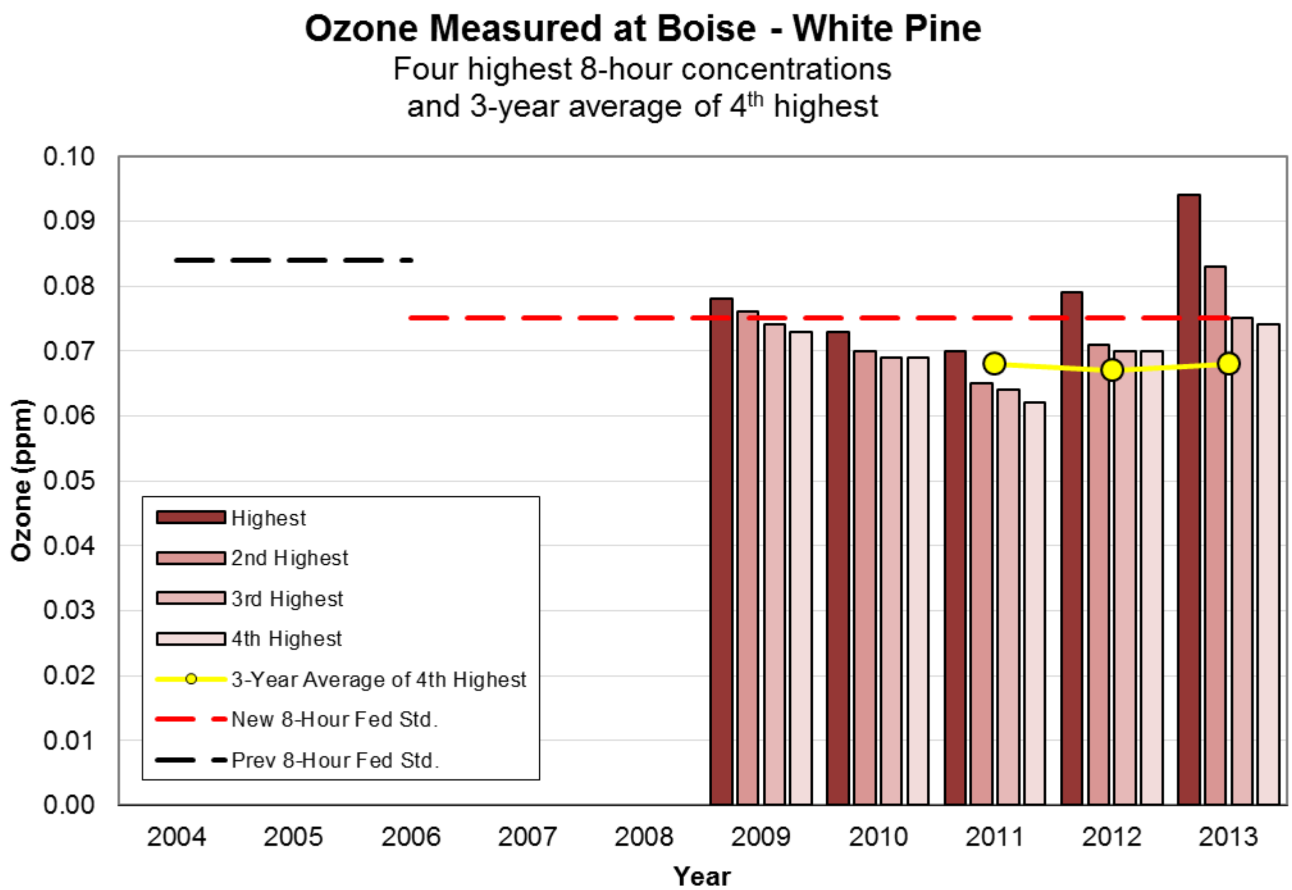


Figure 6. Boise—White Pine highest 8-hour ozone concentrations and 3-year average of the 4th highest concentration.

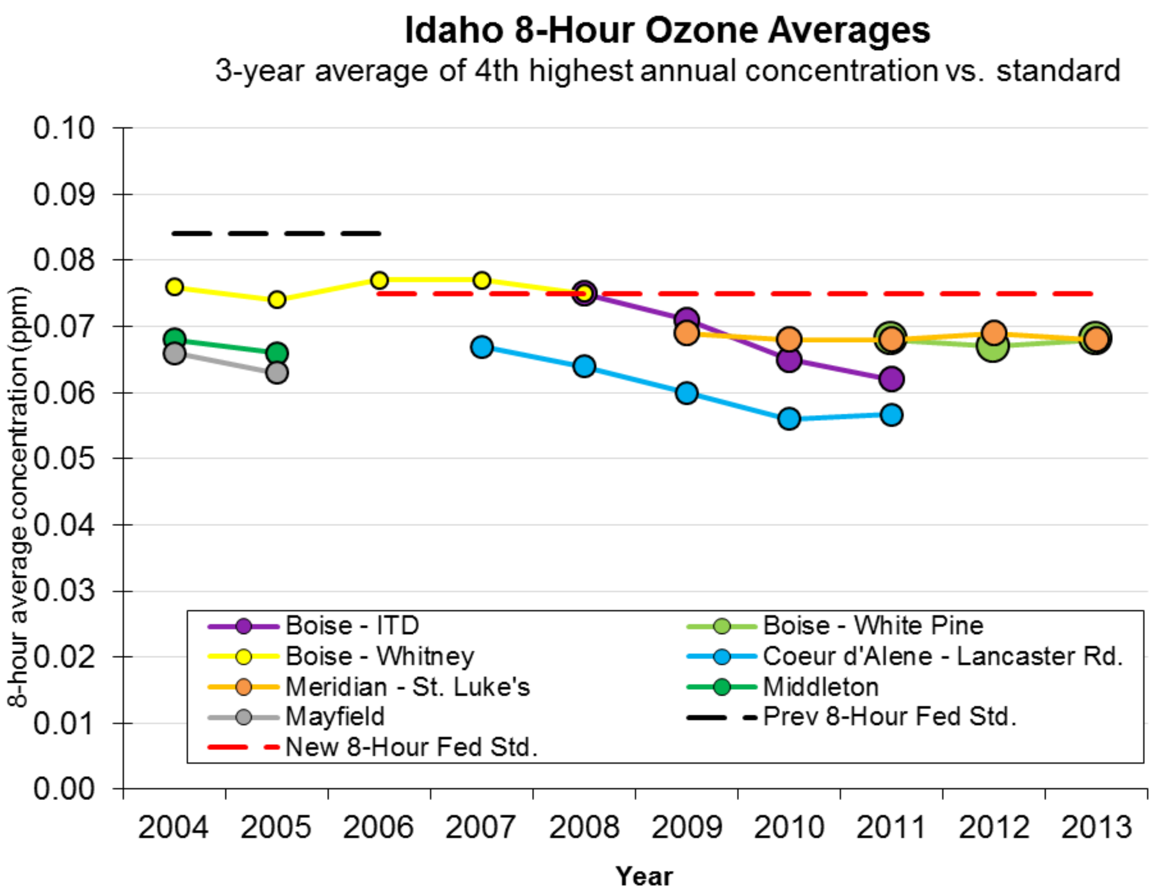


Figure 7. Idaho 8-hour ozone concentrations and 3-year average of the 4th highest concentration.

4.2 Particulate Matter (10 micrometers)

Particulate matter includes solid matter and liquid droplets suspended in the air. Particles between 2.5 and 10 micrometers in diameter are called *coarse* particles. PM_{10} includes fine ($PM_{2.5}$) and coarse particles. Coarse particles typically come from crushing or grinding operations and dust from roads. PM_{10} can aggravate respiratory conditions such as asthma. People with respiratory conditions should avoid outdoor exertion if PM_{10} levels are high.

The federal annual PM_{10} standard was revoked effective December 17, 2006, from a lack of evidence linking health problems to long-term exposure to coarse particle pollution. The 24-hour standard was not changed. EPA may choose to replace the PM_{10} standard in the future with a $PM_{10\text{-}2.5}$ (PM_{coarse}) standard, ranging from diameters 2.5 to 10 micrometers. Boise, Pocatello, Sandpoint, and Pinehurst have previously violated federal PM_{10} standards (Figure 2). Pinehurst is currently a nonattainment area for PM_{10}. Sandpoint, Pocatello (Portneuf Valley), and Boise (northern Ada County) were formerly nonattainment areas but are now considered to be maintenance areas for PM_{10}.

Idaho monitors PM_{10} using the continuous equivalent method. The PM_{10} TEOM is a federal equivalent method. TEOM data are used to determine compliance to the PM_{10} NAAQS. The TEOM method results are shown in Figure 8 and Figure 9. TEOM method data are also used to determine the daily AQI and to inform the public of air quality values in near real-time via DEQ's webpages at http://airquality.deq.idaho.gov/.

The 3-year average daily maximum values shown in Figure 8 describe a variety of trends for the different monitor sites. The Boise and Nampa monitors registered air values above the standard during the last 2 years, while the Sandpoint monitor's values dropped steeply. Pinehurst and Pocatello monitors maintained flat trends. Statistical summaries of the PM_{10} concentrations are provided in Appendix A. The maximum PM_{10} measured in 2013 at the Pinehurst monitor exceeded the 24-hour NAAQS standard. However, the 24-hour PM_{10} NAAQS is only considered violated if more than three exceedances occur during the consecutive 3-year period. For example, we could experience two exceedances in year one, none in year two, and one in year three and not violate the NAAQS.

Figure 9 demonstrates that Idaho's airsheds, where monitoring is occurring, were in compliance with the daily NAAQS for PM_{10} in 2013. The graph shows the 3-year average estimated exceedances of the 24-hour primary standard. None of the PM_{10} monitors have violated the standard during the past 10 years.

For additional information on PM_{10}, refer to Section 7, "Definitions" and visit www.epa.gov/oar/particlepollution/.

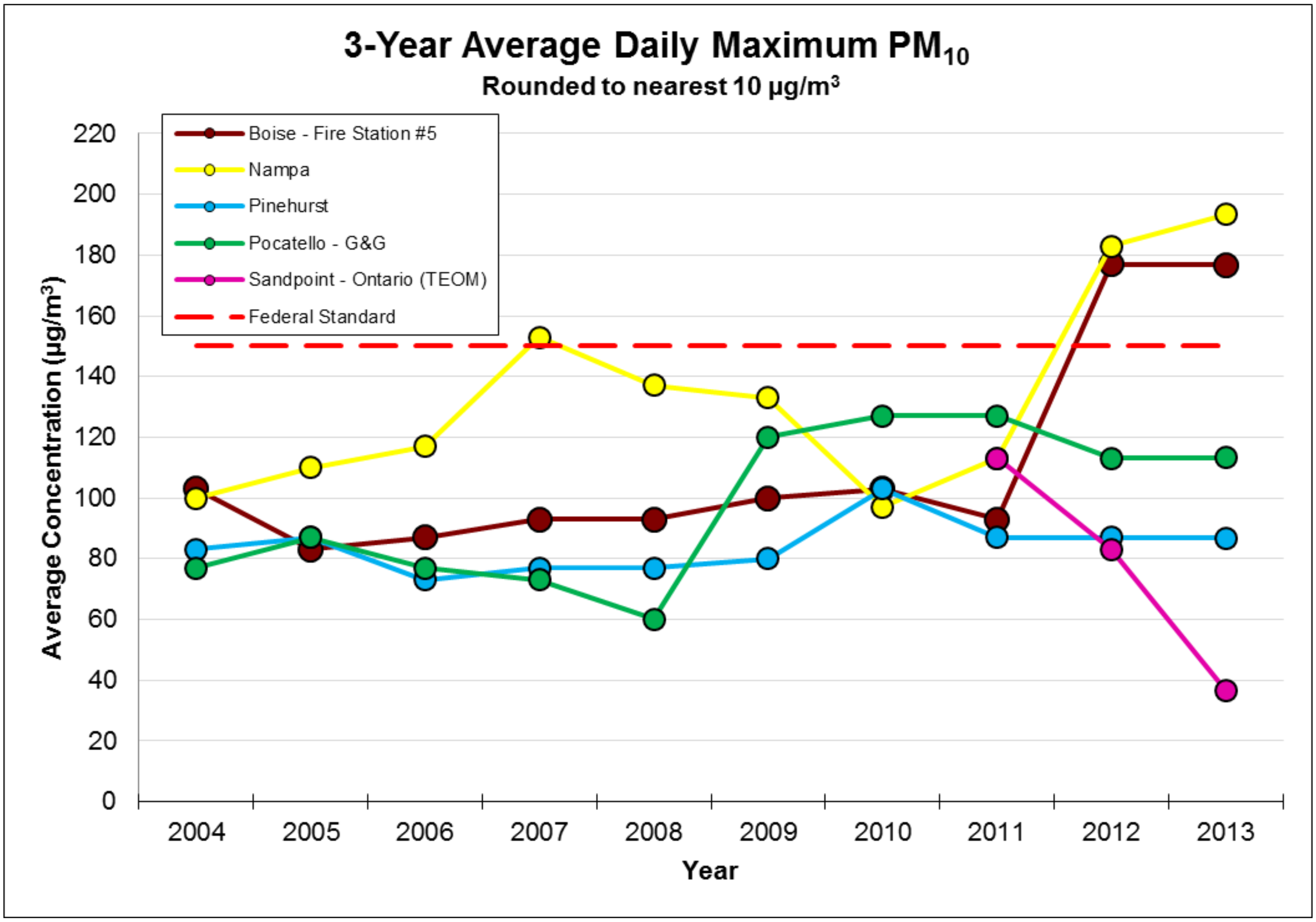


Figure 8. Three-year average of daily maximum PM_{10}.

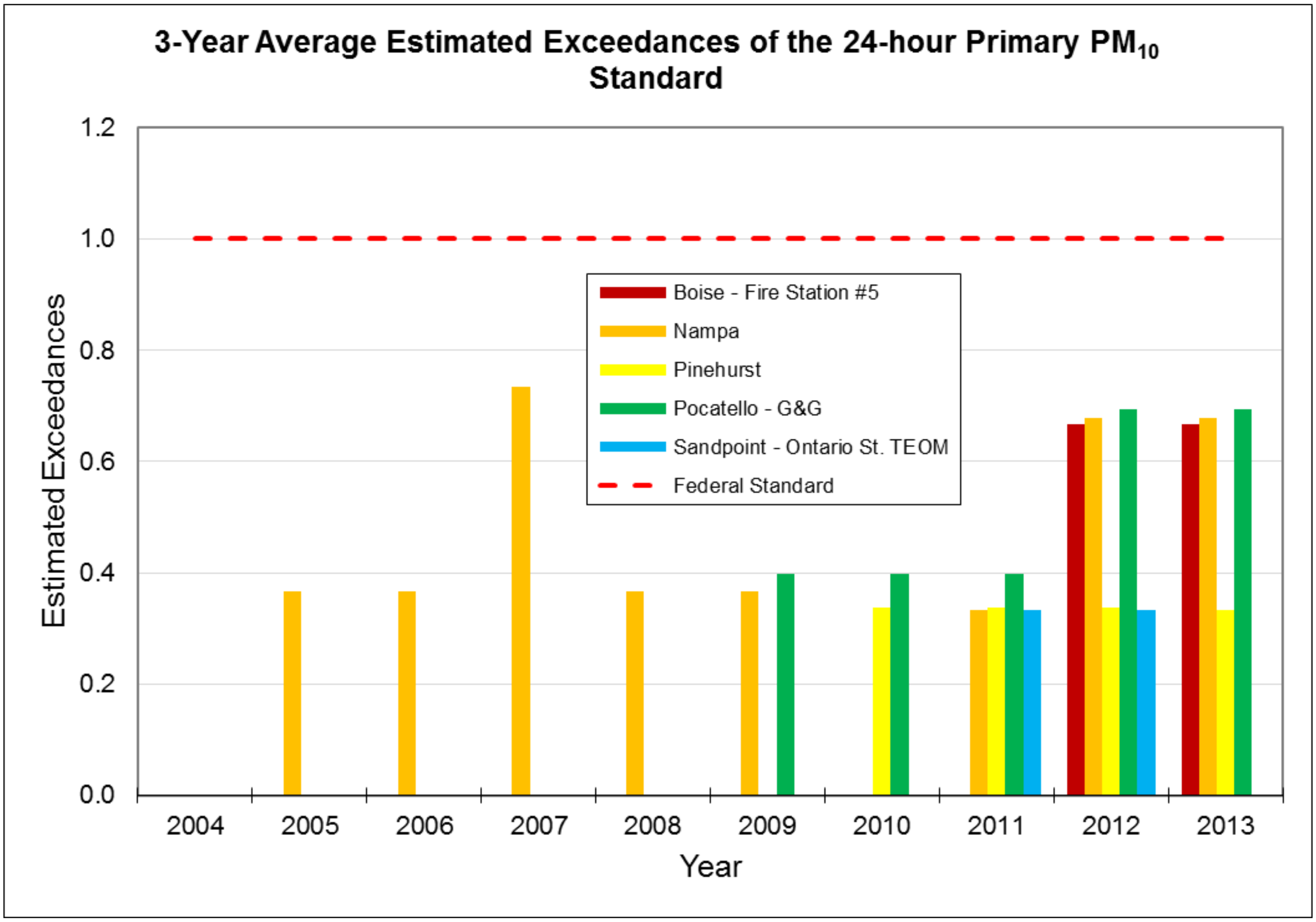


Figure 9. Three-year average estimated exceedances of the daily PM_{10} standard.

4.3 Particulate Matter (2.5 micrometers)

Particles 2.5 micrometers in diameter or less are called *fine* particles, or $PM_{2.5}$. DEQ considers $PM_{2.5}$ to be one of the major air pollution concerns affecting a number of airsheds in Idaho. $PM_{2.5}$ generally comes from wood and agricultural burning, industrial boilers, and vehicle exhaust including cars, diesel trucks, and buses. Fine particulate matter can also be formed secondarily in the atmosphere by chemical reactions of pollutant gases.

Exposure to $PM_{2.5}$ can have serious health effects. Fine particles are closely associated with increased respiratory disease, decreased lung function, and even premature death. Children, older adults, and people with some illnesses are more sensitive and more likely to develop heart or lung problems associated with $PM_{2.5}$. People with respiratory or heart disease, older adults, and children should avoid outdoor exertion if $PM_{2.5}$ levels are high. $PM_{2.5}$ also significantly affects visibility.

DEQ measures $PM_{2.5}$ using three different methods—FRM, TEOM, and BAM. FRM was originally approved by EPA to determine $PM_{2.5}$ NAAQS compliance. This method involves pulling air through a size-selective inlet and a preweighed filter at a given flow rate, which traps particles of a certain size (in this case $PM_{2.5}$) on the preweighed filter. The filter is weighed again, and the net weight is divided by the volume of sampled air (determined from flow rate and amount of time) to provide the concentration. Unfortunately, the FRM does not provide continuous or timely information. Idaho uses the TEOM method to provide more time-relevant data. The TEOM method accounts for the measurement of mass, via an oscillating filter element, to determine particulate matter present. The BAM method also provides data in near real-time. Its measurement method relies on the principle of attenuation to determine particulate concentrations. A final method of $PM_{2.5}$ measurement is achieved using a nephelometer, which measures particulate matter using light scatter technology. This method is used during the agricultural burning season.

EPA provides FRM and FEM designation to monitoring methods that meet certain requirements. The designation allows the methods to be recognized by EPA as appropriate for NAAQS compliance determinations. The graphs in this section use data collected primarily from FRMs. The continuous data are primarily from TEOM methods, which typically are not designated as FRM or FEM but as special purpose monitors. An exception in DEQ's network—one TEOM method is designated an FEM—is the TEOM-FDMS located at Pinehurst. BAM, located at Salmon, is also an FEM. To improve the accuracy of the TEOM special purpose monitors, they are compared to the FRM's values for a period of time, and calculations are made to determine the degree of difference between the two methods. The calculations are then applied to the current TEOM values in an attempt to make them *reference method-like*. Data gathered by the TEOM special purpose or nephelometer monitors cannot be used for NAAQS compliance determinations because they do not meet EPA equivalency requirements. States can request approval to use non-FRM and non-FEM monitors for NAAQS compliance through the approved regional method process. DEQ has not begun this process.

Figure 10 shows the 2013 3-year average of the 98th percentile 24-hour (daily) averages at Idaho monitoring stations against the federal standard. Franklin has violated the daily standard for the past 4 years, including 2013. Pinehurst has done the same. Salmon violated the standard during 2011 and 2013, while Meridian violated the standard only during 2013. All of these sites remain designated in attainment until a SIP determination is made by EPA for the 24-hour NAAQS, except for Franklin, which was included in the Cache Valley nonattainment area in 2010.

Figure 11 shows the 3-year average of the annual averages at each monitoring station against the federal standard. The data show that the annual standard of 12 $\mu g/m^3$ was exceeded at the Pinehurst monitor during 2012 and 2013 and exceeded at Salmon in 2013. A proposed boundary for the Pinehurst $PM_{2.5}$ nonattainment area was submitted by DEQ to EPA in July, 2014. Salmon remains an area of concern for $PM_{2.5}$.

Figure 12–Figure 28 show daily $PM_{2.5}$ concentrations measured at Idaho sites during 2013 using the continuous analyzers against a backdrop of AQI breakpoints. Most sites reflect the sustained nature of Good air quality throughout the state, with a few Yellow days interspersed. Nampa, McCall, and Meridian all spiked into the Orange category for a few days in late January, when the region was under high pressure and deep inversions set up in the valleys, allowing particulates to build up under the warm air caps. Air quality in Idaho City and Ketchum were affected in August by the Beaver Complex wildfire. The Ketchum monitor reached the Very Unhealthy category and sometime after experienced significant machine malfunction. A portable emergency monitor was put in its place to report data to the public during the remainder of the wildfires. Two sites, Garden Valley and Idaho City, exhibited short-lived excursions into the Orange category during March and April, respectively. Franklin, Pinehurst, and Salmon all reached the Red category at different points of the year. A few of the graphs show some blank periods with no concentrations, which are times when a monitor was not functioning due to mechanical malfunctions or maintenance.

For additional information on particulate matter, refer to Section 7, “Definitions” and Section 9, “Criteria Air Pollutants,” and visit www.epa.gov/oar/particlepollution/.

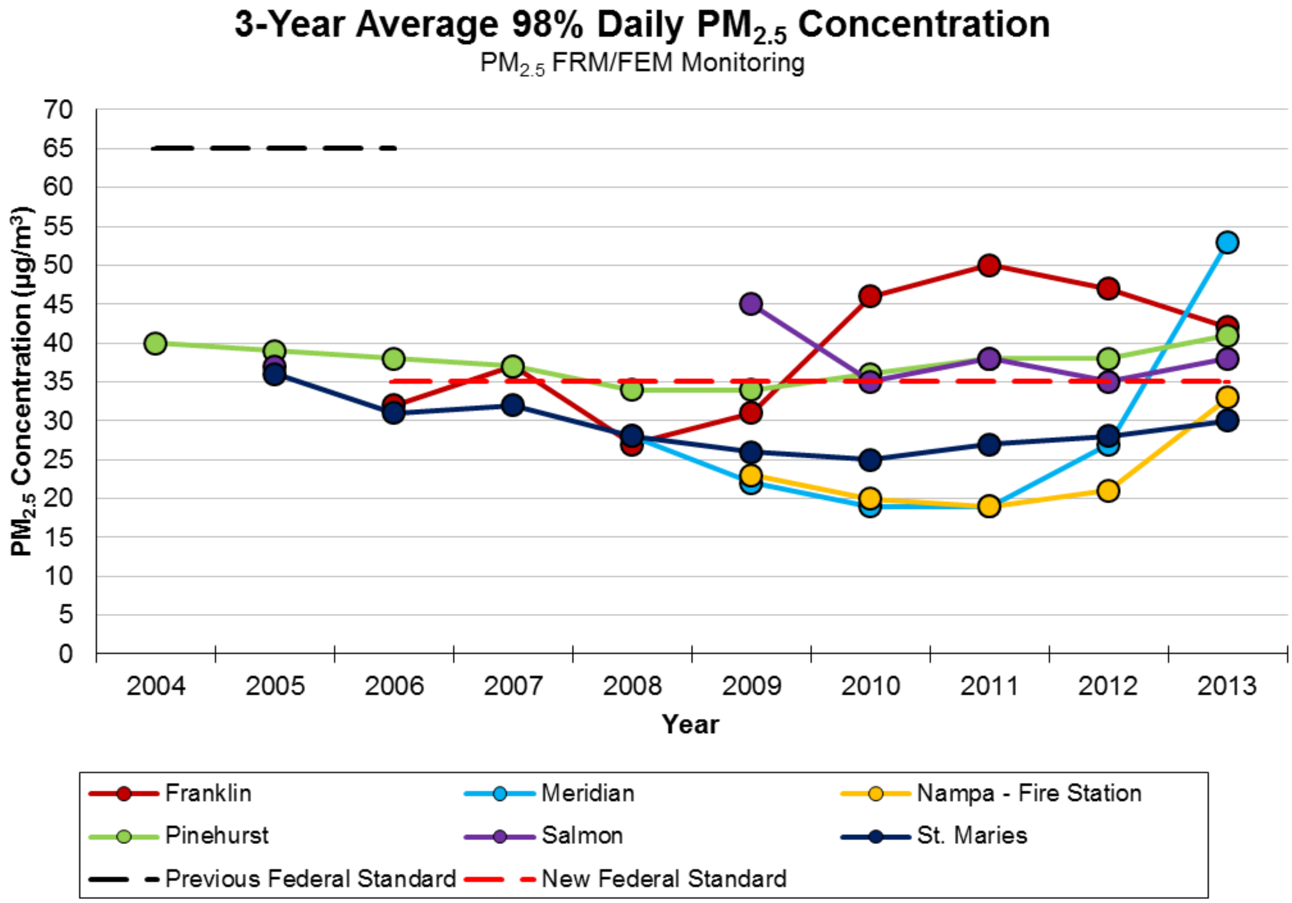


Figure 10. Three-year average 98th percentile daily $PM_{2.5}$ concentration (monitors operated in 2013).

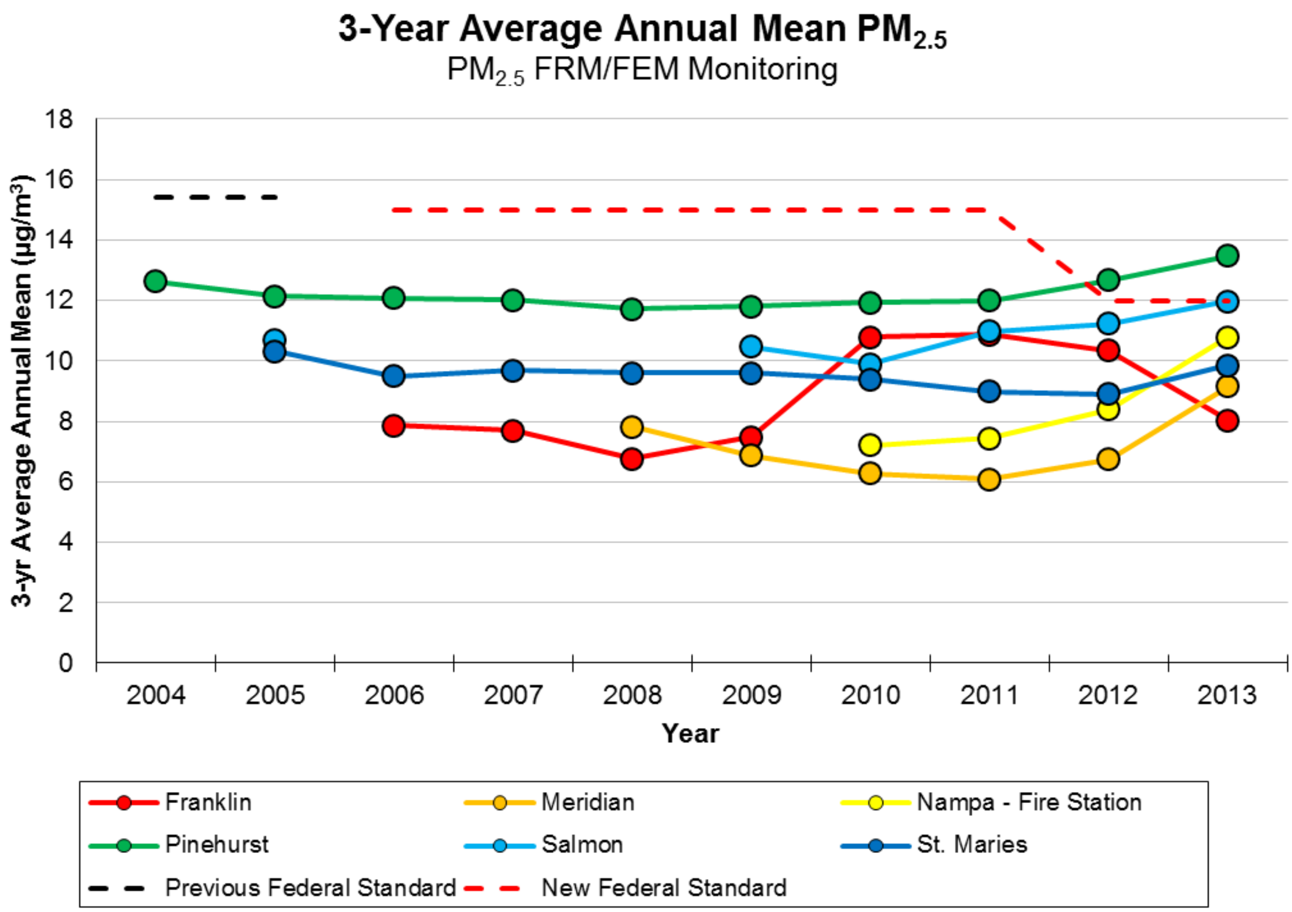


Figure 11. $PM_{2.5}$ 3-year average annual mean (monitors operated in 2013).

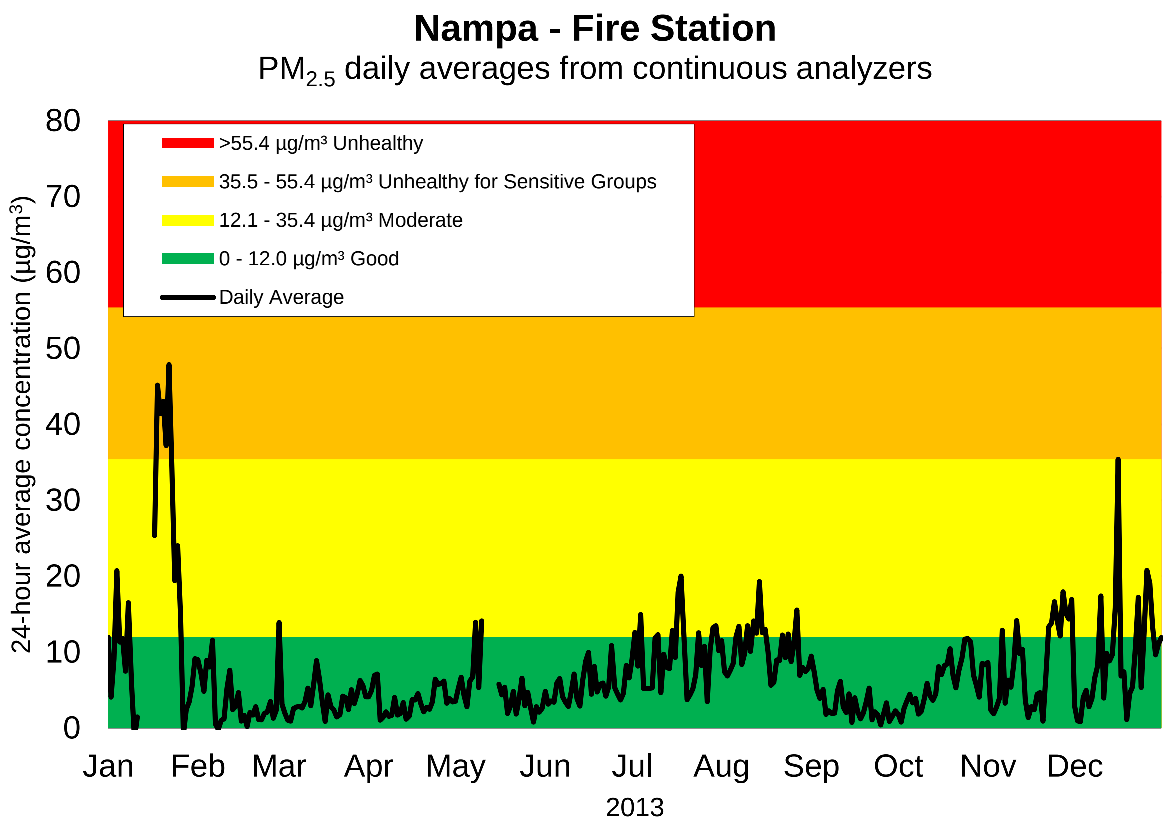


Figure 12. Nampa—Fire Station PM2.5 daily averages from continuous analyzer.

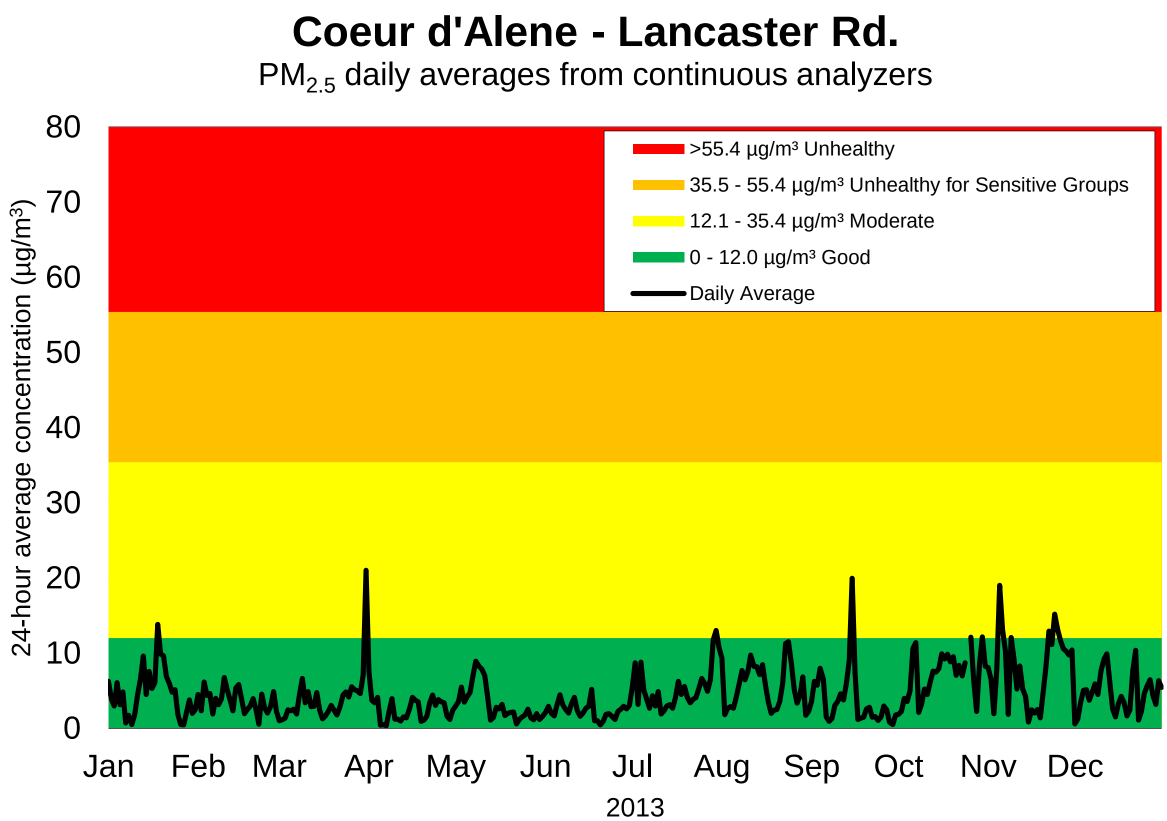


Figure 13. Coeur d'Alene—Lancaster Road $PM_{2.5}$ daily averages from continuous analyzer.

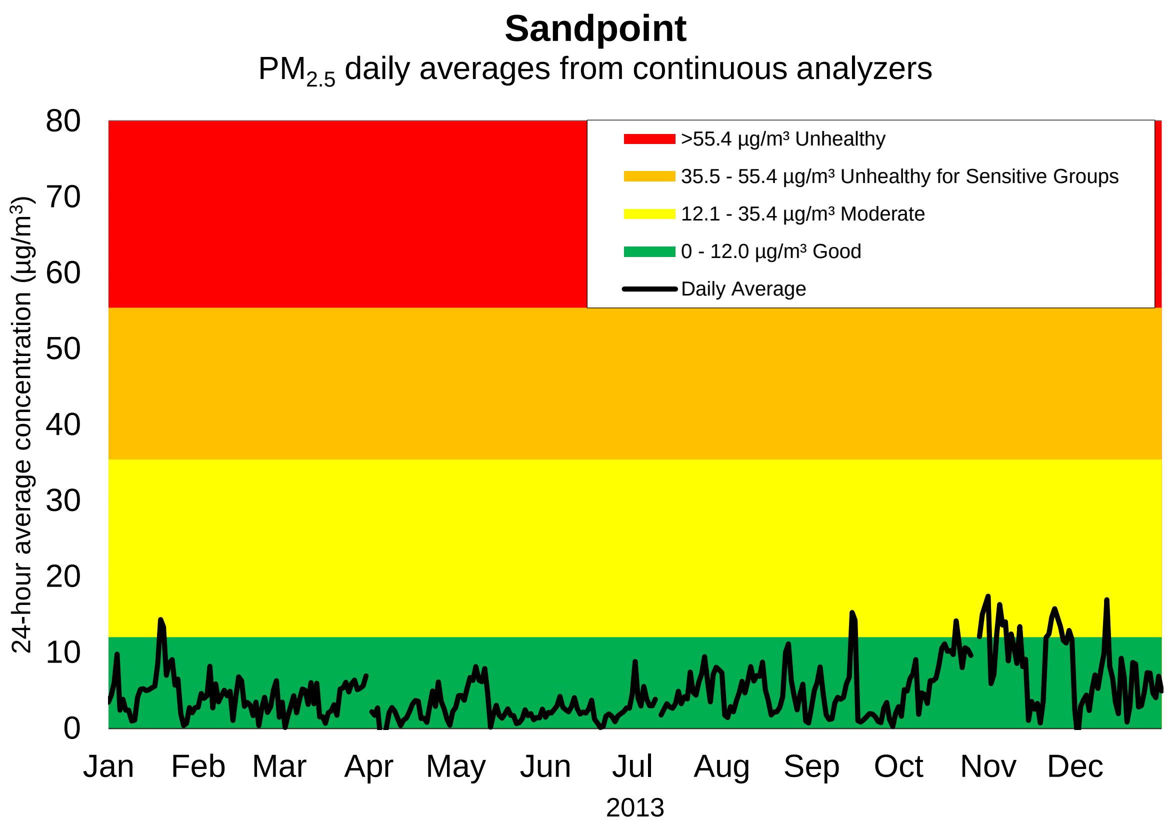


Figure 14. Sandpoint $PM_{2.5}$ daily averages from continuous analyzer.

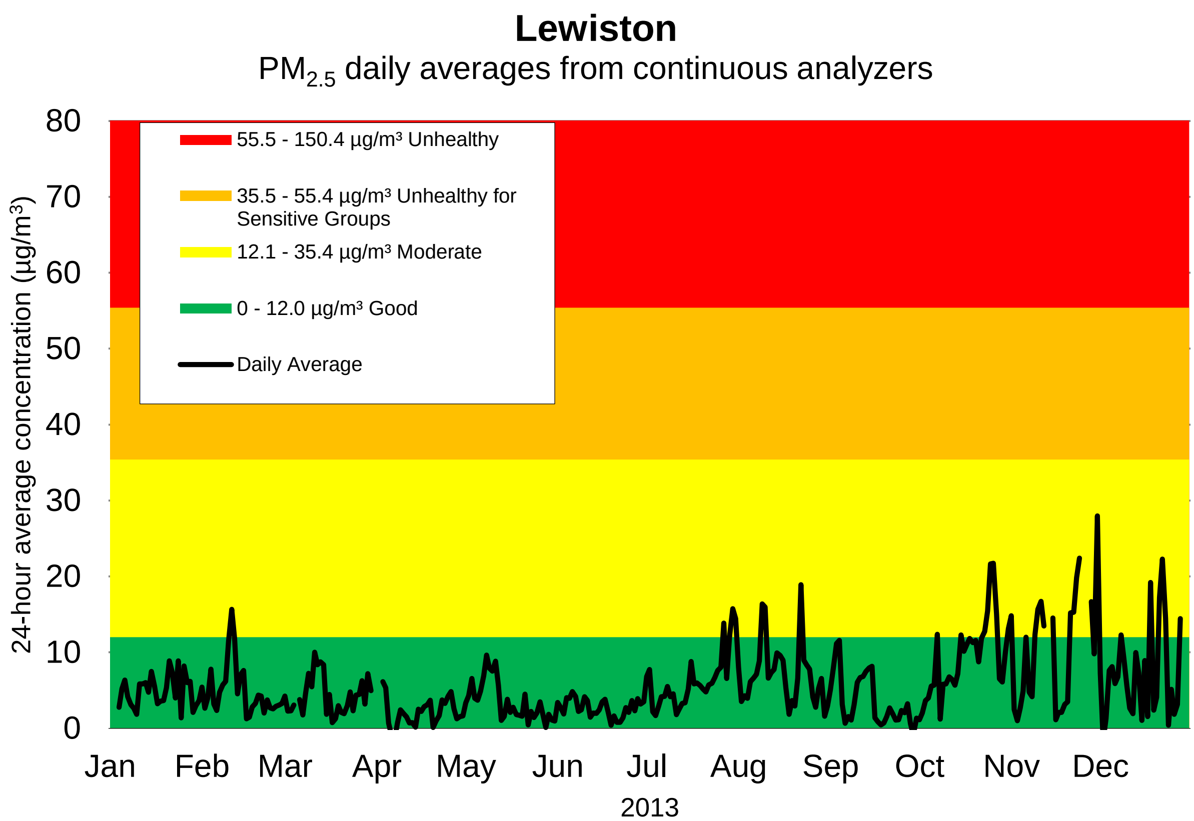


Figure 15. Lewiston $PM_{2.5}$ daily averages from continuous analyzer.

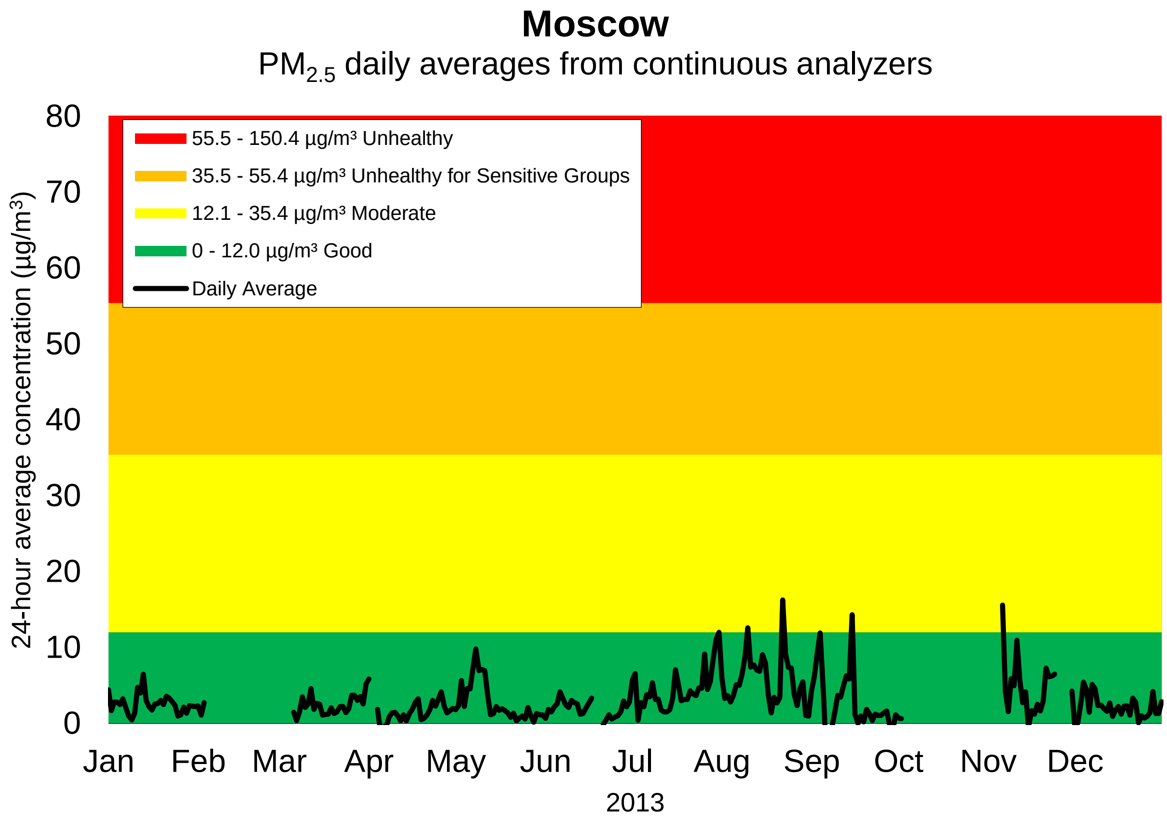


Figure 16. Moscow $PM_{2.5}$ daily averages from continuous analyzer.

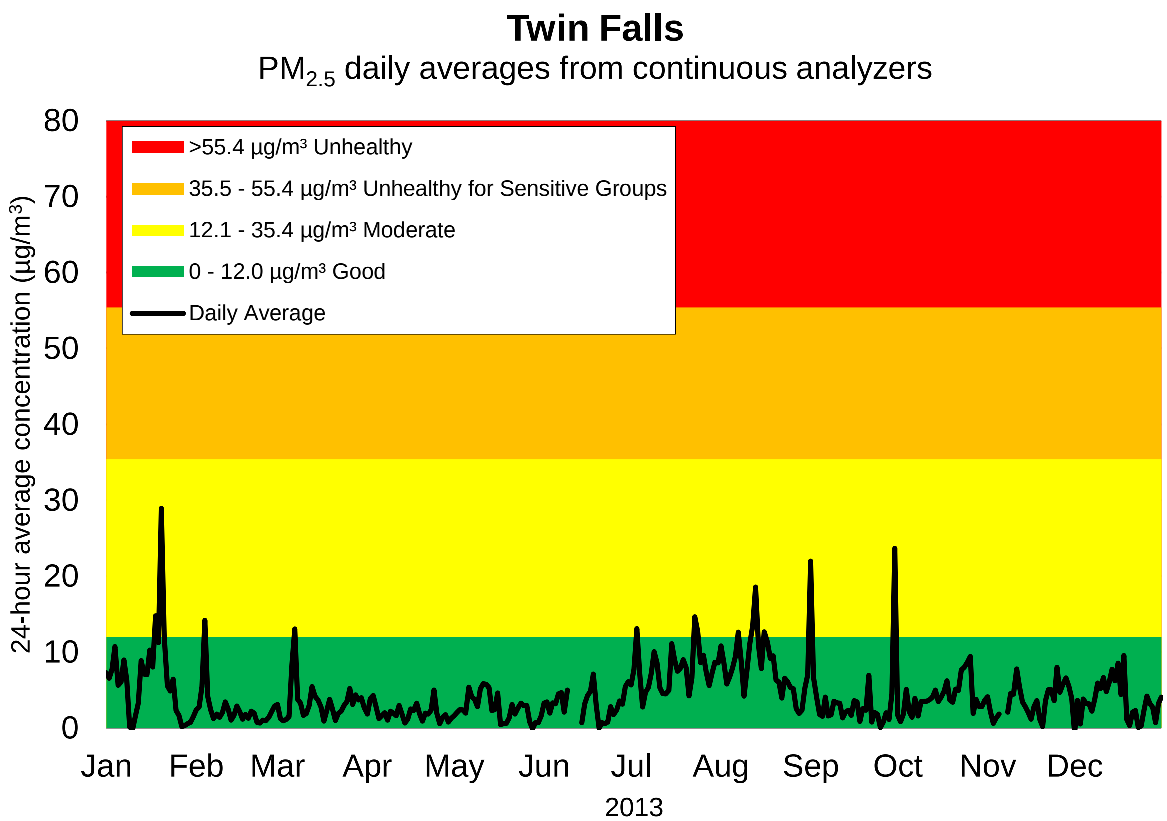


Figure 17. Twin Falls $PM_{2.5}$ daily averages from continuous analyzer.

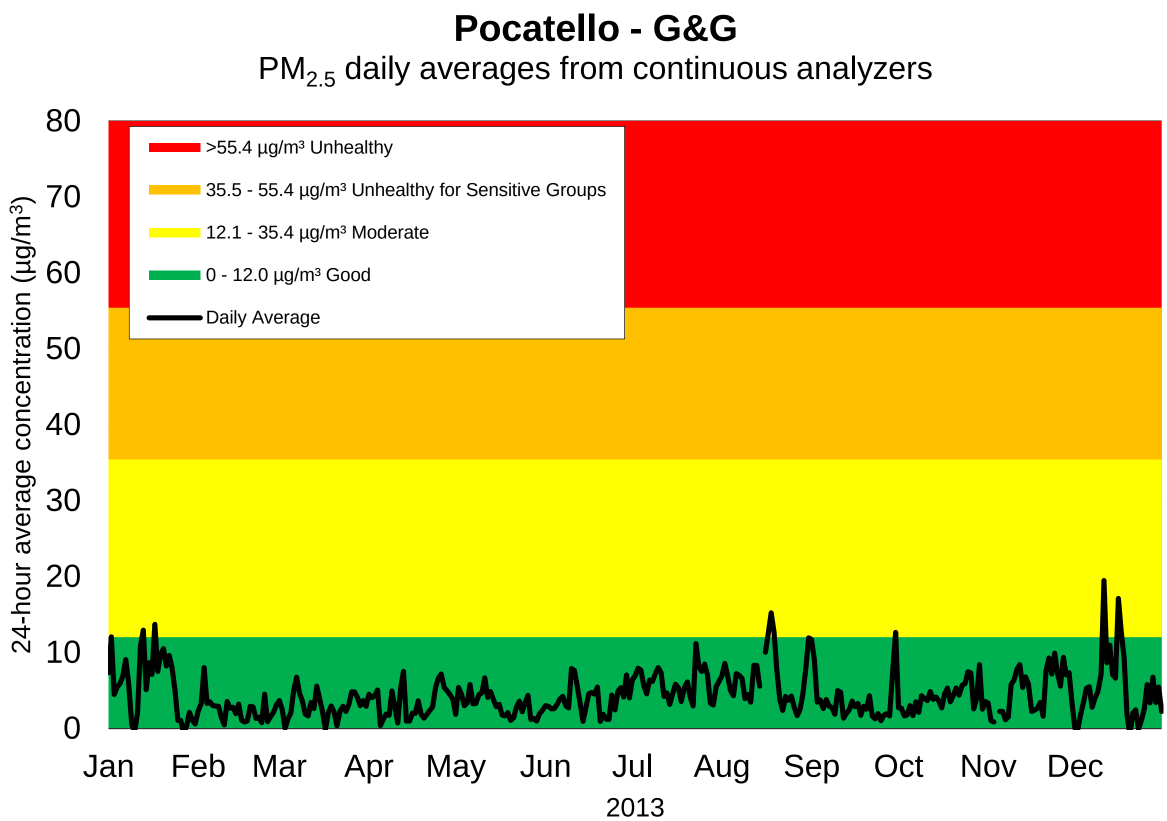


Figure 18. Pocatello—Garrett and Gould $PM_{2.5}$ daily averages from continuous analyzer.

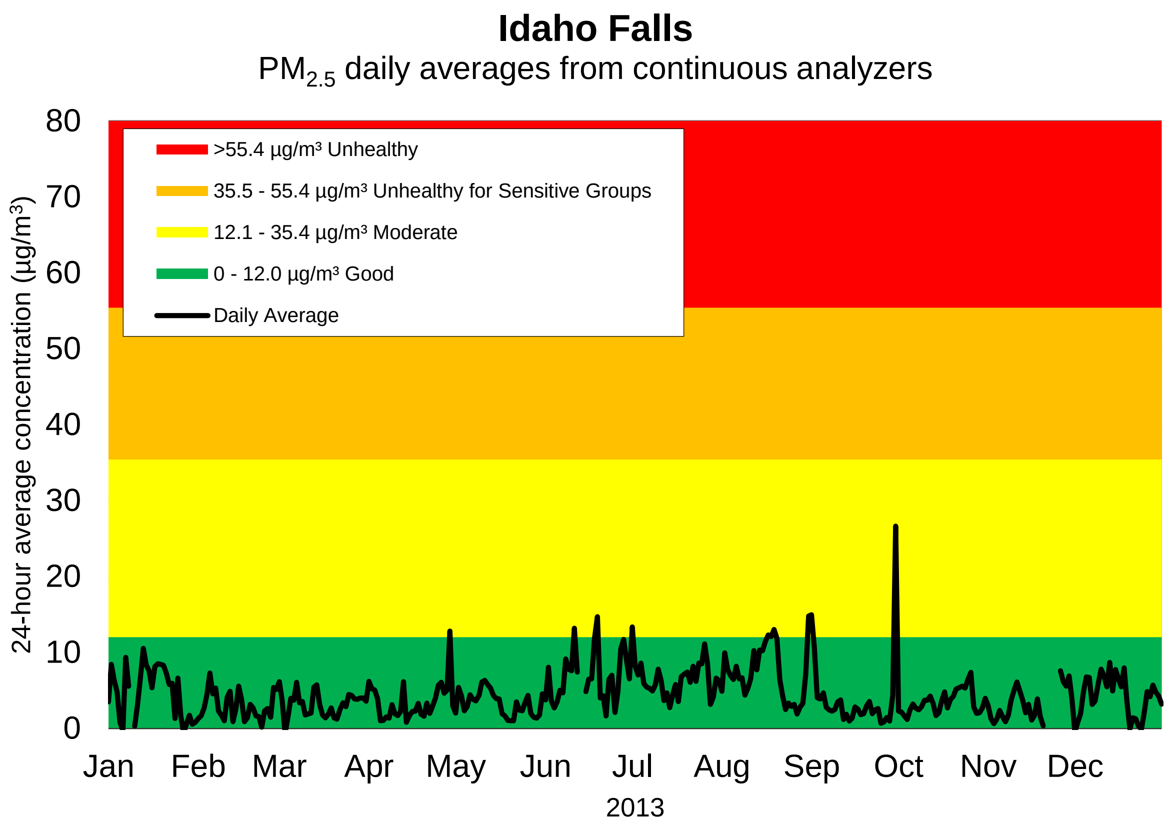


Figure 19. Idaho Falls $PM_{2.5}$ daily averages from continuous analyzer.

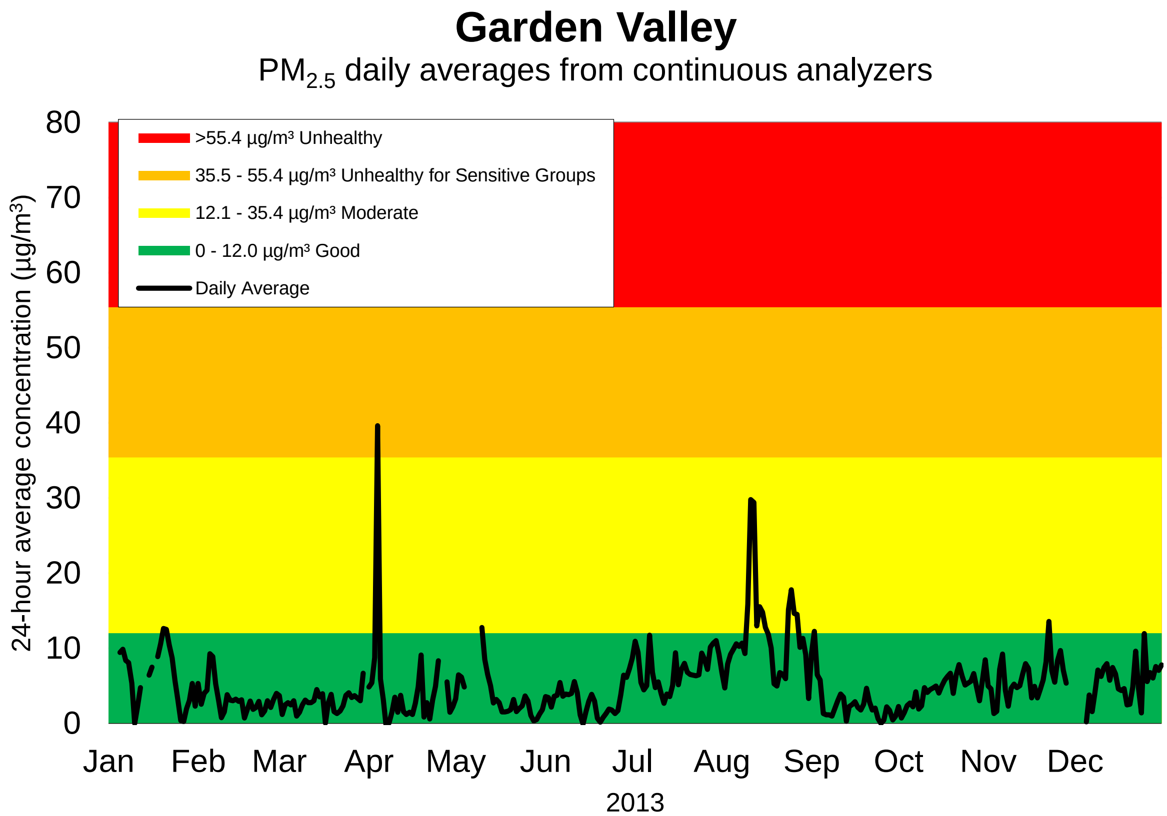


Figure 20. Garden Valley $PM_{2.5}$ daily averages from continuous analyzer.

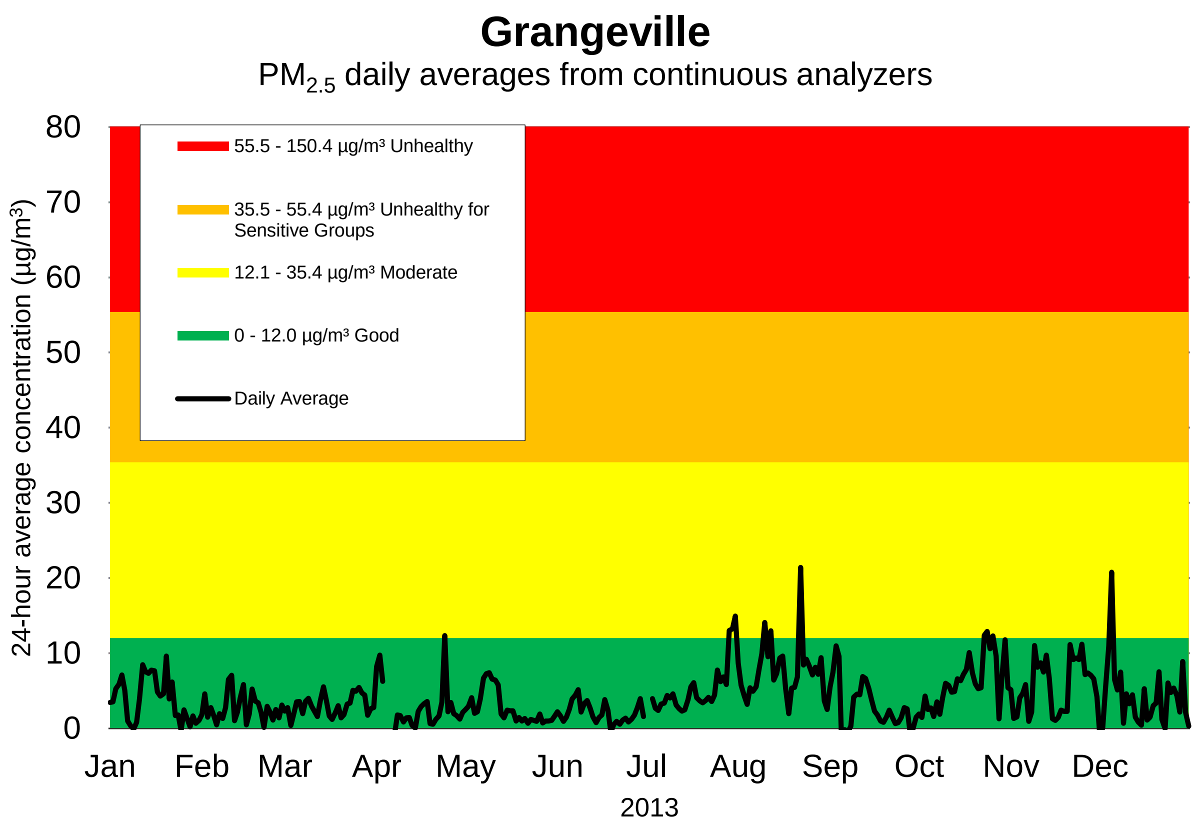


Figure 21. Grangeville $PM_{2.5}$ daily averages from continuous analyzer.

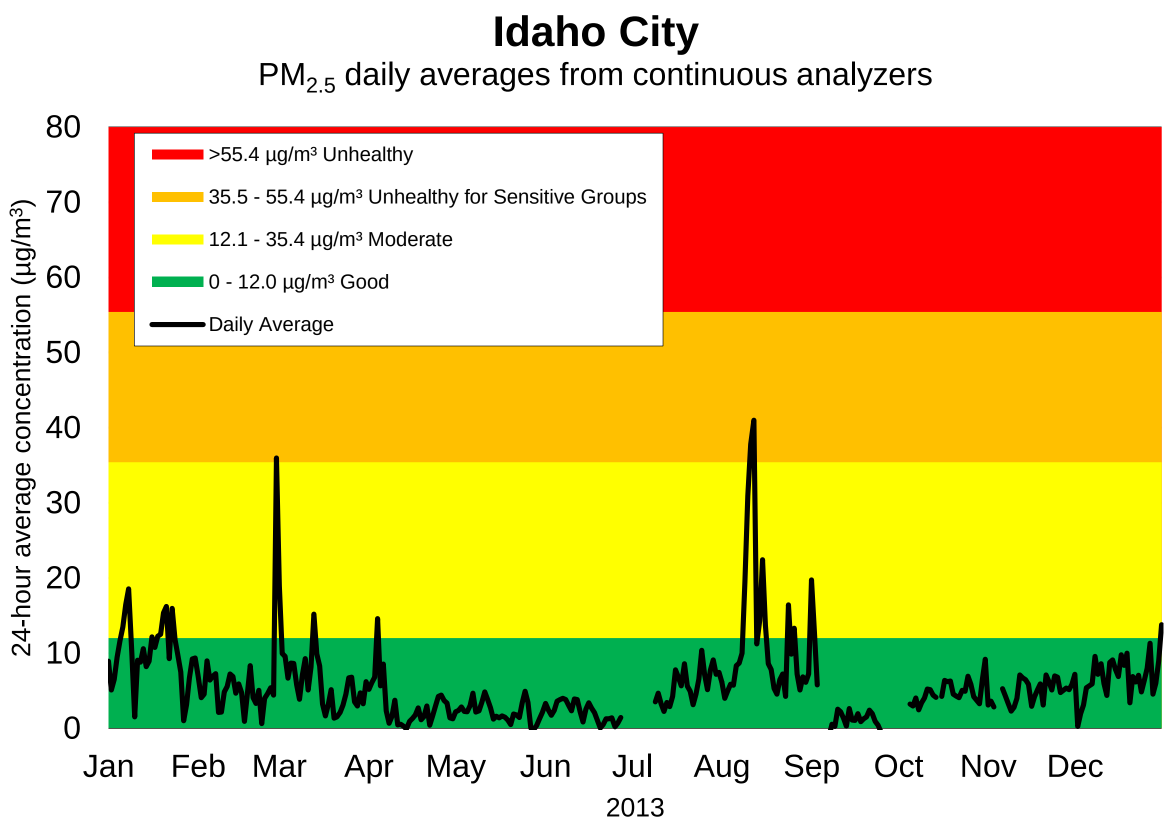


Figure 22. Idaho City $PM_{2.5}$ daily averages from continuous analyzer.

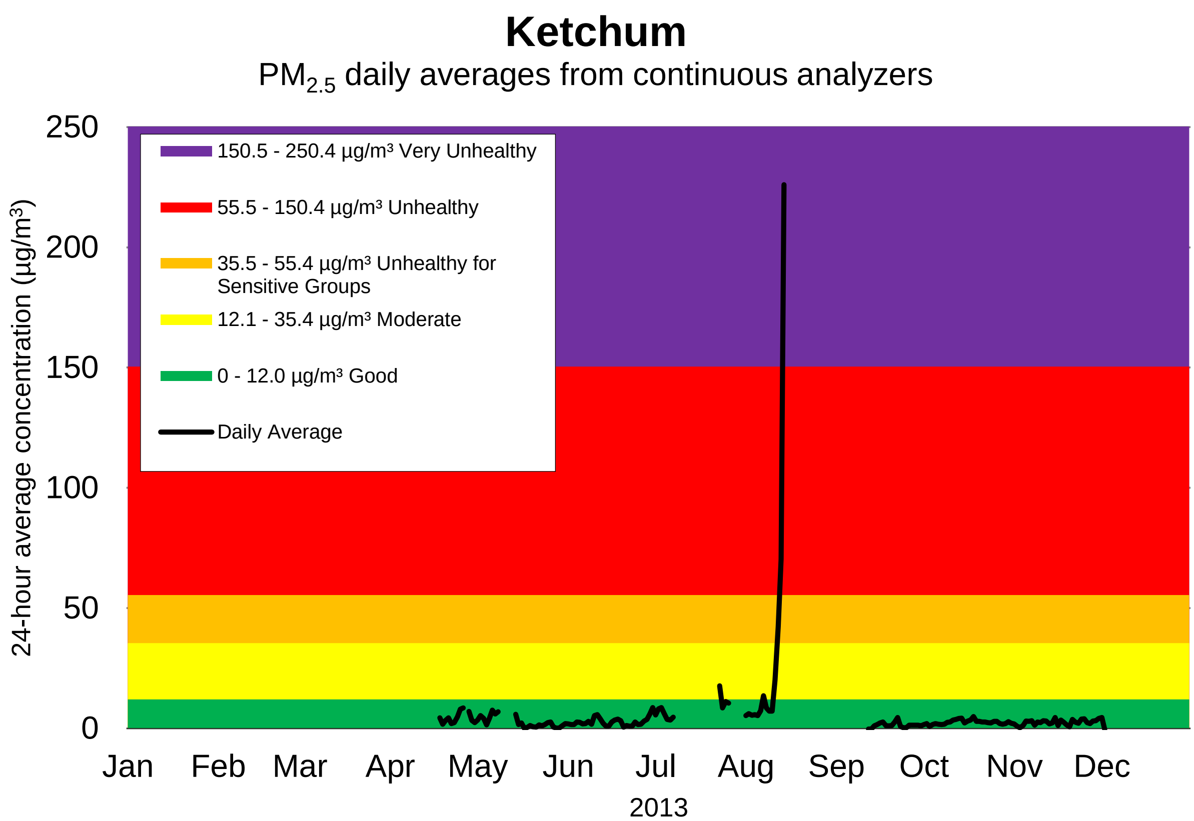


Figure 23. Ketchum $PM_{2.5}$ daily averages from continuous analyzer.

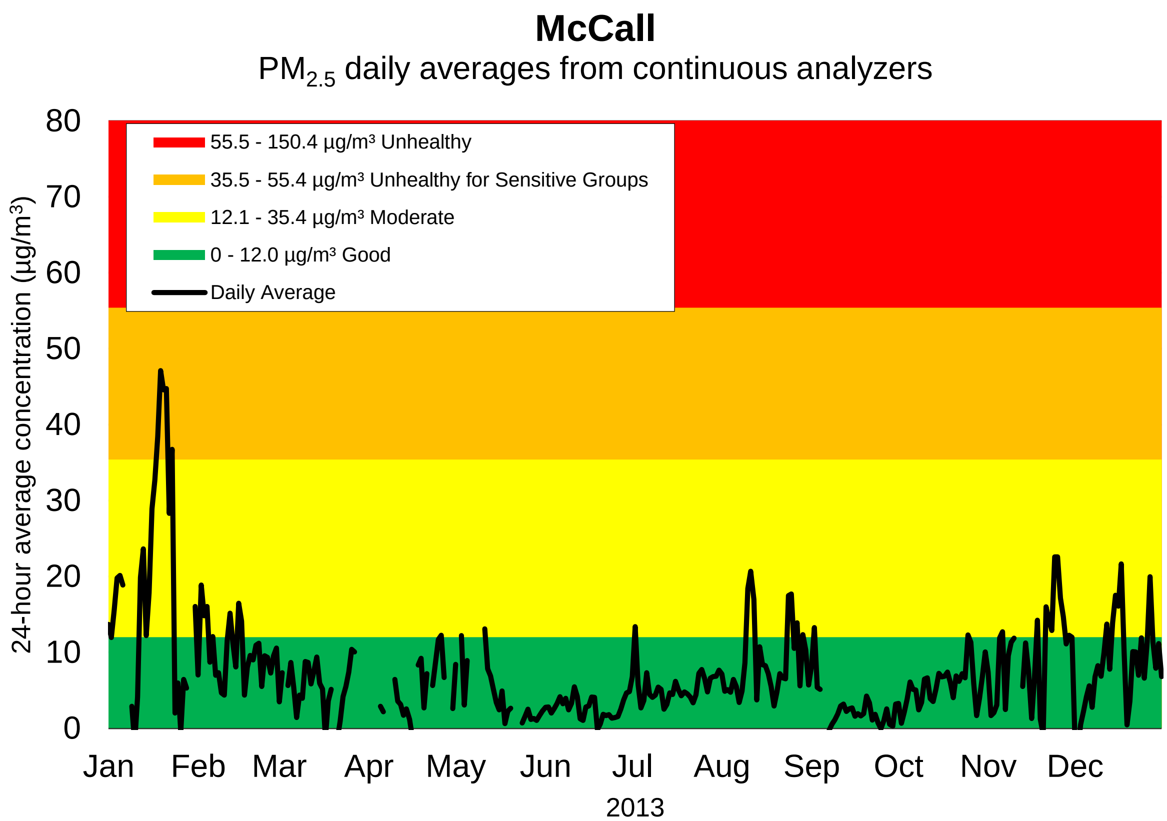


Figure 24. McCall $PM_{2.5}$ daily averages from continuous analyzer.

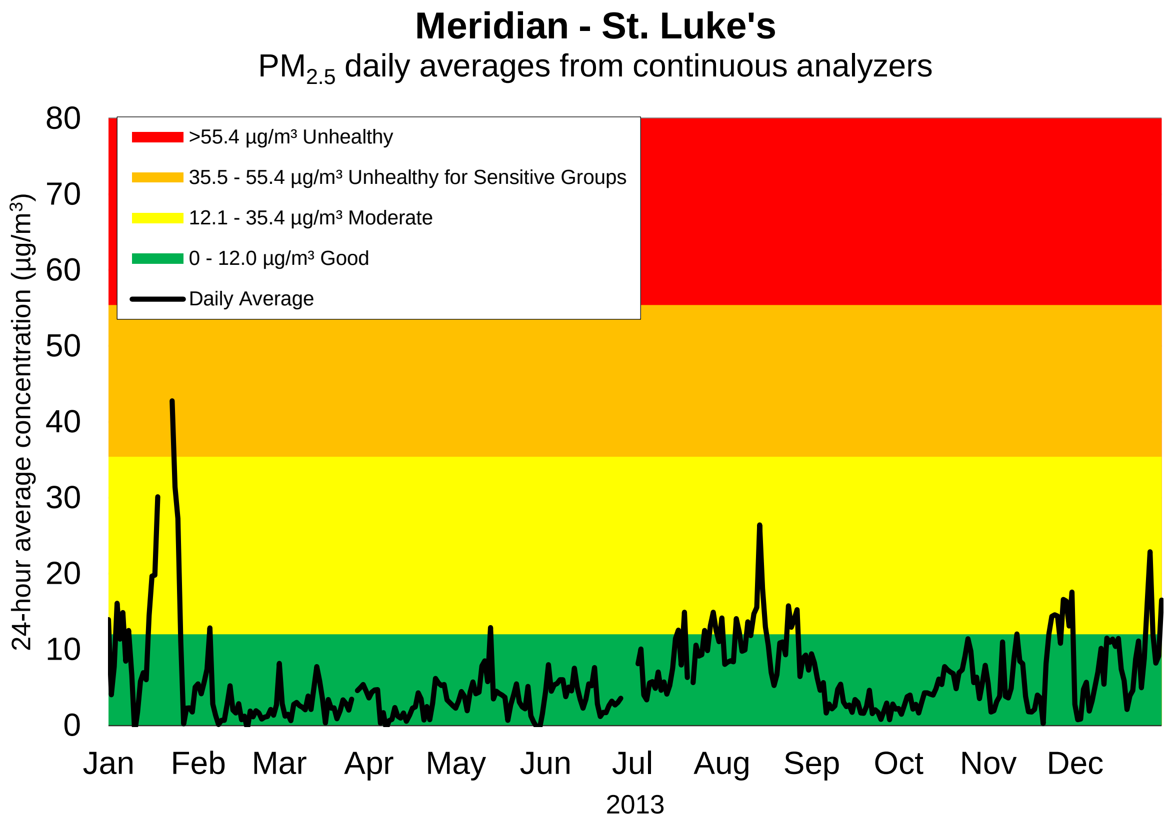


Figure 25. Meridian—St. Luke's $PM_{2.5}$ daily averages from continuous analyzer.

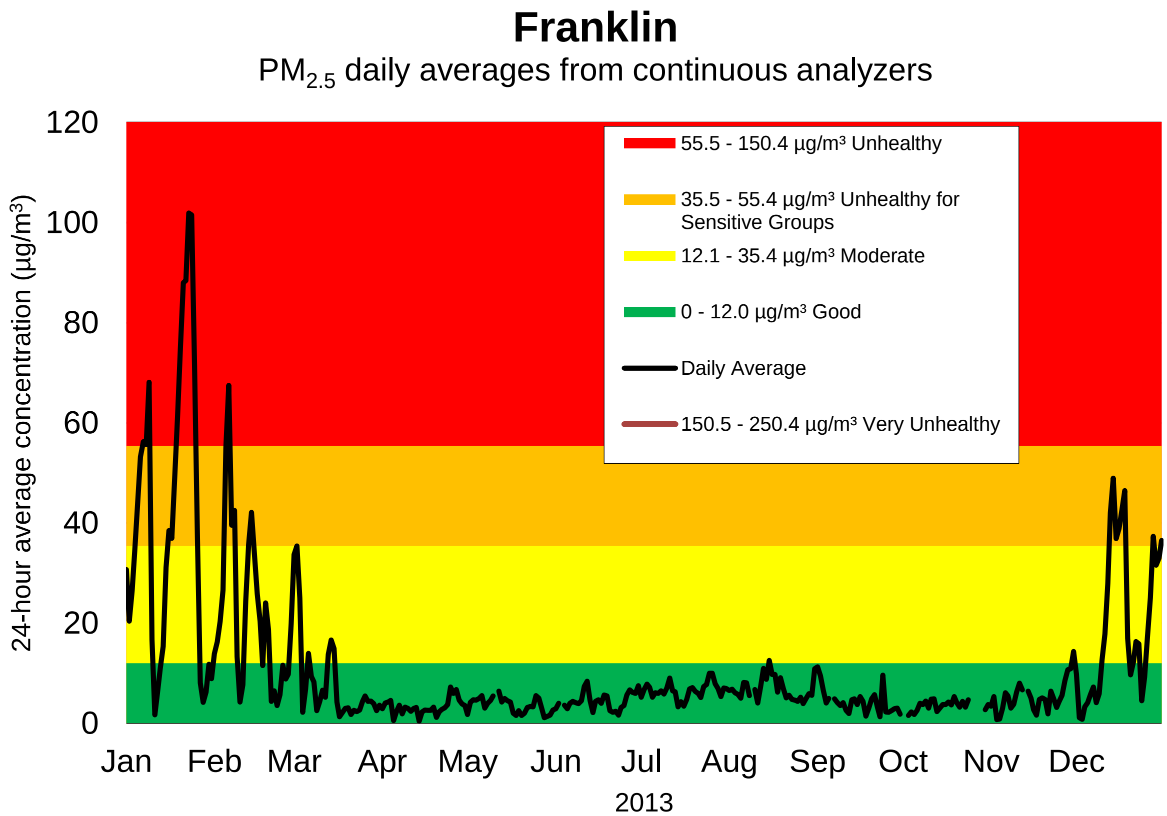


Figure 26. Franklin $PM_{2.5}$ daily averages from continuous analyzer.

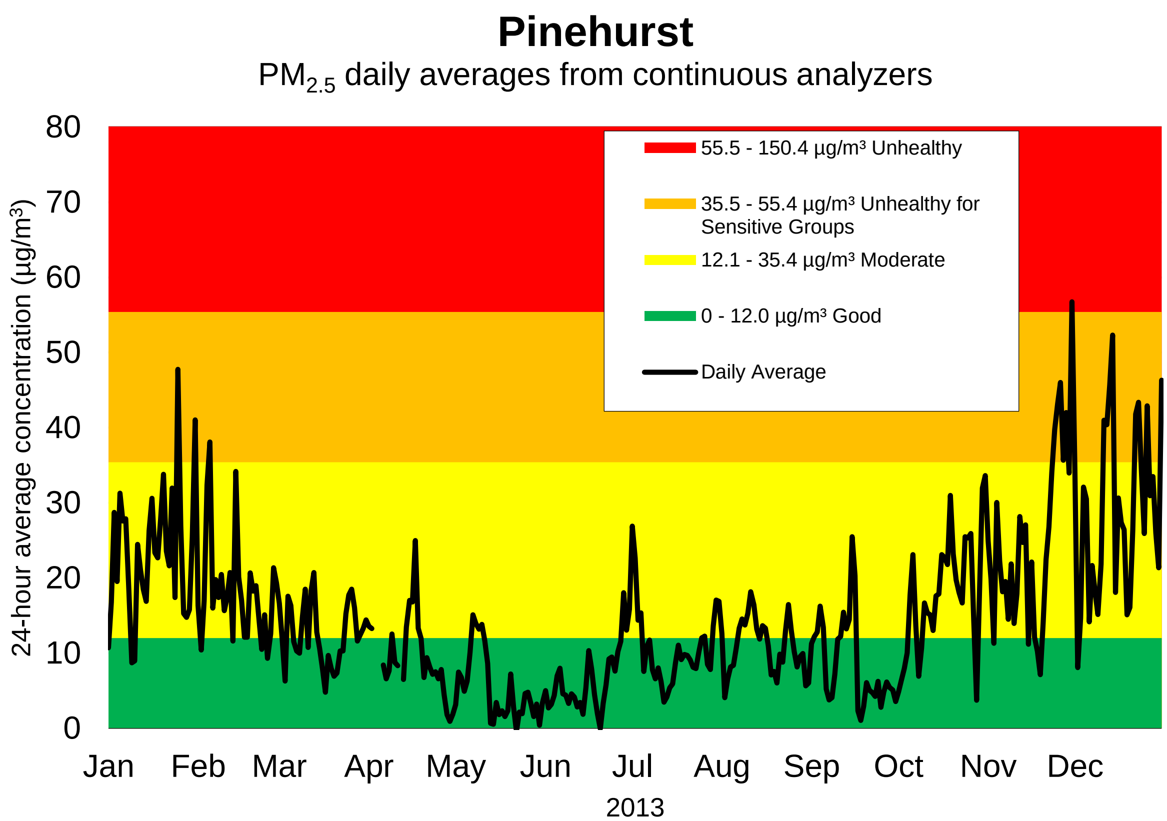


Figure 27. Pinehurst $PM_{2.5}$ daily averages from continuous analyzer.

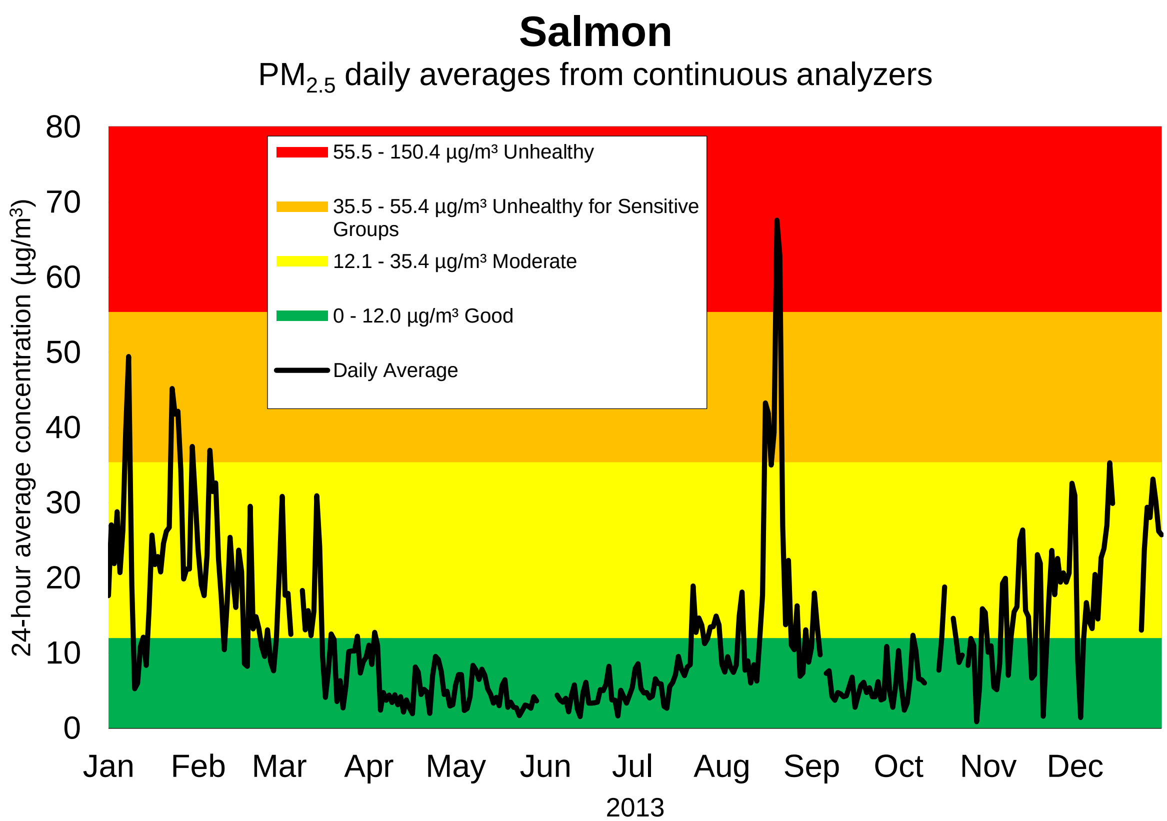


Figure 28. Salmon $PM_{2.5}$ daily averages from continuous analyzer.

4.4 Carbon Monoxide

Carbon monoxide is an odorless, colorless gas that can enter the bloodstream through the lungs and reduce the amount of oxygen that reaches organs and tissues. Carbon monoxide forms when the carbon in fuels does not burn completely. The majority of carbon monoxide comes from vehicle exhaust. In cities, 85%–95% of all carbon monoxide emissions come from motor vehicle exhaust.

Elevated levels of carbon monoxide in the ambient air can occur in urban canyon areas with heavy traffic congestion. The highest levels of carbon monoxide in the outside air typically occur during the colder months of the year when temperature inversions are more frequent. People with cardiovascular disease or respiratory problems might experience chest pain and increased cardiovascular symptoms, particularly while exercising, if carbon monoxide levels are high. High levels of carbon monoxide can affect alertness and vision even in healthy individuals.

Carbon monoxide monitoring stations are generally located in urban canyon areas with heavy traffic congestion, including central business areas, roadsides, and shopping malls. Idaho currently monitors carbon monoxide in Boise as a condition of EPA's *Northern Ada County (Boise), Idaho CO Maintenance Plan*. In 2009, *trace* carbon monoxide monitoring began at the NCore site in Meridian. Trace monitoring provides the ability to determine whether variations in observed concentrations below 1 ppm are from actual changes in atmospheric concentration or from poor sensitivity of older instruments at those low levels. In 2012, near-road monitoring began in Meridian, at 1311 East Central Drive.

Figure 29 shows the second highest 8-hour concentrations at Idaho's monitoring sites versus the NAAQS from 2004 through 2013. The 2nd-highest concentration is displayed on these graphs because, under the federal rule, the 8-hour standard cannot be exceeded more than once per year (thus, choosing the 2nd highest). The data in these graphs demonstrate the sustained low concentrations that have been measured over the last 10 years. None of the 8-hour concentrations measured at any sites exceeded the NAAQS (9 ppm). The maximum 8-hour concentration for carbon monoxide in 2013 was 1.7 ppm, well below the 8-hour standard. These data are provided in Appendix A.

The NAAQS also includes a 1-hour standard for carbon monoxide of 35 ppm (cannot be exceeded more than once in any year). Measured 1-hour concentrations in Idaho are historically much lower than the 35 ppm standard; therefore, 1-hour carbon monoxide trends are not graphed. The maximum and 2nd-highest measured 1-hour carbon monoxide concentrations in 2013 were 4 ppm and 3 ppm, respectively. Additional 1-hour average carbon monoxide data are provided in Appendix A.

For additional information on carbon monoxide, refer to Section 7, "Definitions" and Section 9, "Criteria Air Pollutants," and visit http://www.epa.gov/airquality/carbonmonoxide/.

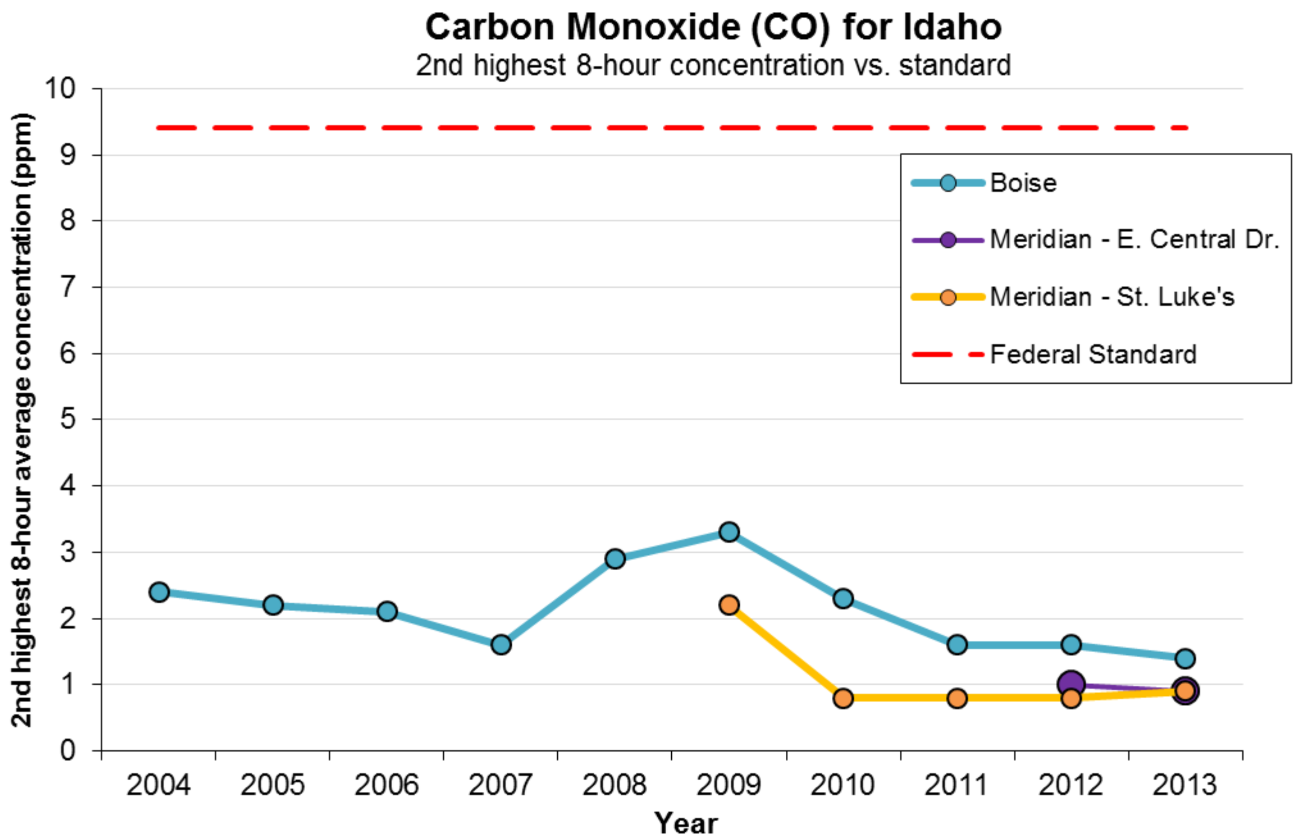


Figure 29. Carbon monoxide 2nd highest 8-hour concentration.

4.5 Sulfur Dioxide

Sulfur dioxide is a colorless, reactive gas produced by burning fuels containing sulfur, such as coal and oil, and by industrial processes. Historically, the greatest sources of sulfur dioxide were industrial facilities that derived their products from raw materials like metallic ore, coal, and crude oil, or that burned coal or oil to produce process heat (petroleum refineries, cement manufacturing, and metal processing facilities). Currently, on-road vehicles, marine craft, and diesel construction equipment also release significant sulfur dioxide emissions to the air.

People with asthma who are active outdoors may experience bronchoconstriction, where symptoms include wheezing, shortness of breath, and tightening of the chest. People should limit outdoor exertion if sulfur dioxide levels are high.

DEQ performs *hotspot* monitoring at the Pocatello and Soda Springs sites. Hotspot monitoring is designed to investigate pollution sources on a local scale. This monitoring assesses impacts from discreet sources to ambient air, rather than emissions monitored directly from a stack or chimney. In 2009, DEQ began trace sulfur dioxide monitoring at the NCore site in Meridian. Trace monitoring determines whether variations in observed concentrations below 0.05 ppm are from actual changes in atmospheric concentration or from poor sensitivity of older instruments at those low levels.

Figure 30 shows the monitoring results from 2013 versus the daily standard for SO_2. The 99th percentile of the 1-hour daily concentrations, averaged over 3 years, is below the NAAQS standard of 0.075 ppm. Data are only available for 2013 because 3 years of data are needed for the average, and the standard was first implemented in 2010.

Additional sulfur dioxide data are located in Appendix A. For information on sulfur dioxide, refer to Section 7, “Definitions” and Section 9, “Criteria Air Pollutants,” and visit http://www.epa.gov/air/sulfurdioxide/.

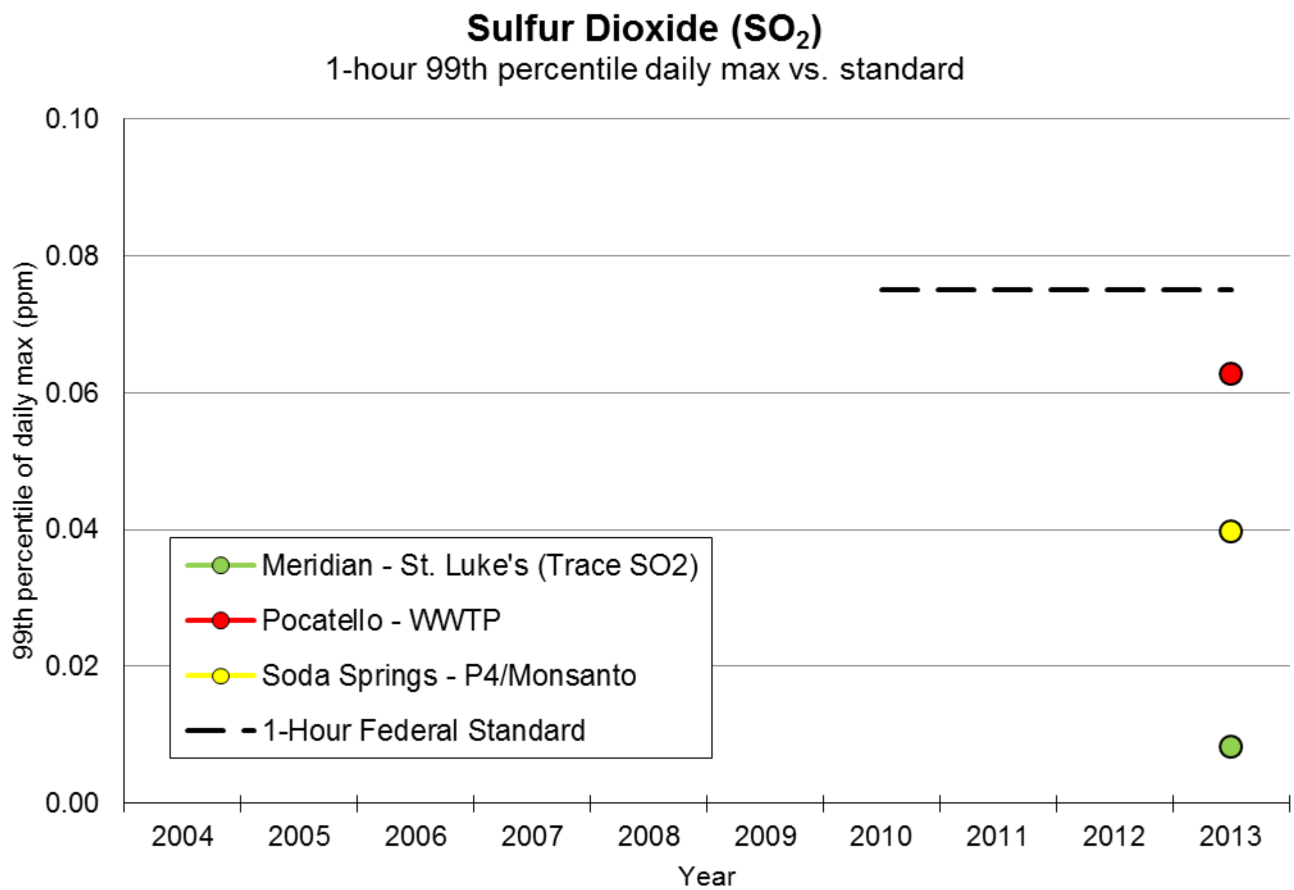


Figure 30. Sulfur dioxide 3-year average of 99th percentile daily maximum.

4.6 Lead

Lead is a highly toxic metal used for many years in household products, automobile fuel, and industrial chemicals. Airborne lead was associated primarily with automobile exhaust and lead smelters. The large reductions in lead emissions from motor vehicles have resulted in great reductions of ambient lead levels across the United States. Industrial processes, particularly primary and secondary lead smelters and battery manufacturers, are now responsible for most of the lead emissions.

People, animals, and fish are mainly exposed to lead by breathing and ingesting it in food, water, soil, or dust. Lead accumulates in the blood, bones, muscles, and fat. Infants and young children are especially sensitive to even low levels of lead. Lead can have health effects ranging from behavioral problems and learning disabilities to seizures and death.

According to EPA, the primary sources of lead exposure are lead-based paint, lead-contaminated dust, and lead-contaminated residual soils. Refer to EPA's website for ways to limit your exposure to these lead sources: www.epa.gov/ttnatw01/hlthef/lead.html.

On November 12, 2008, EPA substantially strengthened the NAAQS for lead. EPA revised the level of the primary (health-based) standard from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$ and revised the secondary (welfare-based) standard to be identical in all respects to the primary standard. This level cannot be exceeded during any rolling 3-month average. In conjunction with strengthening the lead NAAQS, EPA promulgated new monitoring requirements in 2012. Monitoring is now required near lead sources that may contribute to violations of the lead NAAQS. Source-oriented monitoring is required near any source that emits more than 0.5 tons per year. Idaho does not have any sources of lead that trigger source-oriented monitoring. The monitoring regulations also required nonsource-oriented monitoring in metropolitan areas exceeding a 500,000 population at NCore multipollutant monitoring sites, beginning January 2012.

DEQ began lead monitoring at the NCore site in Meridian in January, 2012. The standard states that a rolling 3-month average shall not exceed the level of 0.15 $\mu g/m^3$. Table A-9 in Appendix A lists the maximum values recorded during 2013. None exceeded the standard.

For additional information on lead, refer to the Section 7, "Definitions" and Section 9, "Criteria Air Pollutants," and visit www.epa.gov/air/lead/.

4.7 Nitrogen Dioxide

Nitrogen dioxide is a reddish brown, highly reactive gas that forms from the reaction of nitrogen oxide and oxygen in the atmosphere. The term NO_X, which is frequently used, refers to both nitrogen oxide and nitrogen dioxide. Nitrogen dioxide will react with VOCs and can result in ozone. On-road vehicles like trucks and automobiles are the major sources of NO_X in many airsheds. Industrial boilers and processes, home heaters, and gas stoves can also produce NO_X. Nitrogen dioxide pollution is greatest during the cold weather seasons.

Nitrogen dioxide can cause respiratory symptoms such as coughing, wheezing, and shortness of breath in people with respiratory diseases such as asthma. Long-term exposure can lead to respiratory infections.

Motor vehicle manufacturers have been required to reduce NO_X emissions from cars and trucks since the 1970s. NO_X is not considered a significant pollution problem in Idaho. In 2013, DEQ operated one nitrogen dioxide monitor at its Near Road site in Meridian. The monitoring objectives were to assess ambient NO_X concentrations for evaluating ozone formation processes during the ozone season and for evaluating near-road conditions.

The maximum 1-hour average of nitrogen dioxide measured in 2013 was 0.046 ppm. The averages observed have consistently been well below the hourly and annual NAAQS, as shown in Figure 31 and in the data in Appendix A. Until 2009, these averages could not be used to assess NAAQS compliance since the monitors were not operated for the entire year. Beginning in 2009, DEQ began monitoring nitrogen dioxide year-round at the NCore site in Meridian. In 2012, this monitor was moved to the near-road site at East Central Drive in Meridian.

For additional information on nitrogen dioxide, refer to Section 7, “Definitions” and Section 9, “Criteria Air Pollutants,” and visit http://www.epa.gov/air/nitrogenoxides/.

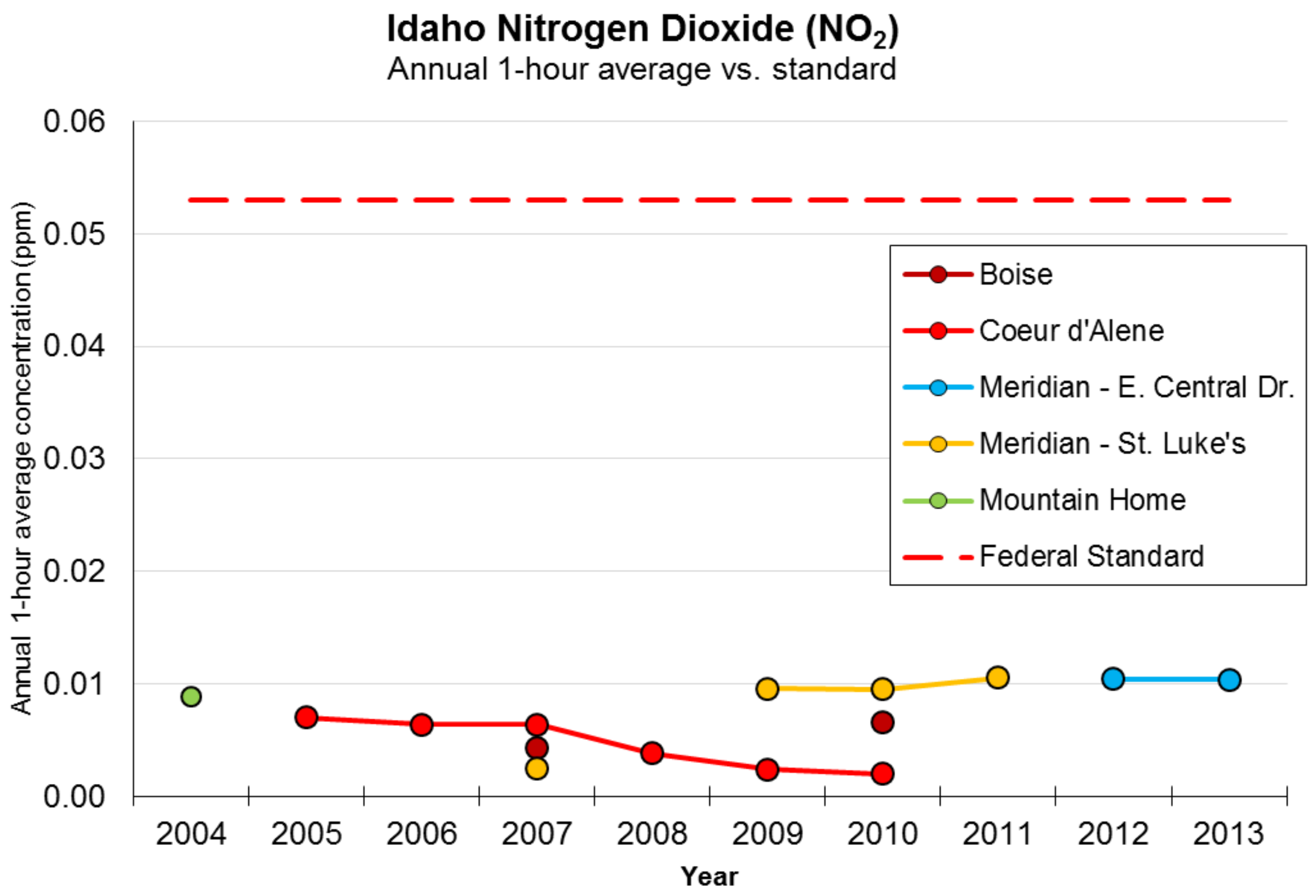


Figure 31. Nitrogen dioxide annual 1-hour average.

5 Air Quality Index

The AQI is reported according to a 500-point scale for each of the major criteria air pollutants: ozone, particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide, nitrogen dioxide, and sulfur dioxide. The "worst denominator" determines the ranking. For example, if an area has a carbon monoxide value of 132 on a given day and all other pollutants are below 50, the AQI for that day would be 132. The AQI scale breaks down into six categories. Each category has a corresponding color shown in Table 4. For information on the concentration breakpoints for each pollutant, refer to Table A-1 in Appendix A.

Table 4. US Environmental Protection Agency Air Quality Index breakpoint definitions.

Levels of Health Concern	Numeric Value	Meaning
Good	0–50	Air quality is satisfactory, and air pollution poses little or no risk.
Moderate	51–100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a small number of people who are unusually sensitive to air pollution.
Unhealthy for sensitive groups	101–150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151–200	Everyone may begin to experience health effects. Members of sensitive groups may experience more serious health effects.
Very unhealthy	201–300	Health alert: everyone may experience more serious health effects.
Hazardous	301–500	Health warnings of emergency conditions. The entire population is more likely to be affected.

The AQI is a national index, so the values and colors used to show local air quality and the associated level of health concern will be the same everywhere in the United States. The number of Good air quality days continues to dominate regionally in Idaho. However, there were periods when the air quality degraded into Moderate, Unhealthy for Sensitive Groups, and Unhealthy categories. Table 5 shows the number of days in each AQI category in Idaho counties where air quality is monitored. In 2013, the highest AQI value of 200 was recorded in Bannock County. This value was in the Unhealthy range.

In Figure 32–Figure 45, the AQI graphs present the distribution of air quality for each individual county. The AQI data summaries for each county, which support the graphs' data, are located in Table A-1 in Appendix A.

Table 5. 2013 Air Quality Index yearly summary.

2013 AQI Ratings							
2013		Number of days in AQI category					
County	Total number of AQI days	Good	Moderate	Unhealthy for sensitive groups	Unhealthy	Very Unhealthy	Highest AQI
Ada	365	301	52	9	3		183
Bannock	365	288	74	2	1		200
Benewah	359	289	69		1		160
Bonner	273	271	2				79
Butte	362	355	7				89
Canyon	312	284	24	3	1		185
Caribou	361	359	2				59
Custer	100	93	5	2			110
Franklin	357	285	40	21	11		175
Latah	34	34					27
Lemhi	346	210	122	12	2		157
Nez Perce	61	60	1				58
Shoshone	365	172	175	17	1		152
Twin Falls	305	292	13				86

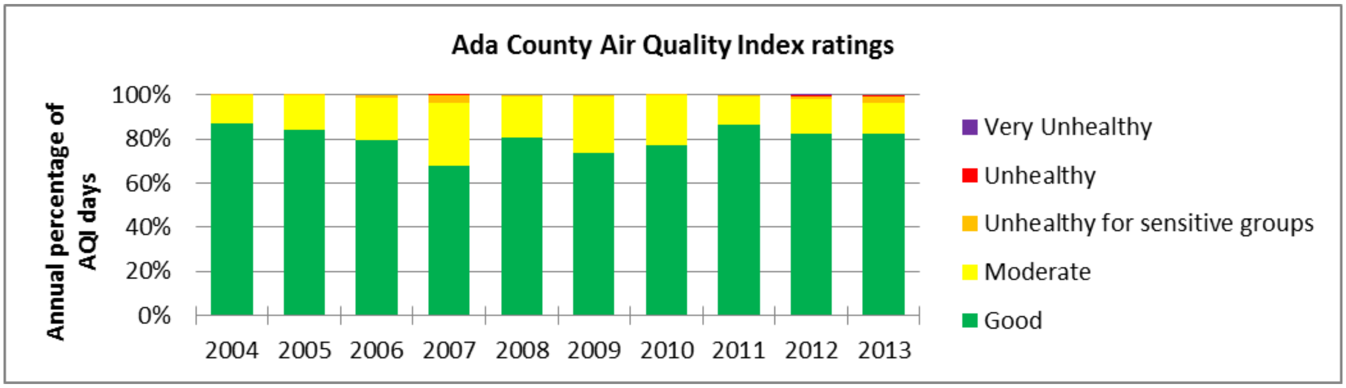


Figure 32. Air quality for Ada County.

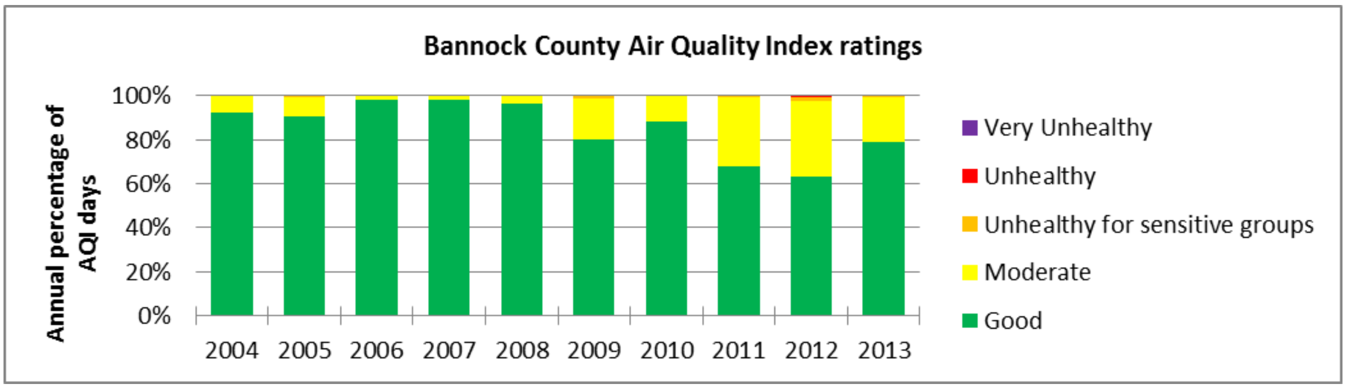


Figure 33. Air quality for Bannock County.

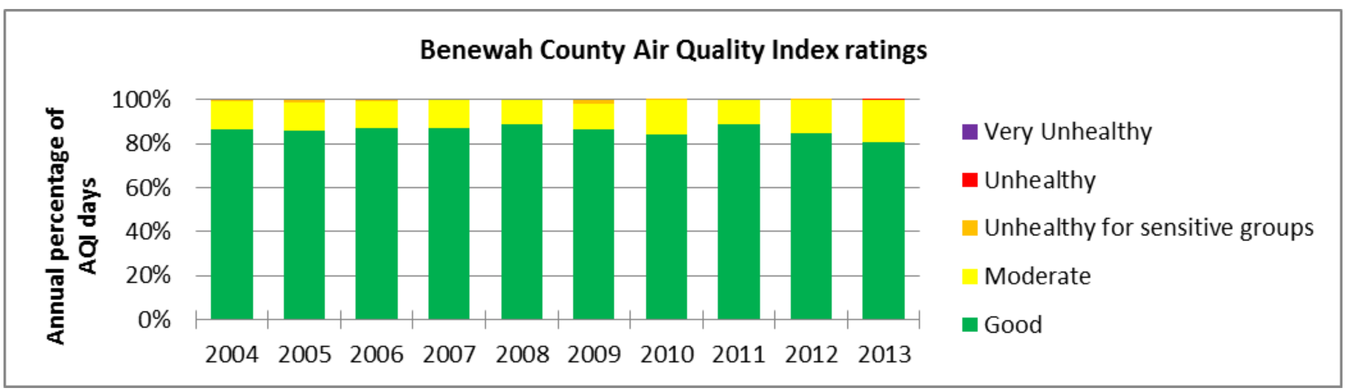


Figure 34. Air quality for Benewah County.

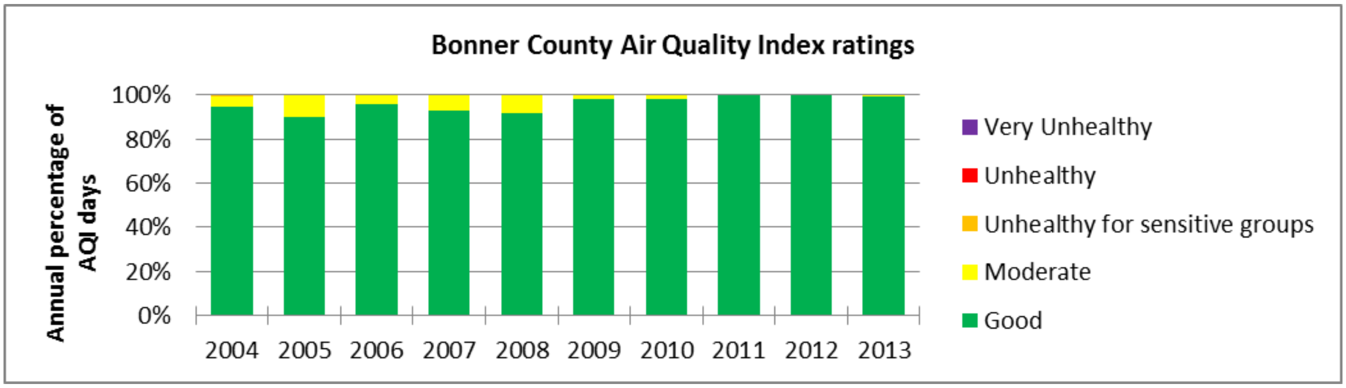


Figure 35. Air quality for Bonner County.

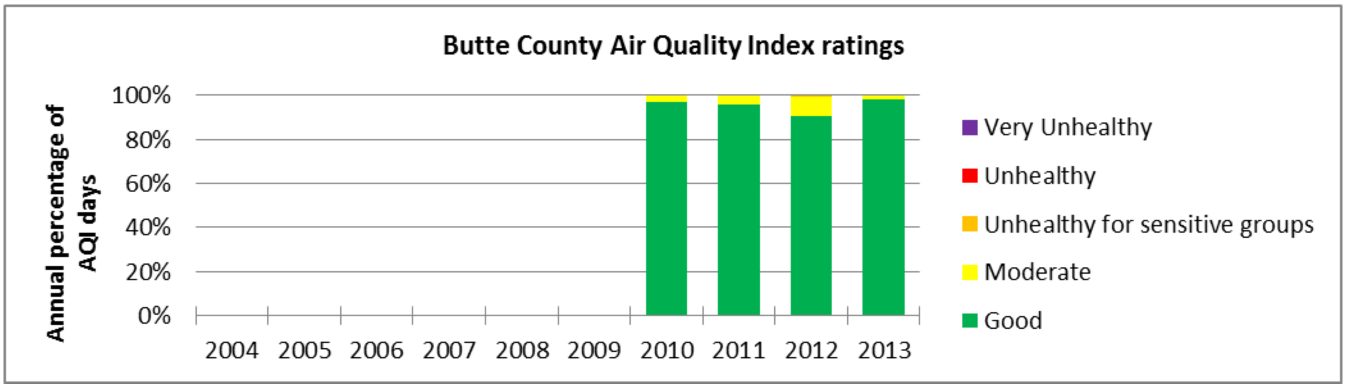


Figure 36. Air quality for Butte County.

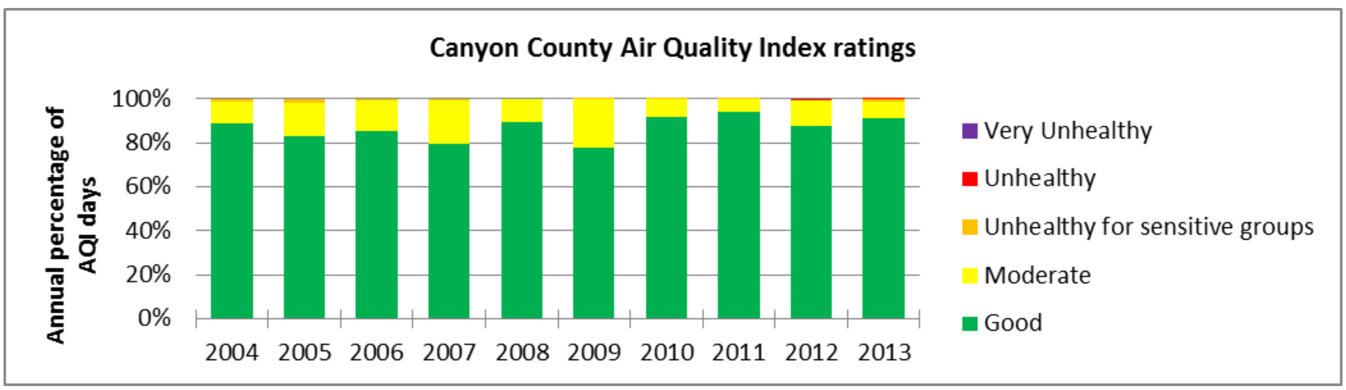


Figure 37. Air quality for Canyon County.

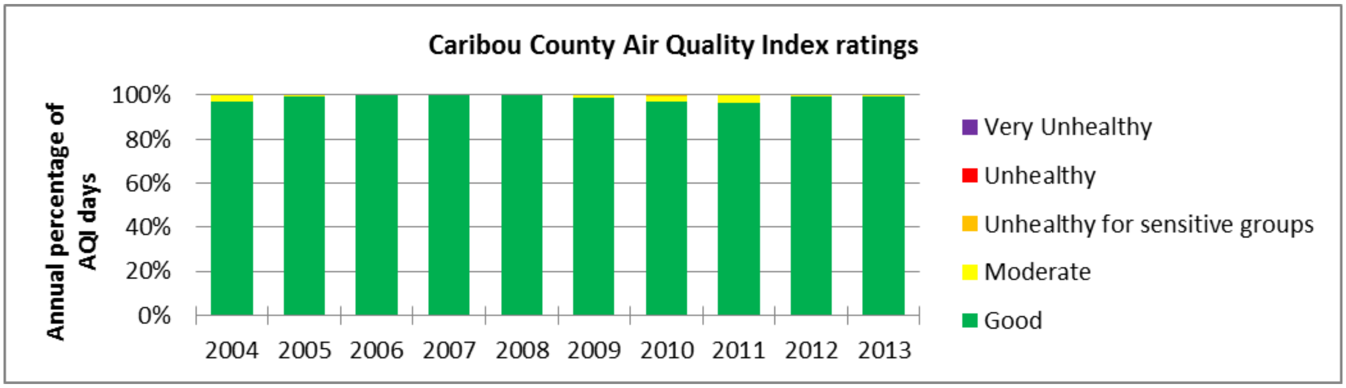


Figure 38. Air quality for Caribou County.

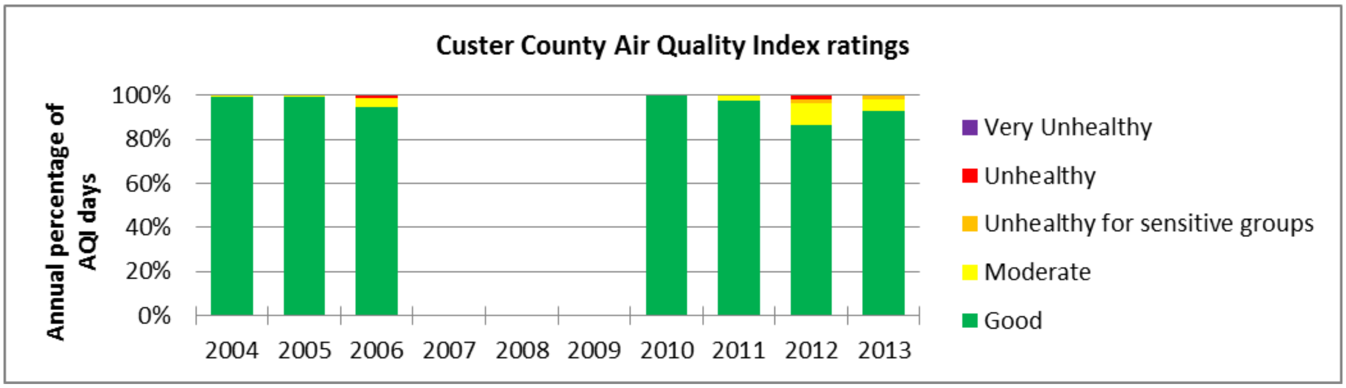


Figure 39. Air quality for Custer County.

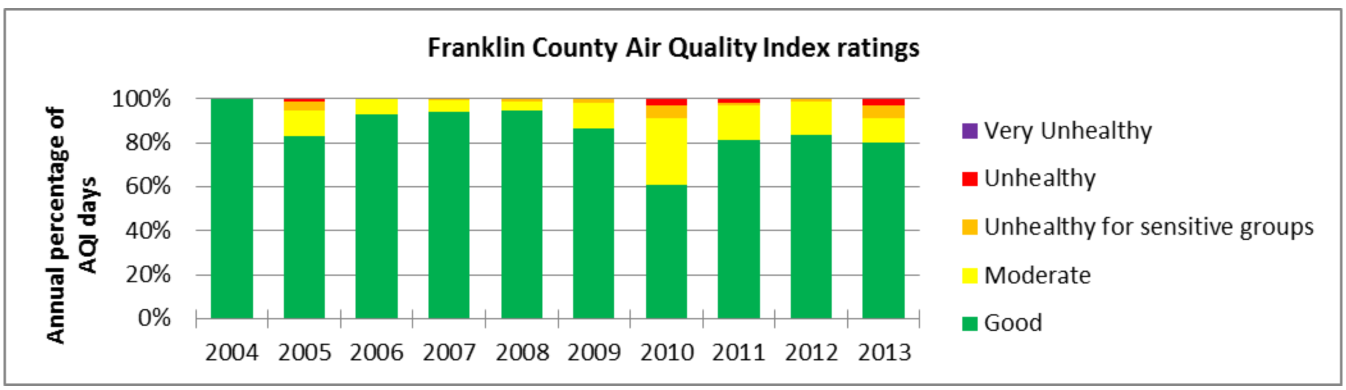


Figure 40. Air quality for Franklin County.

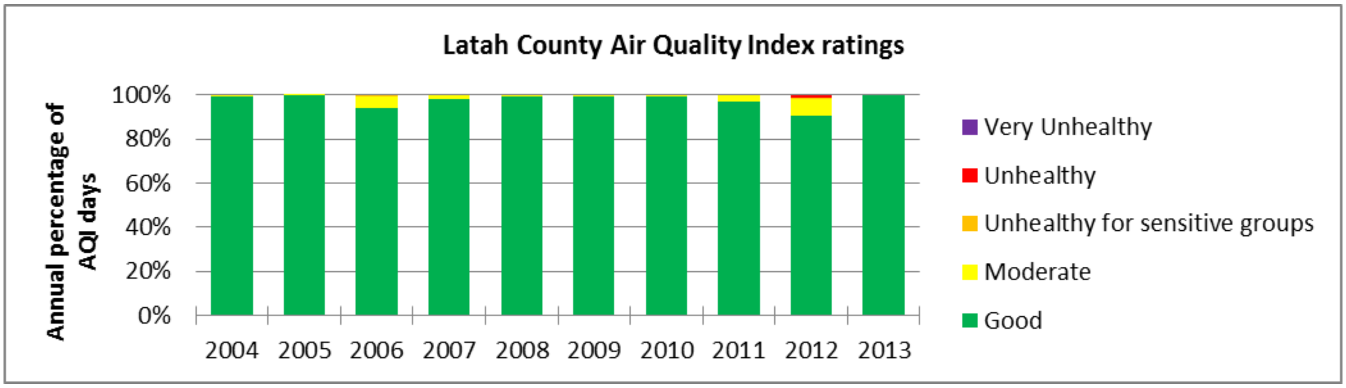


Figure 41. Air quality for Latah County.

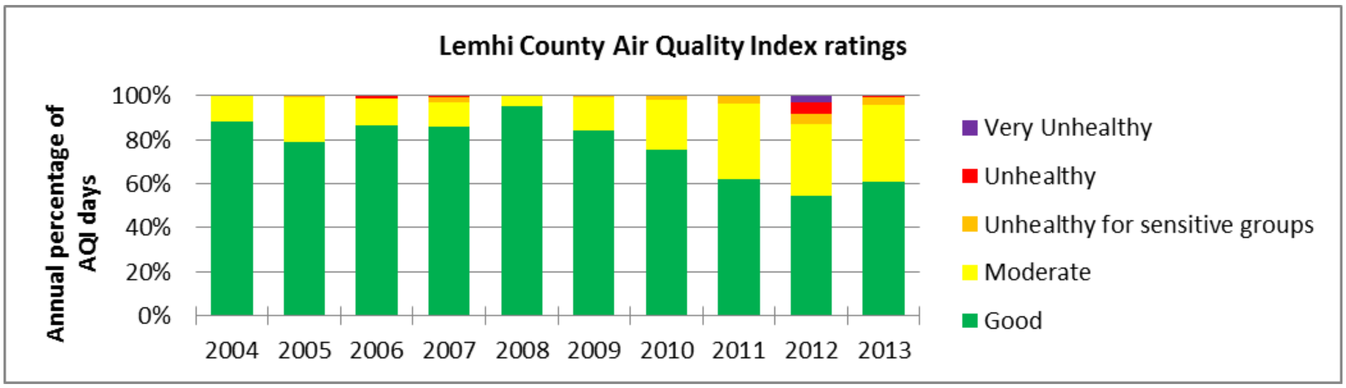


Figure 42. Air quality for Lemhi County.

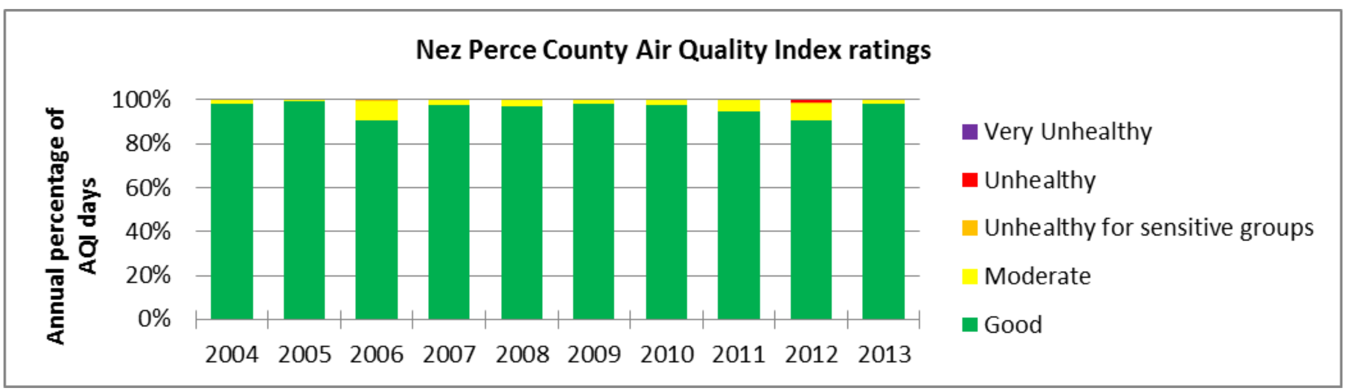


Figure 43. Air quality for Nez Perce County.

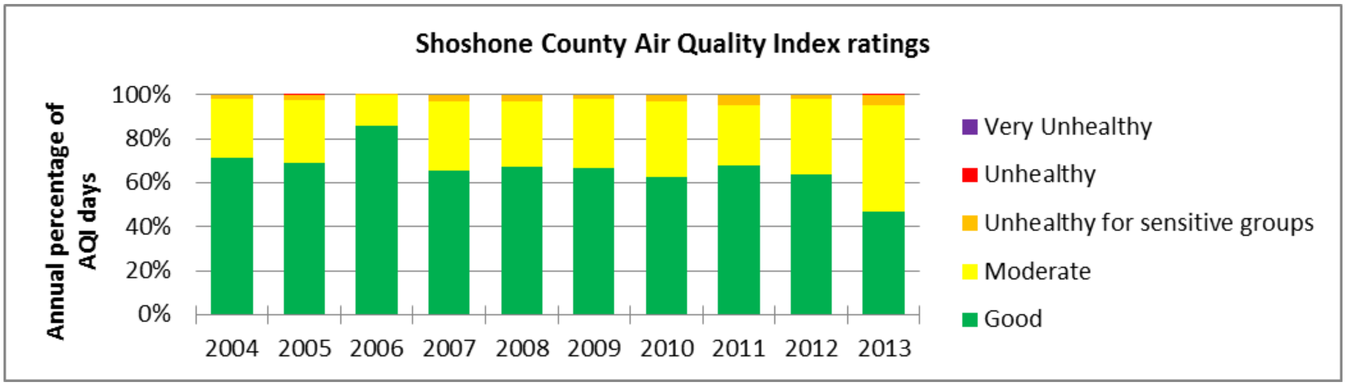


Figure 44. Air quality for Shoshone County.

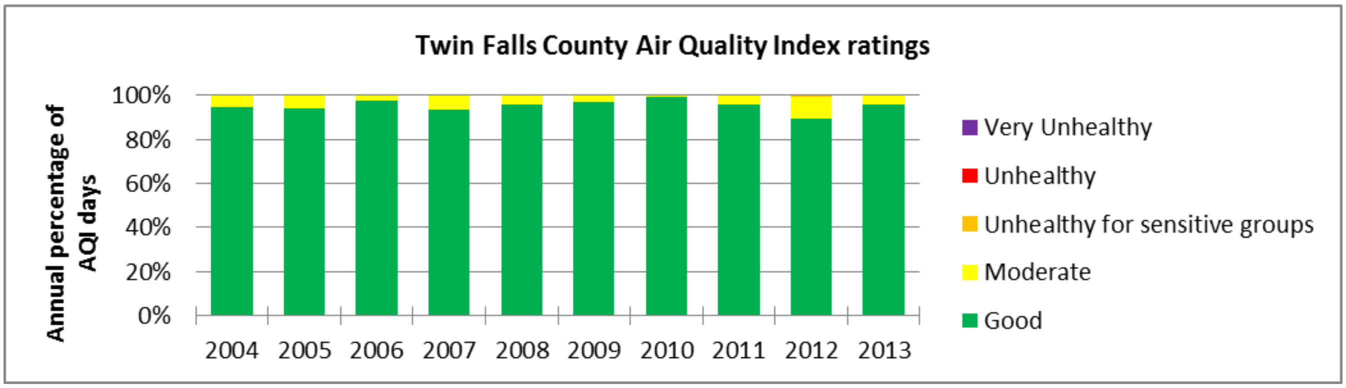


Figure 45. Air quality for Twin Falls County.

6 Impaired Air Quality

6.1 Winter Burn Bans

Idaho has a winter-impaired air quality program primarily targeting sources of particulate matter from open outdoor burning, prescribed fire use, and wood stoves and fireplaces. Idaho's program is implemented through local ordinances in those areas with winter inversion problems. These ordinances specify that public actions such as open burning bans or indoor wood burning bans take place whenever DEQ reports an AQI above a certain value and air stagnation conditions are forecasted to continue for at least 24 hours.

The DEQ web page, Daily Air Quality Reports and Forecasts, lists the daily air quality in many cities and regions in Idaho. Each report lists the air pollutant being monitored, AQI, and burn restrictions, if any, for the day. Residents interested in air quality information can visit the web page to see the forecast for their area.

DEQ issues an air quality advisory for specific locations between 2:00 p.m. and 4:00 p.m. for the next day when air quality is forecast to be poor. The advisories issued are based upon the expected conditions for the next day. Updates are sent out on weekend days at the same times if conditions are expected to be poor. These advisories are provided to local media outlets and to others through e-mail notification lists.

6.2 Summer Ozone Alerts

DEQ forecasts pollution conditions for ozone in the Treasure Valley using pollutant monitoring data and meteorological information. Because ozone needs heat and sunlight to form, it is considered a summertime problem and is only monitored from May 1 through September 30. Ozone pollution can rise to high levels when the valley experiences hot days with few clouds in the sky. The Treasure Valley tends to see daily ozone levels that begin to rise in the late morning and peak in the late afternoon and early evening. This phenomenon follows closely with the time of day that the sun is the highest in the sky through the time temperatures are the hottest. Since we have no control over our weather characteristics, we have to focus on controlling what we put into our air. Under Yellow or Moderate alerts, the public is requested to change certain behaviors to prevent further deterioration of air quality. These alerts are reported to local media outlets and to others through an e-mail notification list.

7 Definitions

Air Toxics

Air toxics are broadly defined as almost 700 pollutants that DEQ considers to be potentially harmful to human health and the environment. These pollutants are listed in the "Rules for the Control of Air Pollution in Idaho" (IDAPA 58.01.01.585 and 586) at http://adminrules.idaho.gov/rules/current/58/0101.pdf. Hazardous air pollutants (see below) are included in this list to identify them as a subset of air toxics.

Criteria Air Pollutant

The Clean Air Act of 1970 defined six criteria air pollutants and established ambient concentrations of each to protect public health. EPA periodically revises the original concentration limits and methods of measurement, most recently in 2012. Table 1 provides the list and the allowed ambient concentrations.

Hazardous Air Pollutant

A hazardous air pollutant (HAP) is an air contaminant identified as toxic in the federal Clean Air Act §112(b). Currently listed, 188 pollutants are considered HAPs (http://www.epa.gov/ttn/atw/188polls.html).

Temperature Inversions

The earth gains and loses most of its energy at its surface. It is warmed by solar heating during the day and cooled by radiation emissions at night. During the late morning and afternoon hours, the air near the surface is warmer than the air aloft and allows for good pollutant dispersion (vertical mixing may be 1,500 meters or more). At night with clear skies, the surface radiates heat into outer space, creating cooler air at the surface and warmer air aloft. Warmer air above cooler air (temperature inversion) is a stable condition and limits the upward movement of pollution because the warmer air acts as a barrier. With little or no wind, pollutants are trapped near the surface (vertical mixing may be 200 meters or less) and can reach high levels of concentration.

Volatile Organic Compound

A volatile organic compound (VOC) is a gas emitted from certain solids and liquids that participates in atmospheric photochemical reactions. This excludes all compounds determined to have negligible photochemical reactivity by EPA and listed in 40 CFR 51.100(s) in effect July 1, 1998.

Visibility/Regional Haze

Visibility is often explained in terms of visual range and light extinction. Visual range is the maximum distance—usually miles or kilometers—that you can see a black object against the horizon. Light extinction is the sum of light scattering and light absorption by fine particles and gases in the atmosphere. The more light extinction, the shorter your visual range will be. Reduced visibility (or visual range) is caused by weather (clouds, fog, and rain) and air pollution (fine particles and gases). The major pollution contributor to reduced visibility is fine particulate matter ($PM_{2.5}$) emissions, which are transported aloft and may remain suspended for a week or longer. Fine particles have a greater impact than coarse particles at locations far from the emitting source because they remain suspended in the atmosphere longer and travel farther. $PM_{2.5}$ also presents some of the most serious health hazards to the public, so you can roughly assume that the worse the visibility, the unhealthier the air is to breathe.

8 Pollution Sources

Area Sources

Area sources are categories of pollution sources, in which each individual industrial source emits pollutants below the thresholds for a point-source facility designation, and includes other categories that are a result of human activities. Area sources are best estimated at a county level in association with population numbers (e.g., natural gas use for home heating, gas stoves, or woodstoves).

Biogenics

Biogenics are natural sources such as trees, plants, grass, crops, and soils. The worldwide emissions rate of these natural hydrocarbons has been estimated to exceed that of nonmethane hydrocarbons originating from human sources. Isoprene, one of the major constituents of biogenic emissions, is very photoreactive and makes biogenic VOCs, a contributor in ozone formation.

Emission Factor

Emission factor is a value derived from source tests, material balance calculations, or engineering comparisons with similar processes. It is used to estimate emissions from process quantities.

Nonroad Mobile Sources

Nonroad mobile sources include farm vehicles, on-site construction/industrial vehicles, logging equipment, small marine craft, aircraft, trains, lawn and garden equipment, and off-road trail machines.

On-road Mobile Sources

On-road mobile sources include cars, trucks, sport utility vehicles, motorcycles and buses.

Point Sources

For the every-third-year statewide emissions inventory, point sources are defined as facilities that have actual annual air pollutant emissions equal to, or exceeding, 1,000 tpy of carbon monoxide; 100 tpy of NO_X, PM_{10}, $PM_{2.5}$, SO_x, or VOCs; or 5 tpy of lead.

Registered Facility

The total of all pollutant-emitting activities located on adjacent or contiguous properties owned or operated by one person or a corporate entity. It includes all of the pollutant-emitting buildings, processes, structures, equipment, control apparatuses, and storage areas at a facility.

9 Criteria Air Pollutants

Ozone

- **What is it?**
  Ozone (O_3), a bluish-colored gas molecule with a strong odor, is composed of three atoms of oxygen. In the upper atmosphere, ozone occurs naturally and partially absorbs the sun's harmful ultraviolet rays. Ozone at ground level is a summertime air pollution problem.

- **How is it caused?**
  Ozone forms when photochemical pollutants from cars, trucks, and industrial sources react with sunlight. Ozone-forming pollutants include NO_X and VOCs; even gasoline-powered yard equipment, paints, solvents, and off-road vehicle motors contribute.

- **When does it happen?**
  Ozone pollution is most common in the summer months, when sunlight and stable atmospheric conditions occur. Ozone levels are usually highest in the afternoon, as sunlight photochemically transforms NO_X and VOCs into ozone.

- **Who is affected?**
  Adults and children, who are active outdoors, people with respiratory disease such as asthma, and people with unusual sensitivity to ozone. During physical activity, ozone penetrates deeper into the lungs and can do more damage.

  Ozone is a reactive gas. For this reason, high ozone concentrations can cause respiratory distress and disease in humans, decreased yields of agricultural crops and forests, and damage to some rubber products, plastics, and paints used outdoors. National crop losses from ozone exposure are estimated at $3 billion to $5 billion annually. Forest losses are harder to estimate.

- **What are the health effects?**
  Ozone can cause coughing and throat irritation, make deep vigorous breathing more difficult, and increase the chance of respiratory infections. It increases sensitivity to allergens and can trigger asthma attacks. The damage it causes to the lungs heals within a few days, but repeated or prolonged exposure may cause permanent damage.

- **What can I do about it?**
  If ozone levels are high and you have a respiratory condition or are normally active outdoors, try to limit your outdoor exertion.

  In the United States, management of ozone and other photochemical oxidants has been a major goal of federal and state clean air legislation (Clean Air Act of 1970). Although many of the pollution control efforts required by the CAA have been implemented, efforts to decrease ozone pollution have been only partially successful.

- **Where is it measured?**
  Unlike other pollutants monitored here in Idaho, ozone is formed when precursor compounds react in the atmosphere. Winds transport ozone and precursor emissions from one area to another. For the Treasure Valley, ozone precursors are emitted into the air in urban areas of the airshed and subsequently travel southeasterly to more rural areas as they react to form ozone. As a result, for the Treasure Valley airshed, DEQ has monitors in Meridian and White Pine.

Particulate Matter

- **What is it?**
  Particulate matter (PM) includes both solid matter and liquid droplets suspended in the air. Particles smaller than 2.5 micrometers in diameter are called *fine* particles, or $PM_{2.5}$. Particles between 2.5 and 10 micrometers in diameter are called *coarse* particles. PM_{10} includes both fine and coarse particles. DEQ considers $PM_{2.5}$ to be one of the major air pollution concerns affecting our state.

  How is it caused?
  $PM_{2.5}$ comes from all types of combustion, including cars, diesel trucks, power plants, wood burning, and from some industrial processes. It can also be formed in the atmosphere by chemical reactions of pollutant gases. The *coarse* particles in PM_{10} typically come from crushing or grinding operations and dust from roads.

- **When does it happen?**
  Daily $PM_{2.5}$ trends in urbanized areas suggest that $PM_{2.5}$ levels peak in association with traffic flow and rush hour periods. Periods of stagnate weather patterns, such as when surface inversions typically occur, contribute to elevated $PM_{2.5}$ trends.

- **Who is affected?**
  People with asthma and heart or lung disease, the elderly, and children are affected. $PM_{2.5}$ also significantly affects visibility.

- **What are the health effects?**
  Fine particulates ($PM_{2.5}$) pose a greater risk to human health than coarse particulates, because they penetrate deeper into the respiratory system. $PM_{2.5}$ exposure can have serious health effects. People with heart or lung diseases are at increased risk of attacks or premature death. Children and the elderly are more likely to develop heart or lung problems. PM_{10} can aggravate respiratory conditions such as asthma.

What can I do about it?
If $PM_{2.5}$ levels are high, people with respiratory or heart disease, the elderly, and children should avoid outdoor exertion. If PM_{10} levels are high, people with respiratory conditions should avoid outdoor exertion.

- **Where is it measured?**
  Due to the health risks associated with particulate matter, both $PM_{2.5}$ and PM_{10} are monitored in various population-oriented locations throughout Idaho.

Carbon Monoxide

- **What is it?**
  Carbon monoxide (CO) is an odorless, colorless gas that can enter the bloodstream through the lungs and reduce the amount of oxygen that reaches organs and tissues.

- **How is it caused?**
  Carbon monoxide forms when the carbon in fuels does not burn completely. Vehicle exhaust contributes 60% of all carbon monoxide. In cities, that contribution can be as high as 95%.

- **When does it happen?**
  Carbon monoxide pollution is at its worst in cold weather because fuels burn less efficiently in low temperatures. Carbon monoxide levels usually peak during morning and evening rush hours.

- **Who is affected?**
  People with cardiovascular disease, such as angina, or cardiovascular or respiratory problems, also fetuses and young infants.

- **What are the health effects?**
  Chest pain and increased cardiovascular symptoms, particularly while exercising. High levels of carbon monoxide can even affect alertness and vision in healthy individuals.

- **What can I do about it?**
  If carbon monoxide levels are high, limit exertion and avoid sources of carbon monoxide such as heavy traffic.

- **Where is it measured?**
  Carbon monoxide monitoring stations are located in urban canyon areas with heavy traffic congestion. These include central business areas, roadsides, and shopping malls. The Boise carbon monoxide monitor is located in downtown Boise and monitors carbon monoxide as part of an air quality maintenance plan. Beginning in 2009, carbon monoxide is also monitored in Meridian and at the near road site starting in 2012.

Sulfur Dioxide

- **What is it?**
  Sulfur dioxide (SO_2) is a colorless, reactive gas.

- **How is it caused?**
  Sulfur dioxide is produced by burning sulfur-containing fuels such as coal and oil and by some industrial processes.

- **Where does it happen?**
  The highest concentrations of sulfur dioxide are usually near large industrial sources.

- **Who is affected?**
  People with asthma who are active outdoors.

- **What are the health effects?**
  Bronchoconstriction can cause wheezing, shortness of breath, and tightening of the chest. When exposure to sulfur dioxide ends, the symptoms should clear up within an hour.

- **What can I do about it?**
  If sulfur dioxide levels are high, limit your outdoor exertion.

- **Where is it measured?**
  Because the large primary sources of sulfur dioxide in Idaho are industrial, DEQ monitors for sulfur dioxide near large facilities with high sulfur dioxide emissions. The monitors running in 2013 were in Pocatello, Soda Springs, and Meridian.

Lead

- **What is it?**
  Lead (Pb) is a highly toxic metal that was used for many years in household products, automobile fuel, and industrial chemicals.

- **How is it caused?**
  Locally, airborne lead is associated primarily with automobile exhaust and lead smelters. Since the phase-out of lead in fuels, cars and trucks are no longer a significant source of lead. The Kellogg Bunker Hill Mine ceased operations in 1981, which also contributed to lead source reduction.

- **When does it happen?**
  Lead concentrations are likely to be highest near sources where current or former lead smelting/processing operations caused particle fallout, especially in nearby soils such as unpaved parking lots.

- **Who is affected?**
  Everyone. Children who are 6 years and younger are most at risk.

- **What are the health effects?**
  Lead can have health effects ranging from behavioral problems and learning disabilities to seizures and death.

- **What can I do about it?**
  According to EPA, the primary sources of lead exposure are lead-based paint, lead-contaminated dust, and lead-contaminated residual soils. Refer to EPA's website at

http://www.epa.gov/ttn/atw/hlthef/lead.html for ways to limit your exposure to these lead sources.

- **Where is it measured?**
  Due to the phase-out of leaded fuels and the closure of Idaho's only lead smelter in 1981, DEQ discontinued monitoring for airborne lead. Historical monitoring was continued until 2002 but was discontinued due to the low levels being measured. With the lowering of the lead standard, DEQ resumed lead monitoring in 2012 at the NCore site in Meridian.

Nitrogen Dioxide

- **What is it?**
  Nitrogen dioxide (NO_2) is a reddish brown, highly reactive gas that forms from the reaction of nitrogen oxide (NO) and oxygen in the atmosphere. Nitrogen dioxide will react with VOCs and can result in the ozone formation.

- **How is it caused?**
  High temperature combustion sources such as power plants and automobiles are major producers of nitrogen oxide. Home heaters and gas stoves can also produce nitrogen oxide.

- **When does it happen?**
  Nitrogen dioxide pollution is greatest in cold weather. It follows a similar trend to carbon monoxide.

- **Who is affected?**
  Children and people with respiratory diseases, such as asthma.

- **What are the health effects?**
  Nitrogen dioxide can cause respiratory symptoms such as coughing, wheezing, and shortness of breath. Long-term exposure can lead to respiratory infections.

- **What can I do about it?**
  Since the 1970s, motor vehicle manufacturers have been required to reduce nitrogen oxide emissions from cars and trucks. It is not a significant pollution problem in Idaho.

- **Where is it measured?**
  Nitrogen dioxide is not a major concern in Idaho. It is monitored year-round at the near road site in Meridian.

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Air Quality Data Summaries

Table A-1. Calculation and breakpoint for the Air Quality Index.

Breakpoints for Criteria Pollutants							AQI Categories	
0_3 (ppm) 8-hour	0_3 (ppm) 1-hour[a]	$PM_{2.5}$ (µg/m^3) 24-hour	PM_{10} (µg/m^3) 24-hour	CO (ppm) 8-hour	SO_2 (ppb) 1-hour	NO_2 (ppb) 1-hour	AQI value	Category
0.000–0.059	—	0.0–12.0	0–54	0.0–4.4	0-35	0-53	0–50	Good
0.060–0.075	—	12.1-35.4	55–154	4.5–9.4	36-75	54-100	51–100	Moderate
0.076–0.095	0.125–0.164	35.5-55.4	155–254	9.5–12.4	76-185	101-360	101–150	Unhealthy for sensitive groups
0.096–0.115	0.165–0.204	55.5-150.4	255–354	12.5–15.4	186-304(c)	361-649	151–200	Unhealthy
0.116–0.374	0.205–0.404	150.5–250.4	355–424	15.5–30.4	305-604(c)	650-1249	201–300	Very unhealthy
(b)	0.405–0.504	250.5–350.4	425–504	30.5–40.4	605-804(c)	1250-1649	301–400	Hazardous
(b)	0.505–0.604	350.5–500.0	505–604	40.5–50.4	805-1004(c)	1650-2049	401–500	

a. Areas are generally required to report the AQI based on 8-hour ozone values. However, there are a small number of areas where an AQI based on 1-hour ozone values would be safer. In these cases, in addition to calculating the 8-hour ozone value, the 1-hour ozone value may be calculated, and the greater of the two values reported.

b. Eight-hour ozone values do not define higher AQI values (≥ 301). AQI values of 301 or greater are calculated with 1-hour ozone concentrations.

c. One-hour SO_2 values do not define higher AQI values (≥200). AQI values of 200 or greater are calculated with 24-hour SO_2 concentrations.

Table A-2. 2013 Air Quality Index summary report.

2013		Number of Days for AQI Categories						Number of Days for Main AQI Pollutants					
County	Total Number of AQI Days	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy	Max AQI	CO	NO_2	O_3	SO_2	$PM_{2.5}$	PM_{10}
Ada	365	301	52	9	3		183		89	166		52	58
Bannock	365	288	74	2	1		200				109	190	66
Benewah	359	289	69		1		160					359	
Bonner	273	271	2				79						273
Butte	362	355	7				89			356		6	
Canyon	312	284	24	3	1		185					56	256
Caribou	361	359	2				59				361		
Custer	100	93	5	2			110					100	
Franklin	357	285	40	21	11		175					357	
Latah	34	34					27					34	
Lemhi	346	210	122	12	2		157					346	
Nez Perce	61	60	1				58					61	
Shoshone	365	172	175	17	1		152					347	18
Twin Falls	305	292	13				86					305	

Table A-3. 2013 monitor values summary for $PM_{2.5}$.[a]

					24-hour $PM_{2.5}$								
Data Year	**County**	**# Obs.**	**1st Max**	**2nd Max**	**3rd Max**	**4th Max**	**98th %**	**# Exceed**	**Annual Mean**	**Monitor #**	**Site ID**	**Site Address**	**City**
2013	Ada	119	117.1	97.9	88.8	44.9	88.8	9	12.23	1	160010010	St. Luke's–520 S. Eagle Rd.	Meridian
2013	Benewah	57	72.1	35.2	32.8	31.7	35.2	2	12.13	1	160090010	9th and Center	St. Maries
2013	Canyon	56	120.4	49.9	45.1	44.8	49.9	4	13.04	1	160270002	Nampa Fire Station–923 1st St.	Nampa
2013	Franklin	116	67.4	65.0	54.9	48.5	54.9	6	9.94	1	160410001	Water Treatment Facility–East 4800 South	Franklin
2013	Lemhi	339	67.5	62.9	49.4	45.2	41.9	>10	12.55	3	160590004	618 N. St. Charles St.	Salmon
2013	Shoshone	361	56.7	52.2	47.7	46.3	43.1	>10	14.69	4	160790017	Pinehurst School–106 Church St.	Pinehurst

a. Values indicated come from Federal Reference or Equivalent Method measurements.

b. The # exceed indicates the number of times measurements exceeded the National Ambient Air Quality Standard (NAAQS) of 35.5 micrograms per cubic meter (µg/m^3). Exceedances themselves do not cause an area to be designated nonattainment, but they can cause the 98th percentile value to be higher, which when averaged with the previous 2 years, can cause an area to be designated nonattainment. For example, in 2008, the 98th percentile for Pinehurst was above the standard at 36.2 µg/m^3. Since the 3-year average of the 2006–2008 98th percentile is 34.7 µg/m^3, which is below the standard, the area is classified as attainment.

Table A-4. 2013 monitor values summary for PM_{10}.[a]

		24-hour PM_{10}										
Data Year	**County**	**# Obs**	**1st Max**	**2nd Max**	**3rd Max**	**4th Max**	**# Exceed Actual**	**Estimated Exceedances**	**Monitor #**	**Site ID**	**Site Address**	**City**
2013	Ada	8146	101	99	91	85	0	0	3	160010009	Fire Station #5–16th and Front	Boise
2013	Bannock	8600	66	62	57	57	0	0	3	160050015	Garret and Gould	Pocatello
2013	Bonner	3317	111	87	31	30	0	0	3	160170003	2105 North Boyer Ave.	Sandpoint
2013	Bonner	3258	27	27	23	23	0	0	3	160170005	1601 Ontario St.	Sandpoint
2013	Canyon	7347	97	90	77	75	0	0	2	160270002	Nampa Fire Station–923 1st St.	Nampa
2013	Shoshone	8320	156	83	50	40	1	1	3	160790017	Pinehurst School–106 Church St.	Pinehurst

a. Values indicated come from Federal Reference or Equivalent Method measurements.

Table A-5. 2013 monitor values for ozone.

		8-hour O_3												
Data Year	**County**	**1st Max**	**2nd Max**	**3rd Max**	**4th Max**	**Days >Std.**	**Required Days**	**# Days**	**% Days**	**Monitor #**	**Site ID**	**Site Address**	**City**
2013	Ada	0.070	0.065	0.064	0.062	0	153	151	99	1	160010010	St. Luke's–520 S. Eagle Rd.	Meridian
2013	Ada	0.094	0.083	0.075	0.074	2	153	151	99	1	160010017	White Pine Elementary–401 E. Linden	Boise

Table A-6. 2013 monitor values summary for carbon monoxide.

		1-hour CO				8-hour CO						
Data Year	County	# Obs.	1st Max	2nd Max	# Exceed	1st Max	2nd Max	# Exceed	Monitor #	Site ID	Site Address	City
2013	Ada	8570	1.319	1.287	0	0.9	0.9	0	1	160010023	1311 East Central Drive	Meridian
2013	Ada	6605	1.297	1.164	0	0.9	0.9	0	1	160010010	St. Luke's–520 S. Eagle Rd.	Meridian
2013	Ada	8327	4.0	3.0	0	1.7	1.4	0	1	160010014	Eastman Building–166 N. 9th St.	Boise

Table A-7. 2013 monitor values summary for nitrogen dioxide.

		1-hour NO_2			Annual NO_2					
Data Year	County	# Obs.	1st Max	2nd Max	Mean	# Exceed	Monitor #	Site ID	Site Address	City
2013	Ada	7877	0.046	0.045	0.0109	0	1	160010010	1311 East Central Drive	Meridian

Table A-8. 2013 monitor values summary for sulfur dioxide.

		1-hour SO_2						
Data Year	County	# Obs.	1st Max	2nd Max	99th Percentile	Site ID	Site Address	City
2013	Ada	6131	0.0151	0.0131	0.0108	160010010	St. Luke's–520 S. Eagle Rd.	Meridian
2013	Bannock	8561	0.3629	0.0418	0.0401	160050004	Sewage Treatment Plant–Batiste and Chubbuck	Pocatello
2013	Caribou	8445	0.0427	0.0372	0.0314	160290031	P4/Monsanto–Five Mile Rd.	Soda Springs

Table A-9. 2013 monitor values summary for lead.

		Rolling 3-month average Pb							
Data Year	County	# Obs.	1st Max	2nd Max	3rd Max	4th Max	Site ID	Site Address	City
2013	Ada	57	0.007	0.006	0.004	0.004	160010010	St. Luke's–520 S. Eagle Rd.	Meridian