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2006 Air Quality Monitoring Data Summary

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The 2006 Air Quality Monitoring Data Summary is available for viewing or downloading on the internet at:

http://www.deq.state.id.us/air/

Links to additional documents for download are also available at the Web site.

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 U.S. Environmental Protection Agency (EPA) sets national ambient air quality standards (NAAQS) for these pollutants. These criteria air pollutants are:

- Particulate Matter (PM_{10} ≤10 micrometers, $PM_{2.5}$ ≤ 2.5 micrometers in diameter)
- Carbon Monoxide
- Sulfur Dioxide
- Nitrogen Dioxide
- Ozone
- Lead

In Idaho, monitoring for the criteria pollutants occurs primarily in areas of high population where the potential for human exposure is greatest. Particulate matter is currently the most common criteria pollutant of concern in Idaho because particulate sources are widespread throughout the state. Common sources include windblown dust, re-entrained 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 it was historically the particulate size of concern. However, $PM_{2.5}$, or PM Fine, has been monitored in Idaho since 1998 and is now the pollutant of concern. Numerous studies have associated fine particulate matter 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 NAAQS was changed 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. The 24 hour standard for $PM_{2.5}$ was lowered from 65 µg/m³ to 35 µg/m³ to provide increased protection against health effects associated with short-term exposure (including premature mortality and increased hospital admissions and emergency room visits),.

Another historical pollutant of concern in Idaho is carbon monoxide (CO). The primary source of CO is incomplete fossil fuel combustion. CO 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 CO nonattainment area in the state. When the SIP and Maintenance Plan were accepted by EPA, it was reclassified as a maintenance area on December 27, 2002. No violations of the 1 or 8-hour CO NAAQS have occurred since 1991.

Sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) sources are few and very localized because these pollutants come primarily from large industrial sources (transportation sources also contribute to NO_2). There is little heavy industry in Idaho and elevated SO_2 and NO_2 concentrations in ambient air are typically not found. However, due to concerns of some localized sources, DEQ has monitored for one or both of these pollutants in Boise, Pocatello, Moyie Springs, Mountain Home, and Soda Springs. In the past 10 years of targeted monitoring, DEQ has not measured significant concentrations of these

pollutants at these monitoring sites. DEQ initiated NO_2 monitoring near Coeur d'Alene on January 1, 2005 to characterize emissions in the area.

The fifth criteria pollutant monitored by DEQ is ozone. Ozone (O_3) has been monitored in the Treasure Valley since 2002, and in Coeur d'Alene beginning in 2005. Ozone is created when combustion by-products 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 is currently proposing to lower the ozone standard (final decision in March 2008). This will put the Treasure Valley at a much higher risk of non-attainment.

Lead (Pb) is the sixth criteria pollutant and is not currently being monitored by DEQ. Lead (Pb) 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 1970's and early 1980's, airborne Pb concentrations at this monitoring site were very low through the 1990's. DEQ discontinued monitoring for lead in 2002.

DEQ monitored for toxic air pollutants in the Treasure Valley from 2003 to the beginning of 2005 to determine if concentrations are at levels that could have adverse health affects. These health effects include, but are not limited to, increased cancer risk and respiratory, cardiovascular, and neurological effects. EPA, through their National Air Toxics Assessment (NATA) program, predicts cancer and non-cancer risk values across Idaho's airsheds using emissions estimates of certain air toxic compounds.

While Idaho generally enjoys good air quality, in many ways our airsheds are faced with new challenges. Some of these challenges are related to 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. Based on local ordinances, DEQ may issue a burn ban when concentrations of these air pollutants reach or exceed the health-based standards or limits established by state law or 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 login to DEQ's Internet web site at http://www.deq.state.id.us/air/aqindex.cfm. DEQ issues a news bulletin to local news media, law enforcement, and fire officials each time a burn ban is imposed. There were a number of voluntary and mandatory bans issued in 2006.

Real-time air monitoring data are available on the Internet at http://www.tcsn.net/family/Idaho/index.html. We encourage you to visit our Web site at http://www.deq.state.id.us/ to find more extensive air quality data, educational materials, and discussions of current topics.

We are expanding and refining our Internet site to better serve the residents of Idaho. We want your feedback on our air quality data and program. Please submit your comments via email to Bruce Louks; Monitoring, Modeling, & Emissions Inventory Manager, at Bruce.Louks@deq.idaho.gov or call at 208-373-0294.

Air Quality Standards

The federal Clean Air Act (CAA) requires EPA to set National Ambient Air Quality Standards (NAAQS) for 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 has established standards for six criteria pollutants. The list below contains seven pollutants, which include two size ranges of particulate matter.

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

EPA adopted a lower fine particulate NAAQS and revoked the annual PM_{10} standard, both became effective December 17, 2006.

Air Quality Standards for Criteria Pollutants

Pollutant	Standard	Level
Ozone	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.	0.084 ppm
Particulate Matter (10 micrometers)	The 3-year annual average of the weighted annual mean concentration at each monitor within an area must not exceed the level	Revoked
	The 24-hour average cannot exceed the level more than once per year	154 $\mu g/m^3$
Particulate Matter (2.5 micrometers)	The 3-year annual average of the weighted annual mean concentrations cannot exceed the level	15.4 $\mu g/m^3$
	The 3-year average of the 98th percentile (based on the number of samples taken) of the daily concentrations must not exceed the level	35 $\mu g/m^3$
Carbon Monoxide	The 1-hour average cannot exceed the level more than once per year	35 ppm
	The 8-hour average cannot exceed the level more than once per year	9.4 ppm
Sulfur Dioxide	Annual arithmetic mean of 1-hour averages cannot exceed the level	0.03 ppm
	24-hour average cannot exceed the level more than once per year	0.14 ppm
	The 3-hour average cannot exceed the level more than once per year	0.50 ppm
Lead	The quarterly average (by calendar) cannot exceed the level	1.5 $\mu g/m^3$
Nitrogen Dioxide	The annual mean of 1-hour averages cannot exceed the level	0.053 ppm

Note: Daily concentration is the 24-hour average, measured from midnight to midnight.

In some instances, comparison of numbers in this table with sources listed above may appear to be slightly off (for example, ozone 8-hour standard 0.084 ppm listed in the table versus 0.08 ppm on the EPA Web site). These slight differences are due to a rounding convention adopted by EPA and the number of significant figures. The numbers shown on the table above are those used to determine if an area is in compliance, and are reflected in the graphs on the following pages.

The NAAQS for each pollutant may have different averaging times (for example, hourly and 8-hour averages). These different forms of the standard are created and enforced to address varied health

impacts that happen as a result of a shorter, high-level exposure versus longer, low-level exposures. These differences are addressed pollutant-by-pollutant in the following sections, and additional information is on the EPA Web site. A distinction exists between “exceeding” and “violating” a standard; the two are not equivalent. This distinction is due to 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 meteorological aberrances. For example, a carbon monoxide 8-hour average of 10 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 often presented for individual monitoring stations in the following sections because this provides more insight into regional differences in Idaho’s ambient air quality. The summaries that follow show how Idaho’s airsheds compared to the standards discussed above for the year 2006 and in many instances also incorporate the AQI and other measures of air quality where appropriate. The AQI color code shading is shown to aid interpretation of air quality, but does not imply whether or not standards were actually met for each pollutant. An airshed must satisfy the conditions in the above table to ensure compliance with the NAAQS.

Monitoring Network

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

The table on the next page presents a summary of the monitoring stations used and parameters monitored during 2006. Some parameters were monitored for only part of the year. For 2006, there were meteorology sites added in Boise and Grangeville. DEQ also dropped monitoring sites in Salmon (PM_{10} and $PM_{2.5}$ FRMs), and $PM_{2.5}$ FRMs in Idaho Falls, and Sandpoint.

The map on page 8 shows monitoring stations that were active in 2006. 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 (for example, 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 National Ambient Air Quality Standards (NAAQS). In addition, some pollutants of particular 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. The table on the next page lists the methods used for the various pollutants. It is noteworthy that the tapered element oscillating microbalance (TEOM) method (for particulate matter) is continuous. A TEOM measures mass concentrations at pre-set time intervals (e.g. hourly). The TEOM can also be accessed through telemetry for instantaneous PM concentrations. TEOMs enable real-time data interpretation and are discussed further in the particulate matter section of this report. Additional information on measurement methods is available at EPA's Web site: http://www.epa.gov/ttn/amtic/.

In addition to the criteria air pollutants described in this report, air toxics were monitored in for two years at a Nampa site. Monitoring was terminated at this site on March 11, 2005. DEQ intends to resume air toxics monitoring at a new location in 2007. For details on air toxics and chemical toxicity, visit the EPA web site at www.epa.gov/ttn/atw/index.html.

Particulate Monitoring

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) to be the most accurate way to determine PM_{10} and $PM_{2.5}$ concentrations. This method involves pulling in air (at a given flow rate) and trapping particles of a certain size (PM_{10} or $PM_{2.5}$) on a pre-weighed filter. The filter is then weighed again and the resulting mass is divided by volume (determined from flow rate and amount of time) to provide concentration. Particles on the filter can be later chemically analyzed and modeled for more information about the sources of particulate matter. Unfortunately, the FRM does not provide continuous or timely information. EPA considers the TEOM continuous method equivalent to the FRM for PM_{10}, but not an equivalent method for $PM_{2.5}$.

DEQ uses the FRM as well as the TEOM continuous method to provide more time-resolved data (i.e. hourly averages).

Monitoring Network for 2006

Name	Location	PM_{10} FRM	PM_{10} TEOM	$PM_{2.5}$ FRM	$PM_{2.5}$ TEOM	O_3	SO_2	NO_x	CO	Met	CSM	Tox
Boise	Boise, various locations	●	●	●	●	●			●	●		
Coeur d'Alene	930 N 15th , Lakes Middle School		●		●							
Emmett	2195 Schiller Road, Emmett			●	●							
Franklin	Franklin, Idaho			●								
Garden Valley	Banks Lowman Road, Garden Valley				●							
Grangeville	USFS Compound, East Grangeville				●					●		
Idaho City	851 Highway 21, Idaho City				●							
Idaho Falls	North Holms & Pop Kroll, Idaho Falls				●							
Inkom	Inkom			●								
Lancaster	Lancaster Road near Coeur d'Alene					●		●				
Lewiston	Sunset Park, Lewiston				●					●		
McCall	500 North Mission, McCall				●							
Meridian	St. Lukes				●						●	
Middleton	Middleton				●	●				●		
Moscow	1025 Plant Sciences Road				●					●		
Nampa	Nampa, various locations		●	●	●				●		●	
P4/Monsanto	Soda Springs						●					
Parma	Parma			●	●							
Pinehurst	106 Church Street, Pinehurst		●	●	●					●		
Pocatello	Pocatello, various locations	●	●	●	●		●			●		
Post Falls	1353 1/2 Syringa, Post Falls				●							
Preston	Preston			●								
Rathdrum	Rathdrum Prairie									●		
Salmon	Salmon, various locations				●					●		
Sandpoint	Sandpoint		●		●					●		
St. Maries	St. Maries			●	●							
Twin Falls	Smith's Food Store, Twin Falls				●							
Wendell	Wendell, Gooding County									●		

Notes:

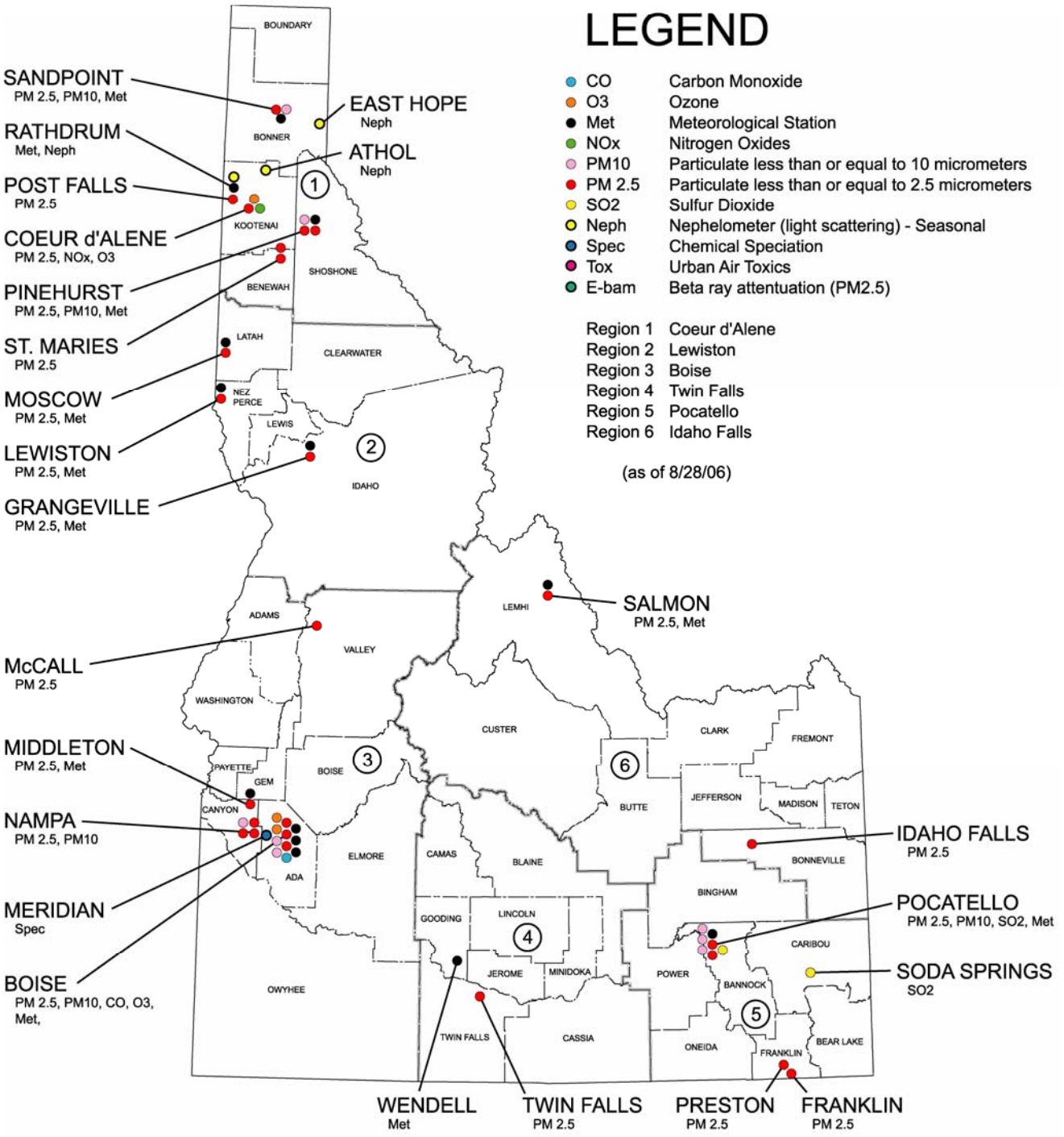
CO	Carbon Monoxide	$PM_{2.5}$ FRM	Particulate Matter 2.5 micrometers (reference)
CSM	Chemical Speciation Monitor	$PM_{2.5}$ TEOM	Particulate Matter 2.5 micrometers (TEOM continuous)
NO_x	Nitrogen Oxide	SO_2	Sulfur Dioxide
O_3	Ozone (May through September)	Tox	Urban Air Toxics
PM_{10} FRM	Particulate Matter 10 micrometers (reference)	●	Monitor Terminated in 2006
PM_{10} TEOM	Particulate Matter 10 micrometers (TEOM continuous)	●	CSM Nampa terminated June 28, 2006 and the St Lukes started July 1, 2006

Monitoring Methods Used in 2006 in Idaho

Pollutant Code	Measurement	Method	Units
CO	Carbon Monoxide	Gas Nondispersive Infrared Radiation	Parts per Million
NO_x	Nitrogen Oxides (NO_x)	Chemiluminescence	Parts per Million
O_3	Ozone	UV Absorption	Parts per Million
PM_{10} FRM	PM_{10} Reference	Reference - Hi Vol Andersen/ GMW 1200	Micrograms per Cubic Meter
PM_{10} TEOM	PM_{10} TEOM	R&P Mass Transducer	Micrograms per Cubic Meter
$PM_{2.5}$ FRM	$PM_{2.5}$ Reference	Reference—R&P Partisol 2025	Micrograms per Cubic Meter
$PM_{2.5}$ TEOM	$PM_{2.5}$ TEOM	R&P Mass Transducer	Micrograms per Cubic Meter
Tox	Urban Air Toxics	Various Methods	Parts per Billion and $\mu g/m^3$
SO_2	Sulfur Dioxide	UV Fluorescence	Parts per Million

IDAHO DEQ

SFY 2006 Air Monitoring Network



LEGEND

CO	Carbon Monoxide
O3	Ozone
Met	Meteorological Station
NOx	Nitrogen Oxides
PM10	Particulate less than or equal to 10 micrometers
PM 2.5	Particulate less than or equal to 2.5 micrometers
SO2	Sulfur Dioxide
Neph	Nephelometer (light scattering) - Seasonal
Spec	Chemical Speciation
Tox	Urban Air Toxics
E-bam	Beta ray attentuation (PM2.5)

Region 1	Coeur d'Alene
Region 2	Lewiston
Region 3	Boise
Region 4	Twin Falls
Region 5	Pocatello
Region 6	Idaho Falls

(as of 8/28/06)

Monitoring Results

Ozone

Ozone is a summertime air pollution problem which primarily forms when photochemical pollutants from cars and industrial sources (paints, solvents, gas vapors) react with sunlight. These pollutants are called ozone precursors and include VOC and NO_X. Ozone can also be directly emitted by pollutant sources. Levels of ozone 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 in 2006, as this is the time period of concern for high ozone levels.

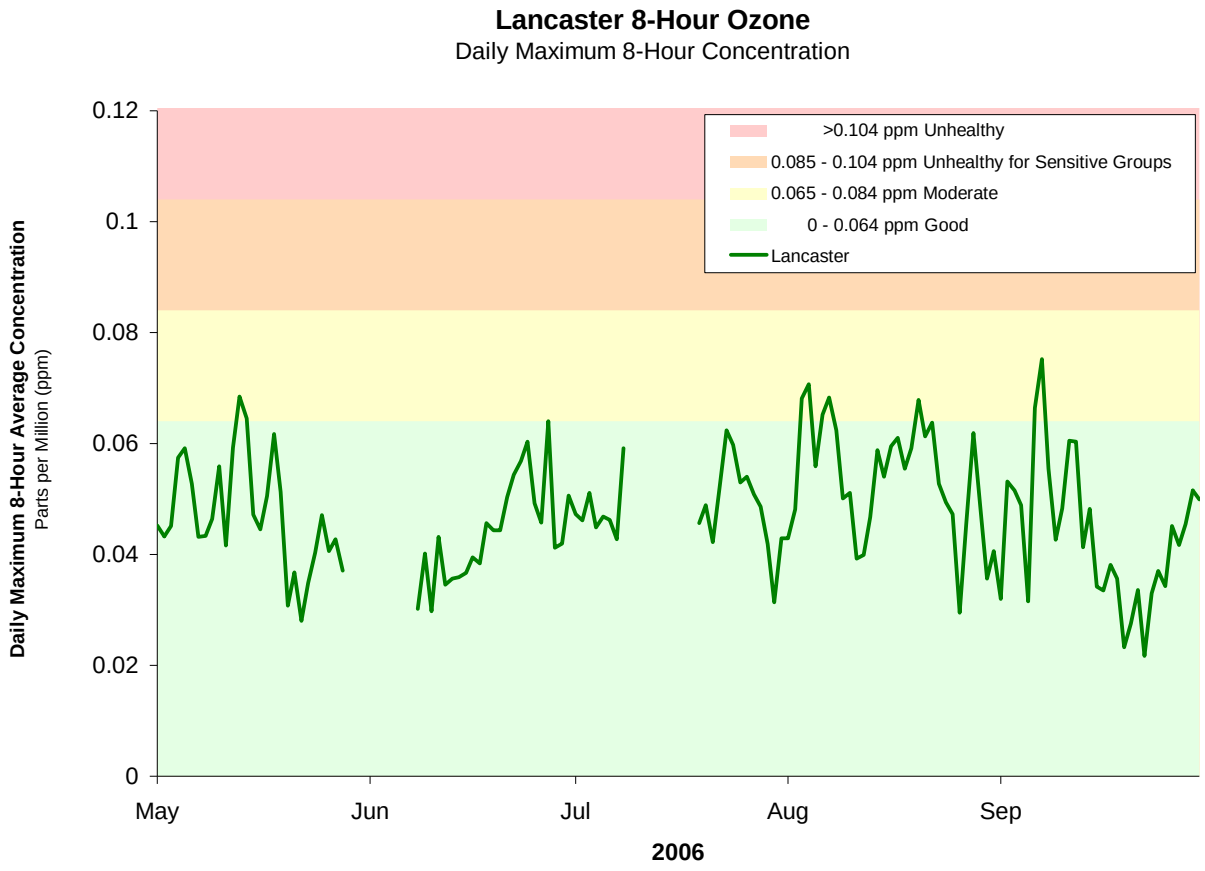
People frequently hear of ozone in the upper atmosphere. In this context, ozone is considered beneficial because it helps to protect the earth from the sun's rays. In contrast, ozone formed at ground level is unhealthy. Elevated concentrations of ground-level ozone can cause reduced lung function, respiratory irritation, and can aggravate asthma. Ozone has also been linked to immune system effects (http://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.

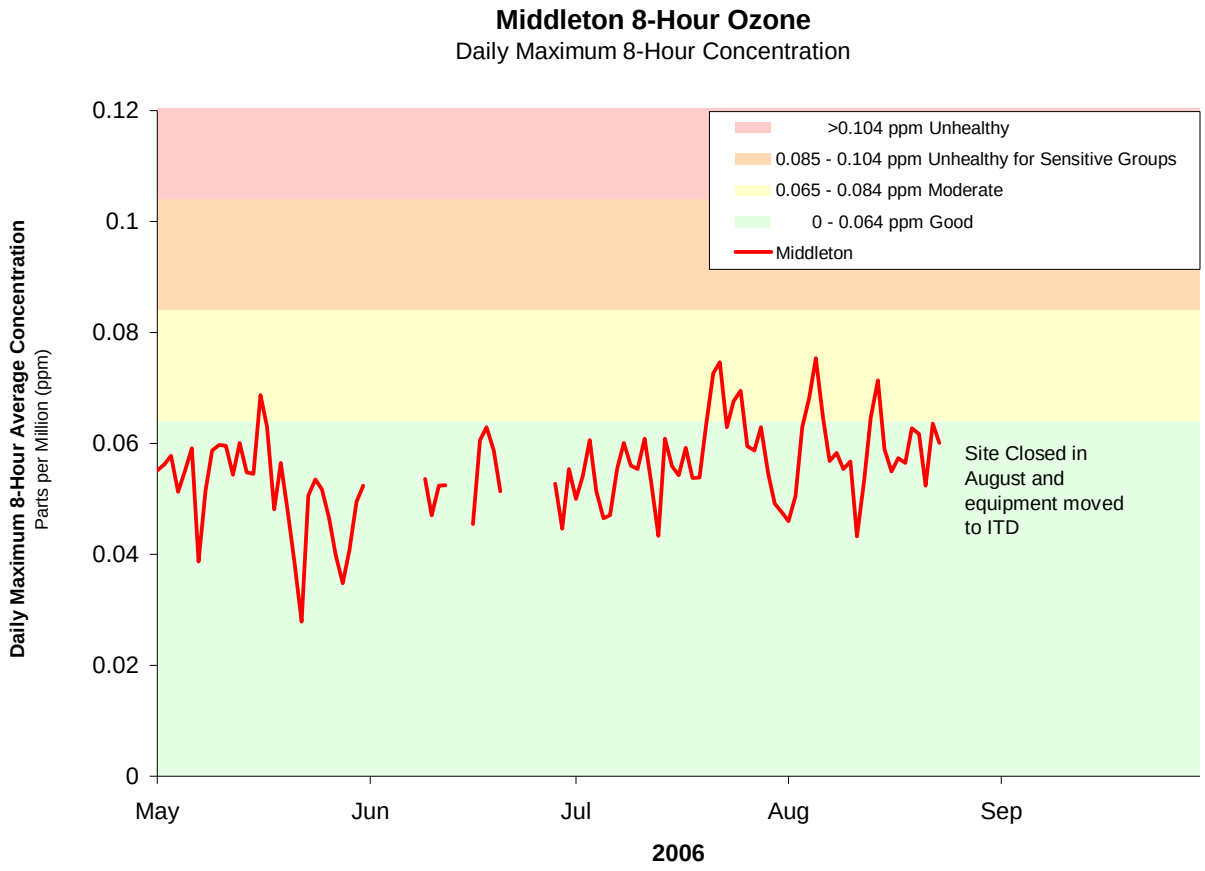
The monitoring stations measuring ozone are located in both urban and rural areas, although the precursor chemicals that react with sunlight to produce ozone are generated primarily in large metropolitan areas. Because summers in Idaho are normally hot and dry, some areas tend to see daily ozone levels that begin to rise in the late morning and then peak in the late afternoon and early evening. This phenomenon follows very closely with the time of day that the sun is the highest in the sky and temperatures are the hottest.

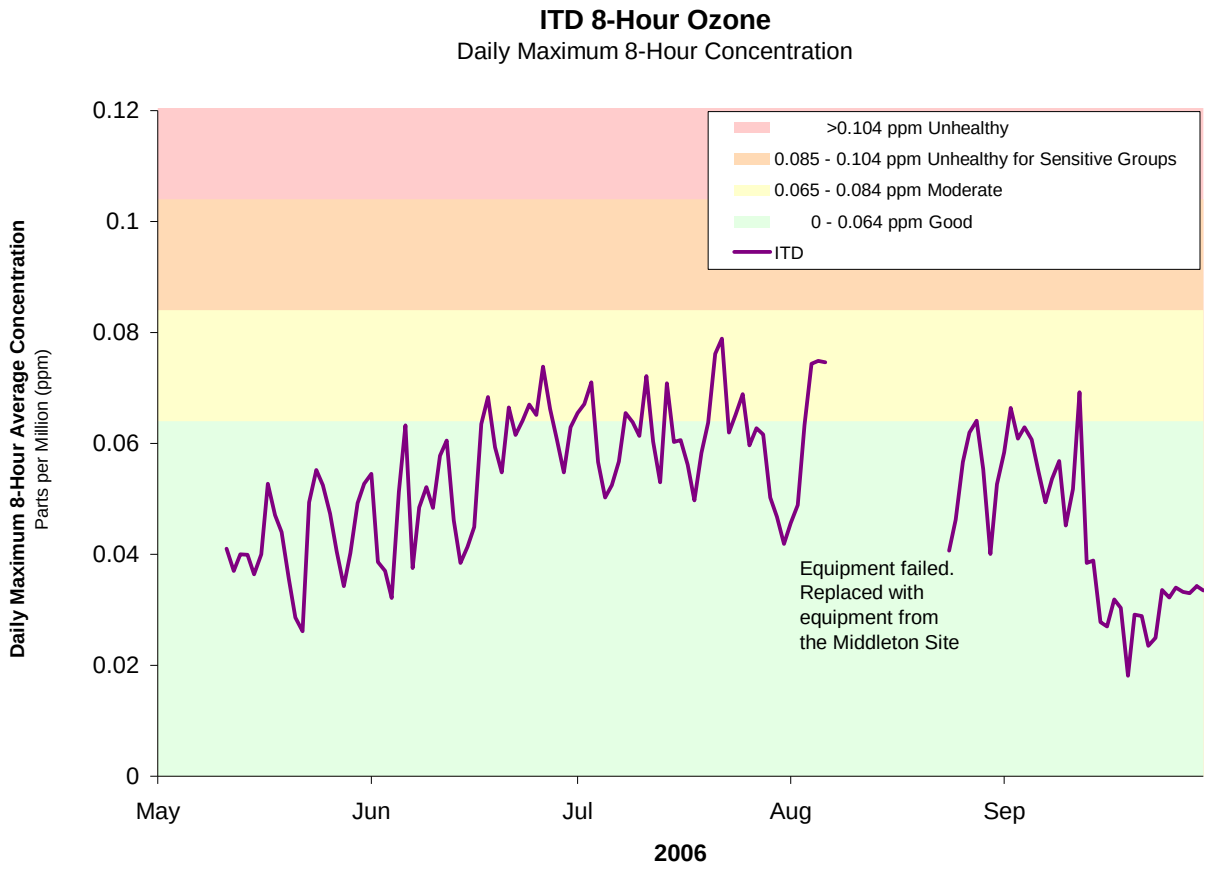
Graphs presented on pages 10-13 show trends in ozone levels in Idaho, reflecting both the AQI and the NAAQS. The graphs on the following pages present daily maximum 8-hour average data for the months of May through September. The shading on each graph corresponds to the AQI breakpoints for ozone, which is typically based on the 8-hour average.

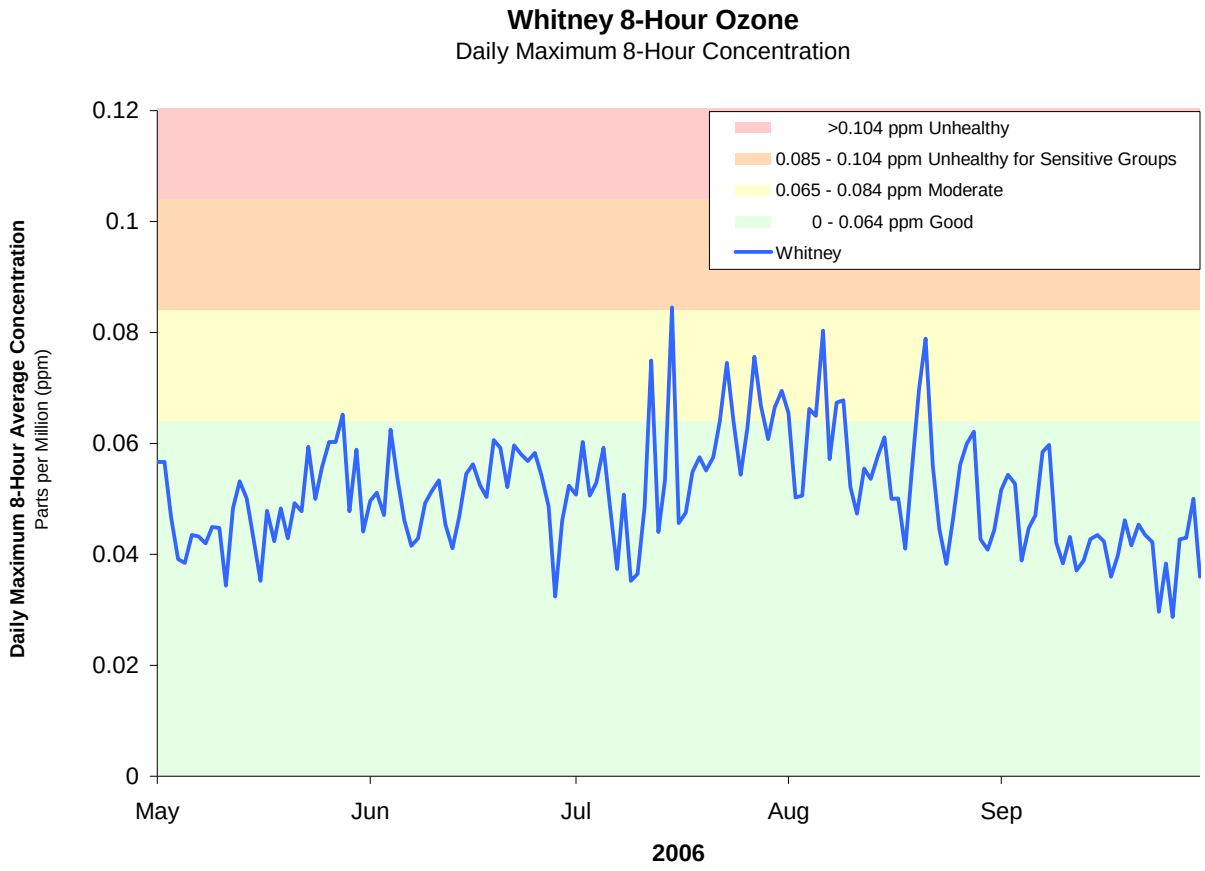
The graph on page 14 shows monitoring data for each ozone monitoring station against the 8-hour federal standard, and shows that the region has remained below the standard since monitoring began. This means the three-year average of the 4th-highest 8-hour concentration has not violated the NAAQS standard of 0.08 ppm. The ozone standard is defined such that the three highest concentrations can exceed the level of the standard while still maintaining attainment. Values presented on the page 14 graph are 3-year averages of the 4^{th}-highest concentrations; the year on the x-axis represents the last year averaged. For example, concentrations shown for 2006 are an average of 2004, 2005, and 2006 concentrations.

For additional information on ozone, visit www.epa.gov/air/urbanair/ozone/index.html. There is also additional information on ozone in question/answer format in the definitions section of this document.


Lancaster 8-Hour Ozone
Daily Maximum 8-Hour Concentration
>0.104 ppm Unhealthy
0.085 - 0.104 ppm Unhealthy for Sensitive Groups
0.065 - 0.084 ppm Moderate
0 - 0.064 ppm Good
Lancaster
Daily Maximum 8-Hour Average Concentration
Parts per Million (ppm)
0.12
0.1
0.08
0.06
0.04
0.02
0
May
Jun
Jul
Aug
Sep
2006

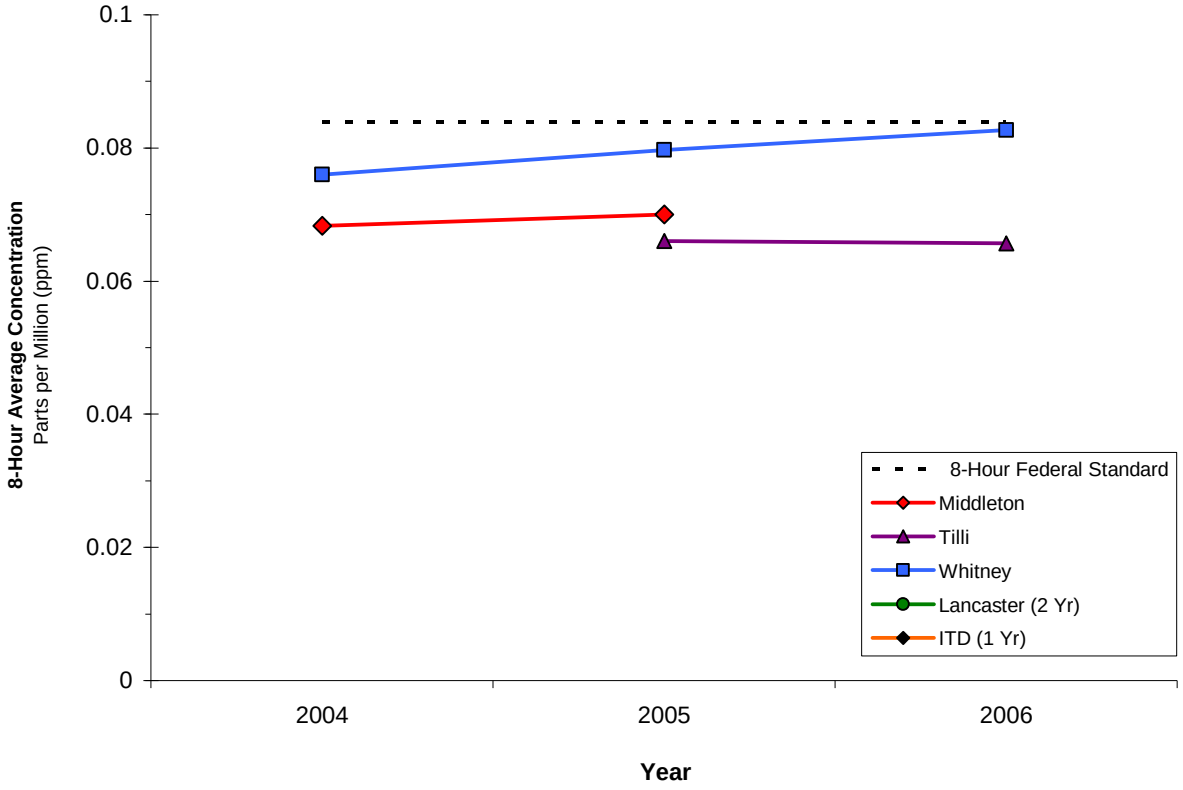

Middleton 8-Hour Ozone
Daily Maximum 8-Hour Concentration
Daily Maximum 8-Hour Average Concentration
Parts per Million (ppm)
0.12
0.1
0.08
0.06
0.04
0.02
0
May
Jun
Jul
Aug
Sep
2006
>0.104 ppm Unhealthy
0.085 - 0.104 ppm Unhealthy for Sensitive Groups
0.065 - 0.084 ppm Moderate
0 - 0.064 ppm Good
Middleton
Site Closed in August and equipment moved to ITD


ITD 8-Hour Ozone
Daily Maximum 8-Hour Concentration
Daily Maximum 8-Hour Average Concentration
Parts per Million (ppm)
0.12
0.1
0.08
0.06
0.04
0.02
0
May
Jun
Jul
Aug
Sep
2006
>0.104 ppm Unhealthy
0.085 - 0.104 ppm Unhealthy for Sensitive Groups
0.065 - 0.084 ppm Moderate
0 - 0.064 ppm Good
ITD
Equipment failed. Replaced with equipment from the Middleton Site


Whitney 8-Hour Ozone
Daily Maximum 8-Hour Concentration
Daily Maximum 8-Hour Average Concentration
Parts per Million (ppm)
0.12
0.1
0.08
0.06
0.04
0.02
0
May
Jun
Jul
Aug
Sep
2006
>0.104 ppm Unhealthy
0.085 - 0.104 ppm Unhealthy for Sensitive Groups
0.065 - 0.084 ppm Moderate
0 - 0.064 ppm Good
Whitney

Idaho 8-Hour Ozone Averages

3-Year Average of 4th Highest Annual Concentration vs Standard



Particulate Matter (10 micrometers)

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. 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.

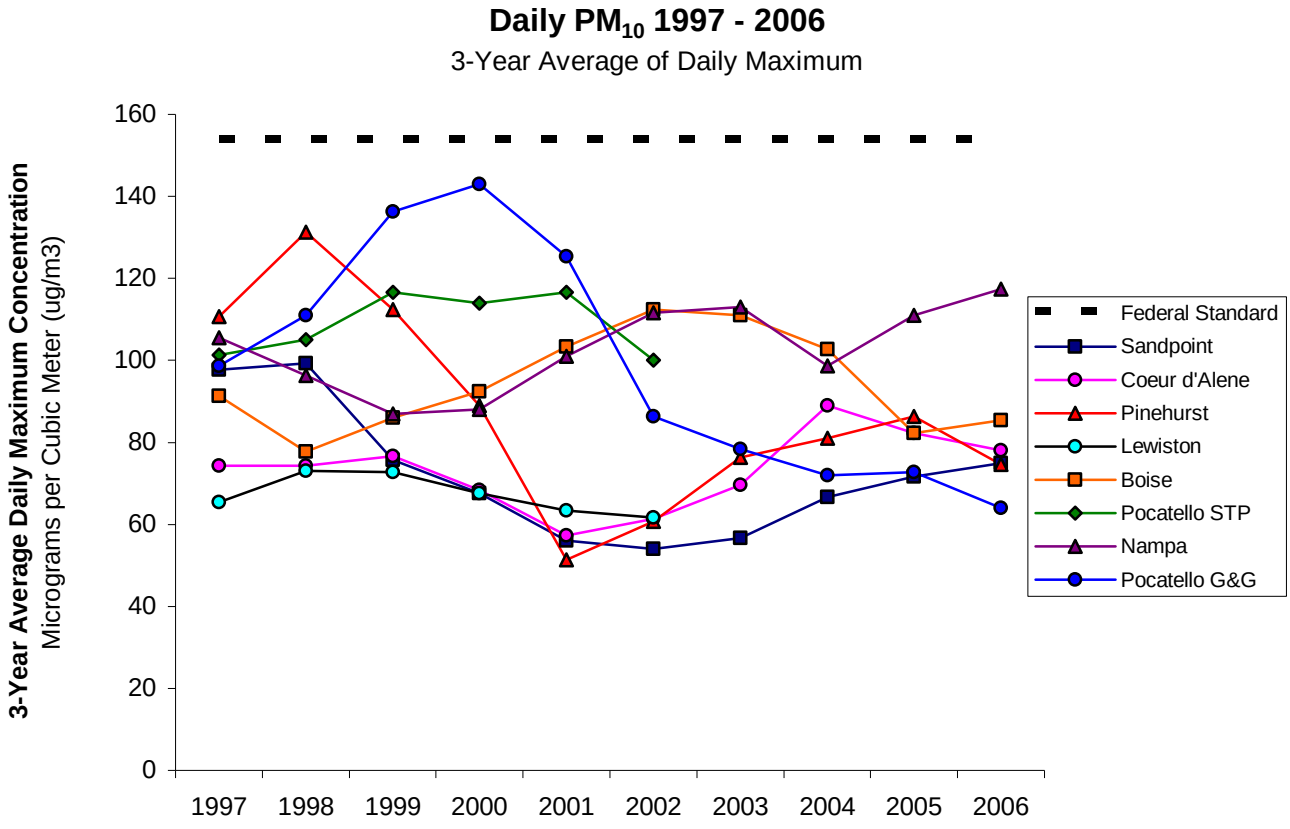
The federal annual PM_{10} standard was revoked effective December 17, 2006 due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution. The 24-hour standard was not changed. EPA may choose to replace the PM_{10} standard in the future with a $PM_{10-2.5}$ (PMcoarse) standard, ranging from diameters 2.5-10 micrometers. In 2006, Idaho had three areas that had previously exceeded federal PM_{10} standards. These nonattainment areas are in Sandpoint, Pinehurst, and Pocatello. Northern Ada County was formerly a nonattainment area but is now considered to be a maintenance area for PM_{10}.

Idaho monitors PM_{10} using both reference and continuous methods. The PM_{10} TEOM is a federal equivalent method. TEOM data is also used to determine compliance to the PM_{10} NAAQS. Reference and equivalent method results are shown in the following graphs. TEOM data is also used to determine the daily AQI and to inform the public of air quality values in near real-time via DEQ Web pages.

The graph on the page 16 demonstrates that Idaho's airsheds were in compliance for the daily NAAQS standards for PM_{10}. Some concentrations were measured using the reference method while Sandpoint, Pinehurst, Coeur d'Alene, the Boise Fire Station, and Nampa were measured with TEOMs, the federal equivalent method. The graph shows PM_{10} at individual monitoring stations for each monitoring location. It is clear that all concentrations are below the NAAQS. Years shown on the x-axis are actually the last year that was averaged. For example, data points for 2006 actually reflect the three-year average of 2004, 2005, and 2006.

Maximum daily values (24-hour average) confirm that Idaho has shown a slight decrease since 1996. Statistical summaries of reference and continuous method PM_{10} concentrations are provided in tables in the Appendix. The maximum PM_{10} measured in 2006 was 106 $\mu g/m^3$ at the Nampa monitor, measured by a continuous equivalent method analyzer. This value is below the 24 hour standard allowing each monitor one value above 154 $\mu g/m^3$ per year. The 24-hour daily PM NAAQS is violated if the expected number of exceedances over three consecutive years is greater than one. So you can have 2/0/1 exceedances in three consecutive years and not violate the NAAQS.

For additional information on PM_{10}, visit www.epa.gov/air/urbanair/pm/index.html. More information on PM_{10} is also presented in question/answer format in the definitions section of this document.


Daily PM10 1997 - 2006
3-Year Average of Daily Maximum
3-Year Average Daily Maximum Concentration
Micrograms per Cubic Meter (ug/m3)
160
140
120
100
80
60
40
20
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Federal Standard
Sandpoint
Coeur d'Alene
Pinehurst
Lewiston
Boise
Pocatello STP
Nampa
Pocatello G&G

Particulate Matter (2.5 micrometers)

Particles smaller than 2.5 micrometers in diameter 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 burning, agricultural burning and other area sources, as well as vehicle exhaust including cars, diesel trucks, and buses. Fine particulate 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 most 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.

$PM_{2.5}$ is primarily measured using two different methods in Idaho, the federal reference method and the Tapered Element Oscillating Method (TEOM). The federal reference method is considered by EPA to be the most accurate way to determine $PM_{2.5}$ concentrations. This method involves pulling in air (at a given flow rate) and trapping particles of a certain size (in this case $PM_{2.5}$) on a pre-weighed filter. The filter is then used, weighed, and divided by volume (determined from flow rate and amount of time) to provide the concentration. Unfortunately, the reference method does not provide continuous or timely information. Thus, Idaho uses the TEOM method to provide more time-relevant data. The TEOM method uses measurement of mass to determine particulate matter present. A third method of $PM_{2.5}$ measurement is used during agricultural burning season; the nephelometer. These transportable instruments help DEQ estimate $PM_{2.5}$ concentrations during these activities.

The graphs in this section use data primarily from the federal reference method. The continuous data are from the TEOMs. The continuous methods are compared to the reference method values for a one year period and calculations are made to determine the degree of difference from the reference method. The differences are then applied to the current continuous values in an attempt to make them "reference method-like." Continuous methods are not designated as equivalent methods for $PM_{2.5}$ and data cannot be used for NAAQS determinations.

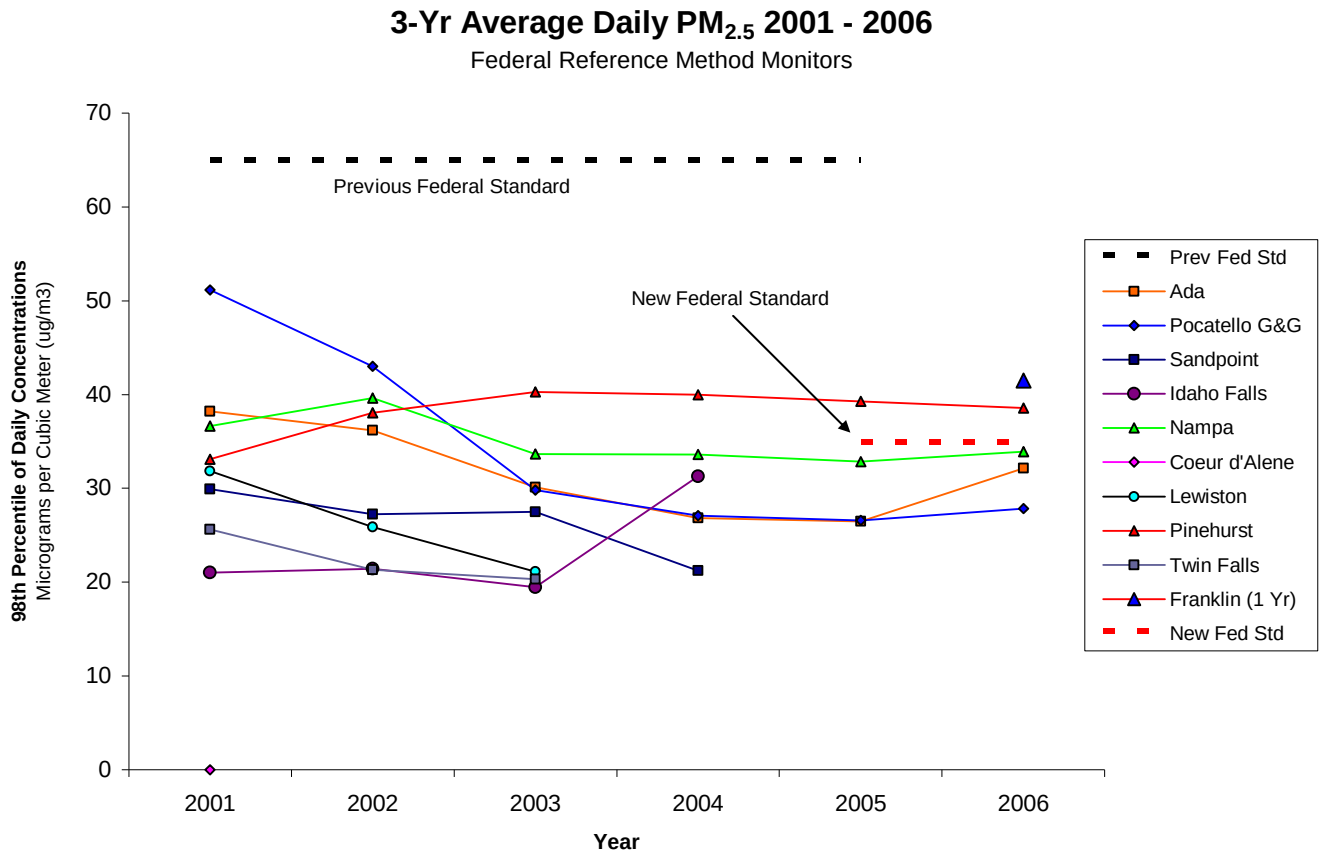
The graphs on pages 19 and 20 show that $PM_{2.5}$ measurements meet the daily and annual NAAQS using the standard reference method. All of Idaho was designated attainment/unclassifiable for $PM_{2.5}$ in 2006. The graphs on pages 21 through 27 use data from the continuous samplers to display $PM_{2.5}$ with the AQI. Both types of graphs are discussed below.

The graph on page 19 shows the 2006 three-year average of the 98^{th} percentile 24-hour (daily) averages at each monitoring station against the federal standard. The annual averages for 2001-2006 all fell well below the previous standard of 65 $\mu g/m^3$. For 2006 the graph shows the three year average for Pinehurst exceeding the new NAAQS of 35 $\mu g/m^3$. There is only one year of data for Franklin, but if it continues its current trend, it will also exceed the new NAAQS after the 2008 data year.

The graph on page 20 shows the three-year average of the annual averages at each monitoring station, against the federal standard. It is easily seen that the annual standard of 15.4 µg/m^3 was not exceeded at any of the monitoring stations.

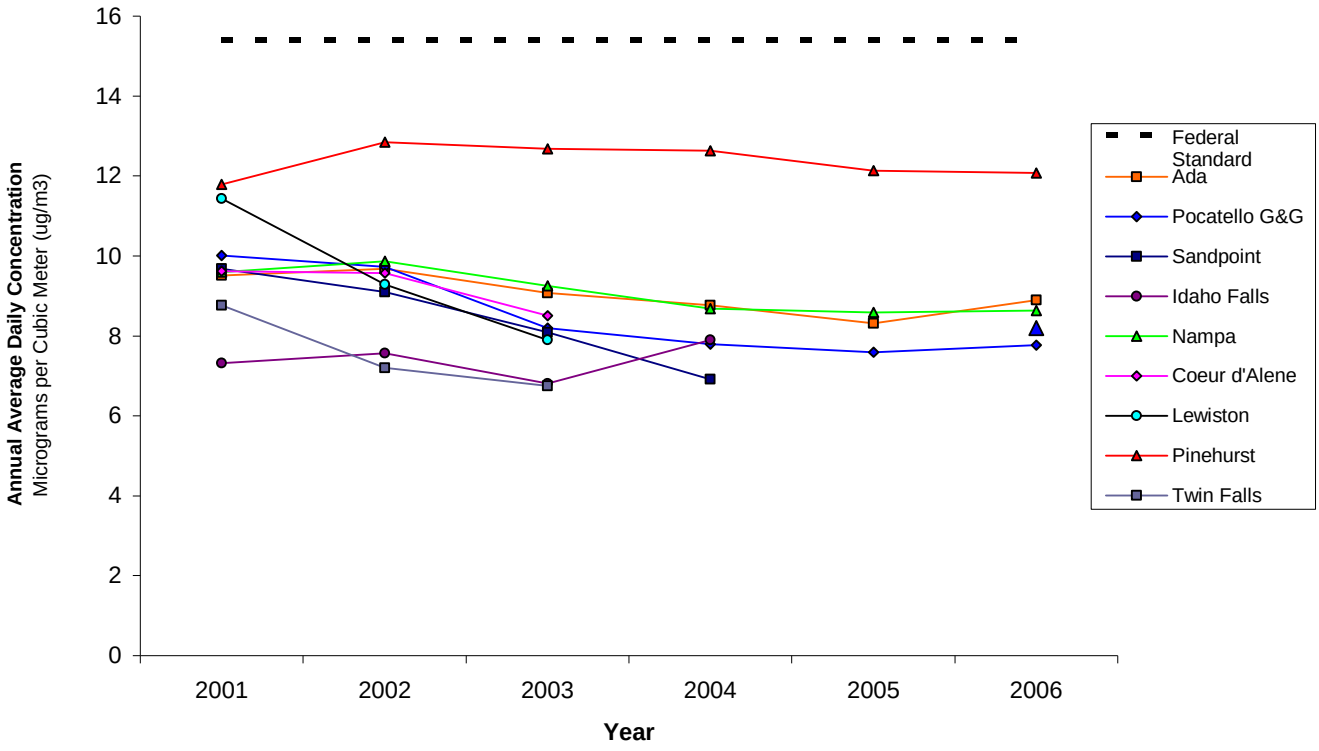
Graphs on pages 21 through 27 show daily $PM_{2.5}$ concentrations measured at Idaho sites during 2006 using the TEOM continuous analyzers against a backdrop of AQI breakpoints. The highest concentration of $PM_{2.5}$ measured with the TEOMS in 2006 was 99.4 µg/m^3, measured at Salmon. A few of the graphs show some extended periods of zero concentrations. These are times when a TEOM was not functioning due to mechanical malfunctions.

For additional information on particulate matter, visit www.epa.gov/air/urbanair/pm/index.html. Information on $PM_{2.5}$ is also presented in a question/answer format in the definitions section of this document.


3-Yr Average Daily PM2.5 2001 - 2006
Federal Reference Method Monitors
98th Percentile of Daily Concentrations
Micrograms per Cubic Meter (ug/m3)
70
60
50
40
30
20
10
0
Previous Federal Standard
New Federal Standard
2001
2002
2003
2004
2005
2006
Year
Prev Fed Std
Ada
Pocatello G&G
Sandpoint
Idaho Falls
Nampa
Coeur d'Alene
Lewiston
Pinehurst
Twin Falls
Franklin (1 Yr)
New Fed Std

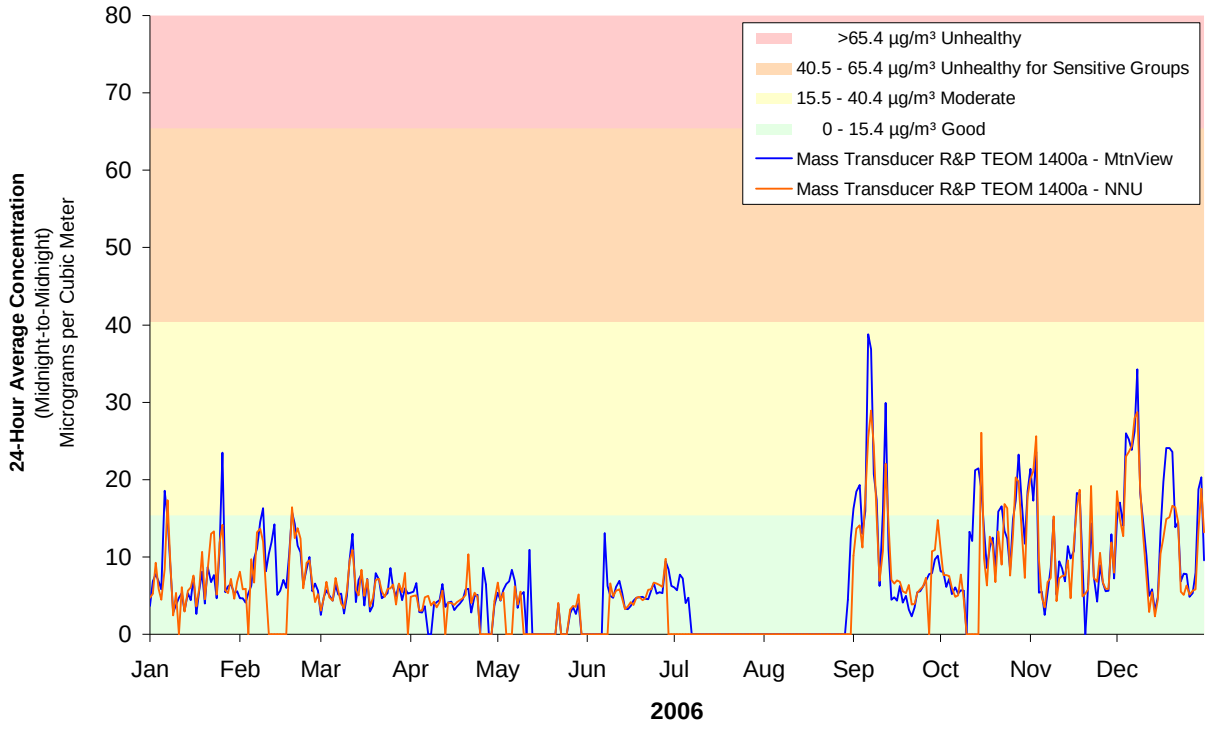
3-Year Average Annual Mean $PM_{2.5}$ 2001 - 2006

Standard Reference Method Monitors



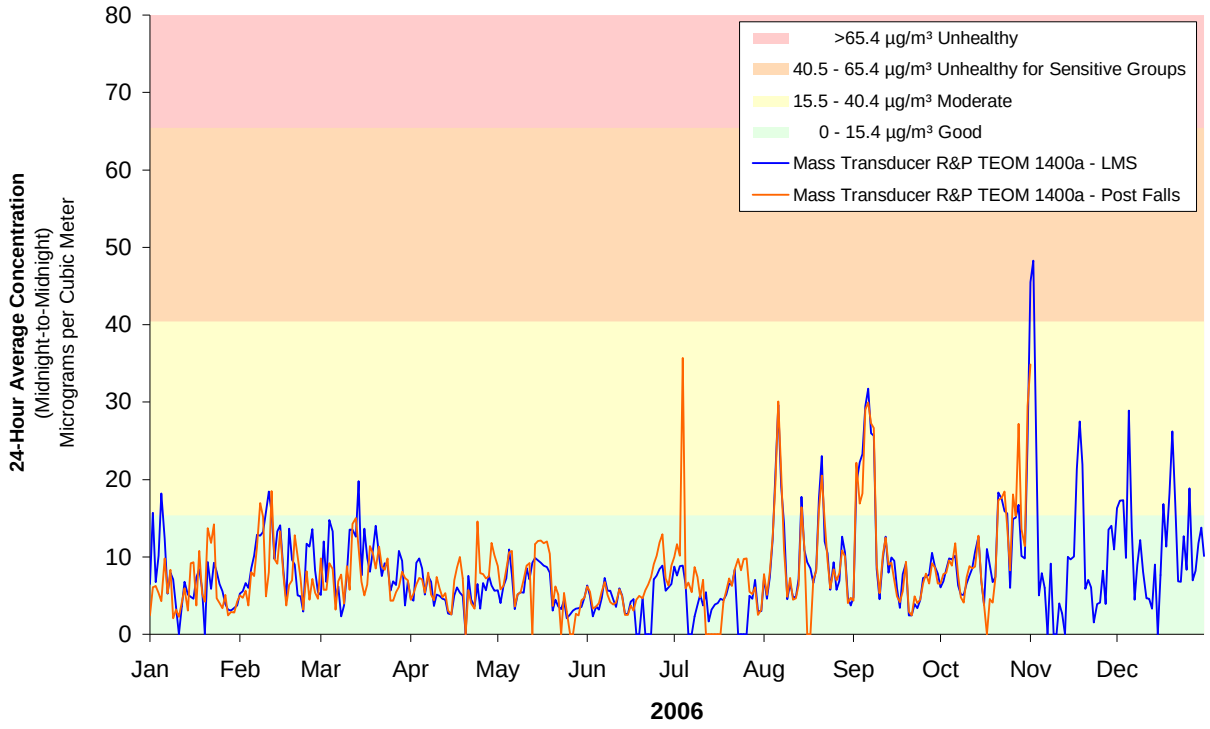
Treasure Valley

$PM_{2.5}$ Daily Averages from Continuous Analyzers



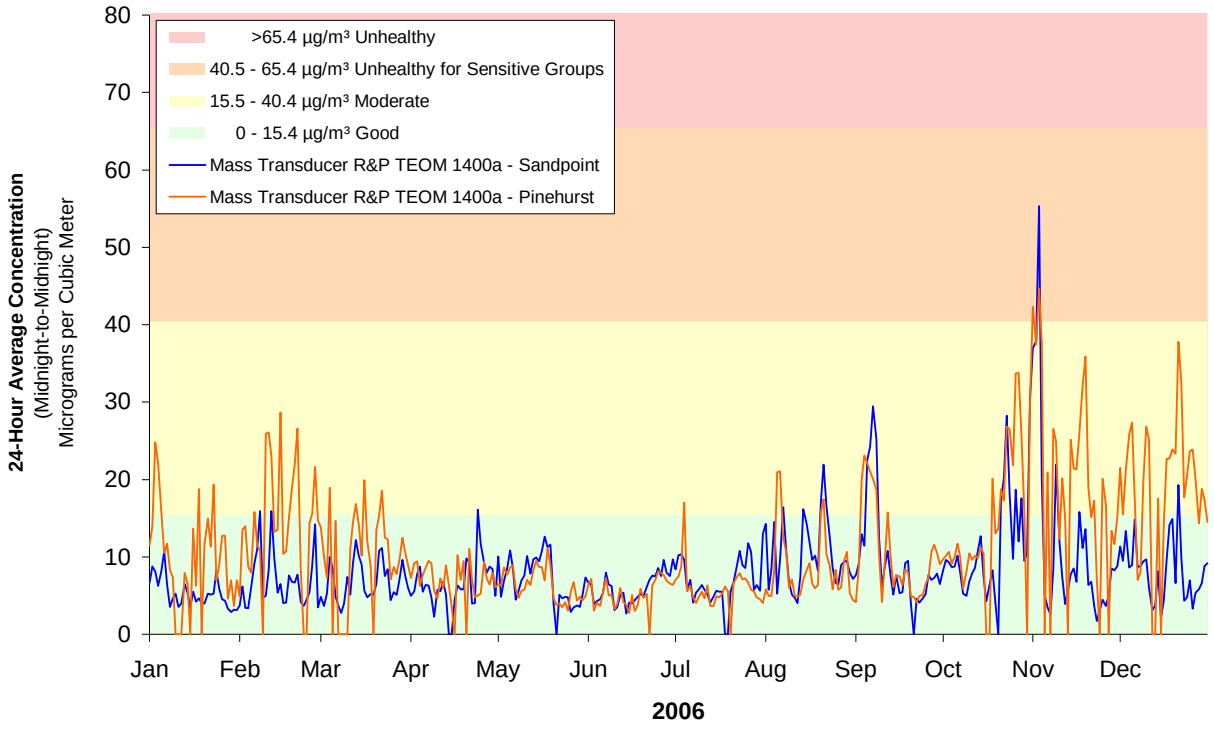
Coeur d'Alene

$PM_{2.5}$ Daily Averages from Continuous Analyzers



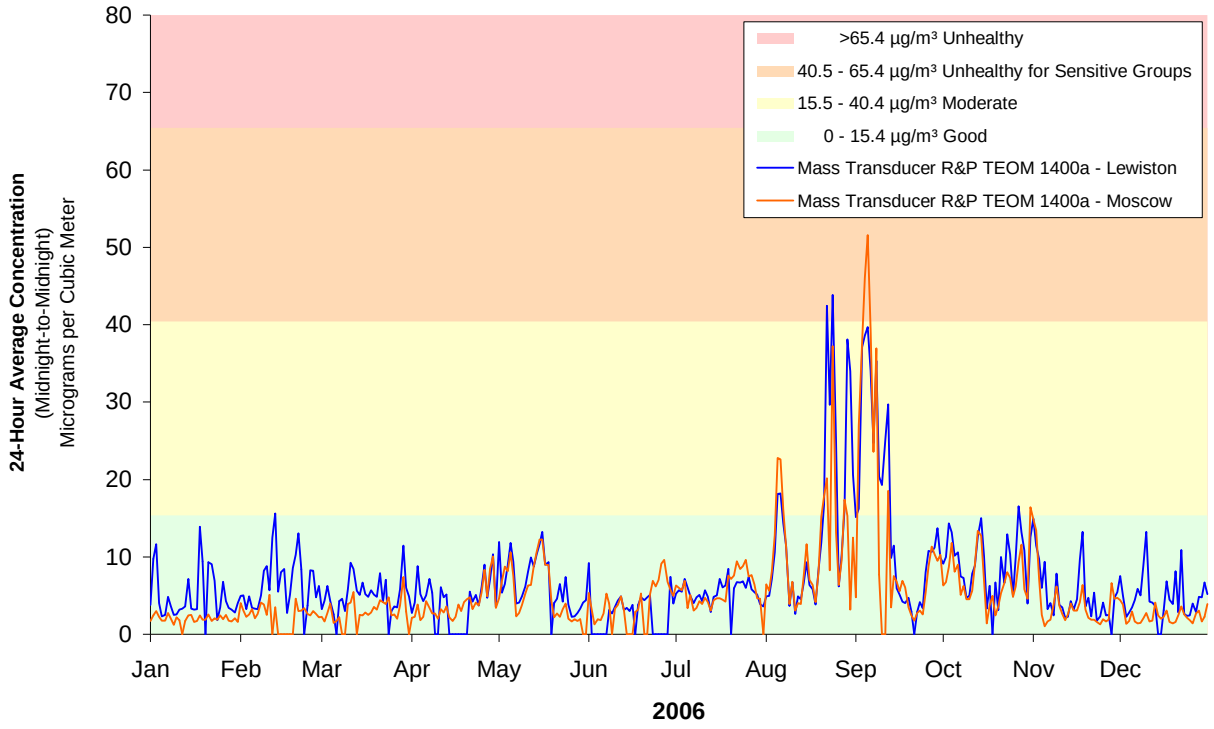
Northern Idaho

$PM_{2.5}$ Daily Averages from Continuous Analyzers



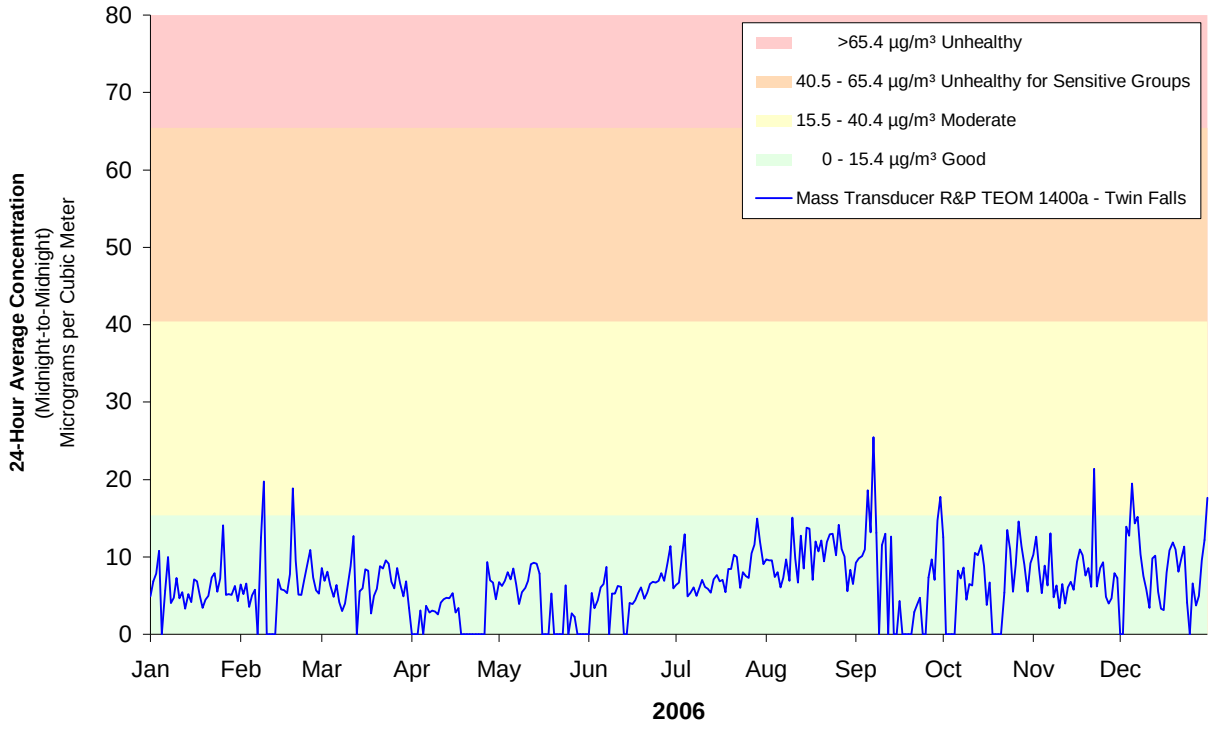
North Central Idaho

$PM_{2.5}$ Daily Averages from Continuous Analyzers



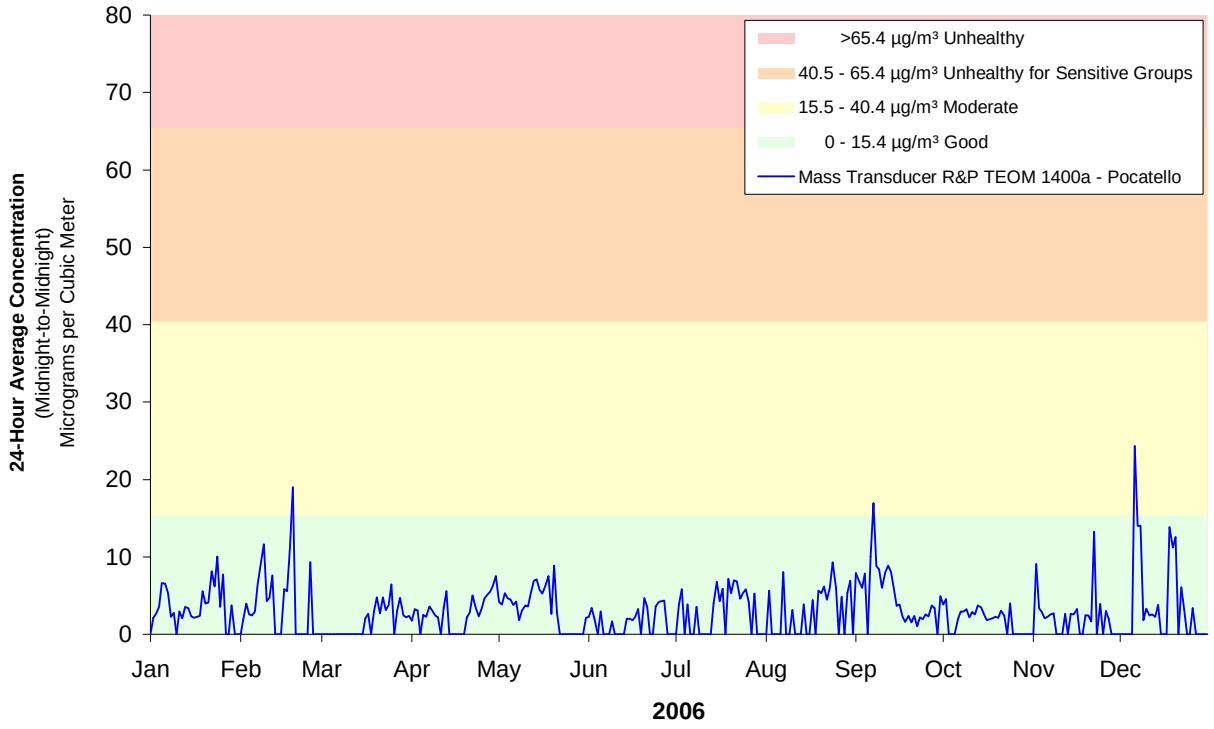
Twin Falls

$PM_{2.5}$ Daily Averages from Continuous Analyzers



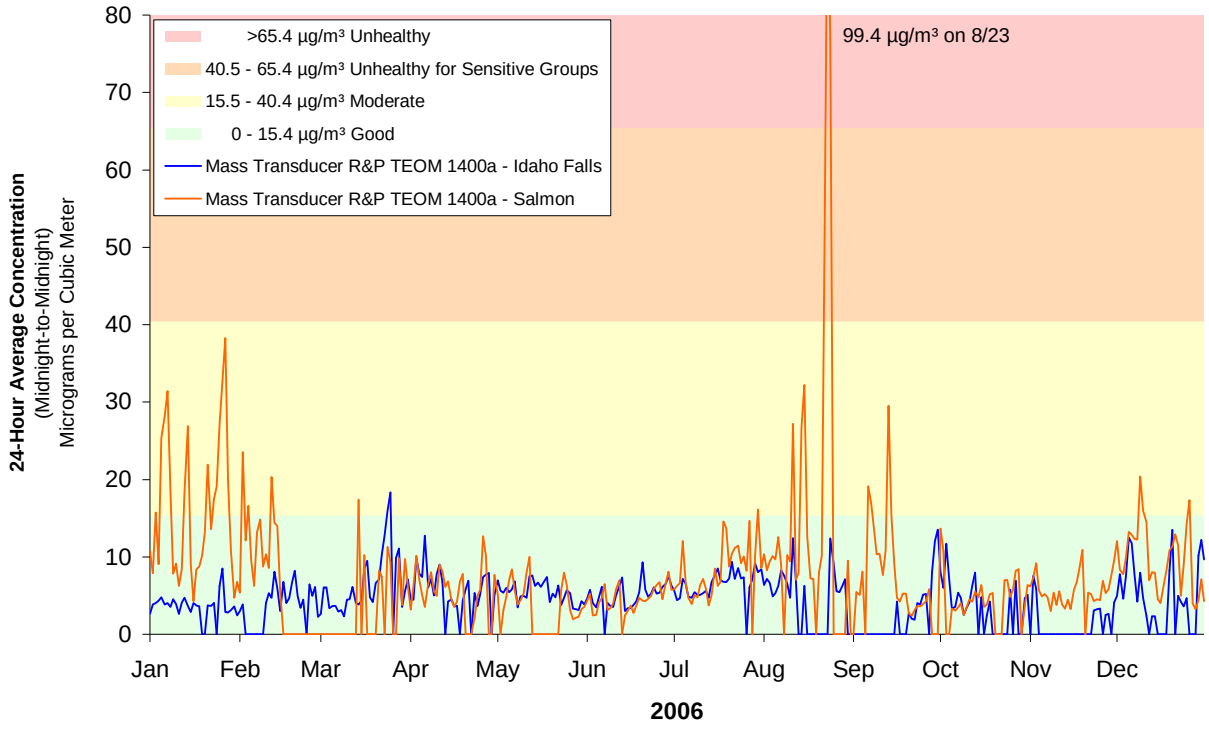
Southeast Idaho

$PM_{2.5}$ Daily Averages from Continuous Analyzers



Eastern Idaho

$PM_{2.5}$ Daily Averages from Continuous Analyzers



Carbon Monoxide

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. Carbon monoxide forms when the carbon in fuels doesn't burn completely. The majority of CO comes from vehicle exhaust. In cities, 85-95% of all CO emissions may come from motor vehicle exhaust.

Elevated levels of CO in the ambient air can occur in urban canyon areas with heavy traffic congestion. The highest levels of CO 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 CO levels are high. High levels of CO can affect alertness and vision even in healthy individuals.

CO monitoring stations are generally located in urban canyon areas with heavy traffic congestion. These include central business areas, roadsides, and shopping malls.

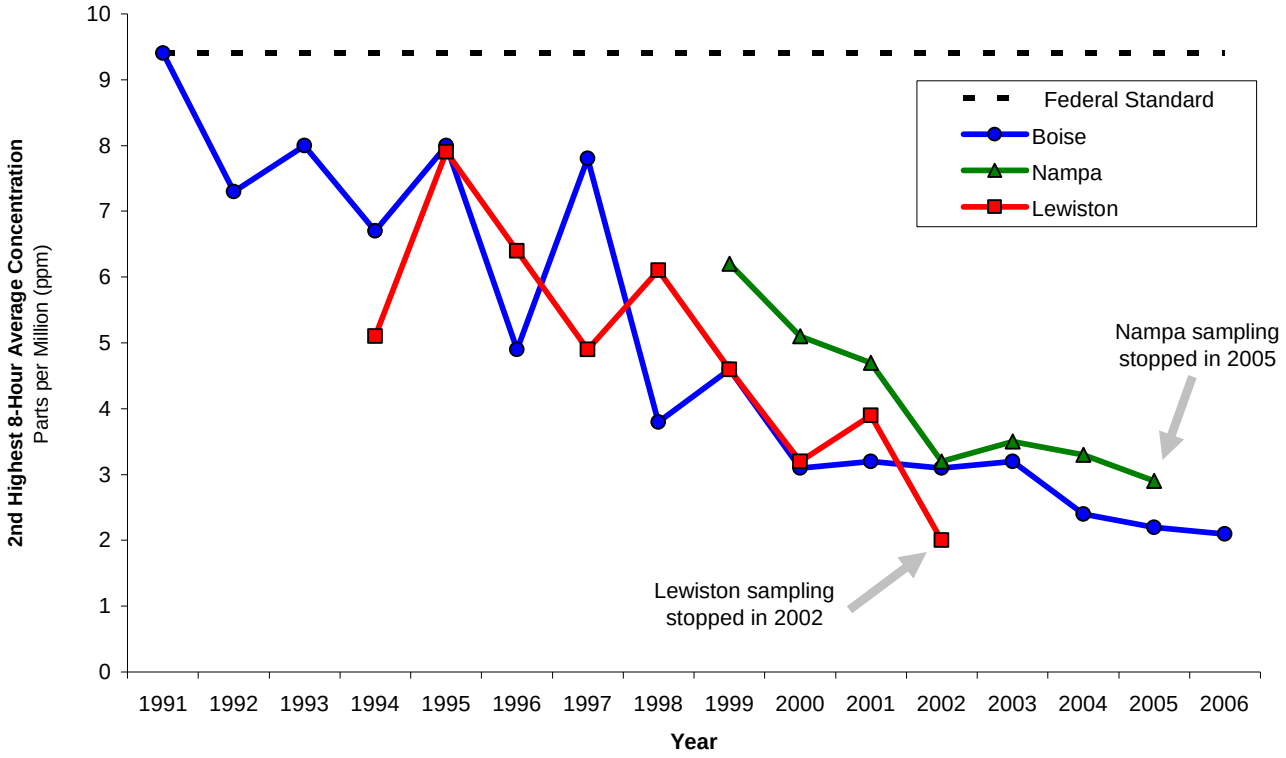
The graph on page 29 shows the second highest 8-hour concentrations at Idaho's monitoring sites versus the NAAQS standard. The second-highest concentration is displayed on these graphs because, under the federal rule, the 8-hour average can not be exceeded more than once per year (thus, choosing the second highest). These graphs confirm the general downward trend that CO is taking from the early 1990s to present. There were no 8-hour concentrations measured at any sites that exceeded the NAAQS standard of 9.4 ppm. The maximum 8-hour concentration for CO in 2006 was 2.1 ppm, well below the 8-hour standard. These data are provided in the Appendix.

The NAAQS also includes a 1-hour standard for CO of 35 ppm (can not be exceeded more than once a year). Measured 1-hour concentrations in Idaho are historically much lower than the 35 ppm standard, and therefore 1-hour CO trends were not graphed. The maximum and second-highest measured 1-hour CO in 2005 are 4.8 and 3.5 ppm, respectively. Additional 1-hour average CO data are provided in the Appendix.

For additional information on CO, visit www.epa.gov/air/urbanair/co/index.html. CO information is also provided in question/answer format in the definitions section of this document.

Carbon Monoxide (CO) for Idaho

2nd Highest 8-Hour Concentration vs Standard



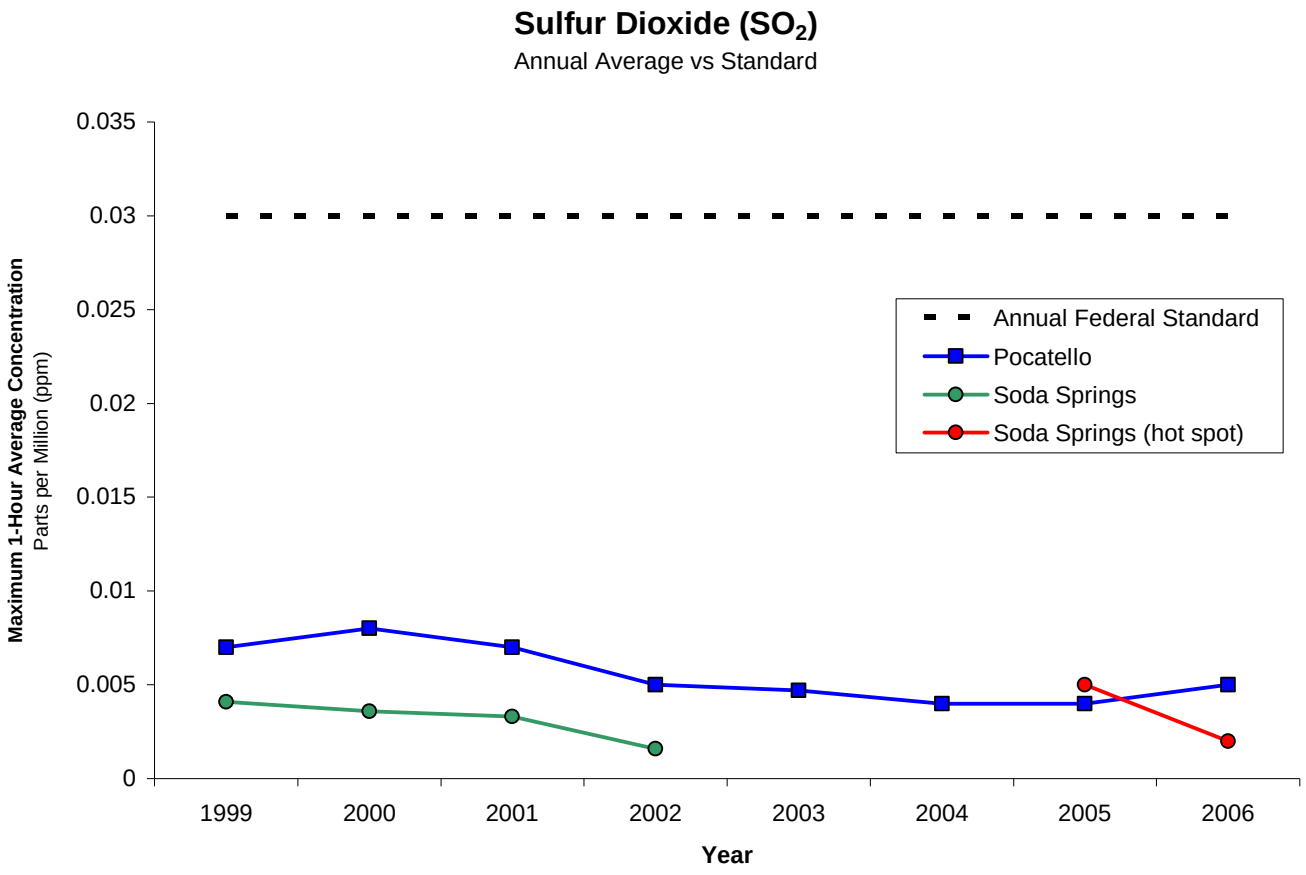
Sulfur Dioxide

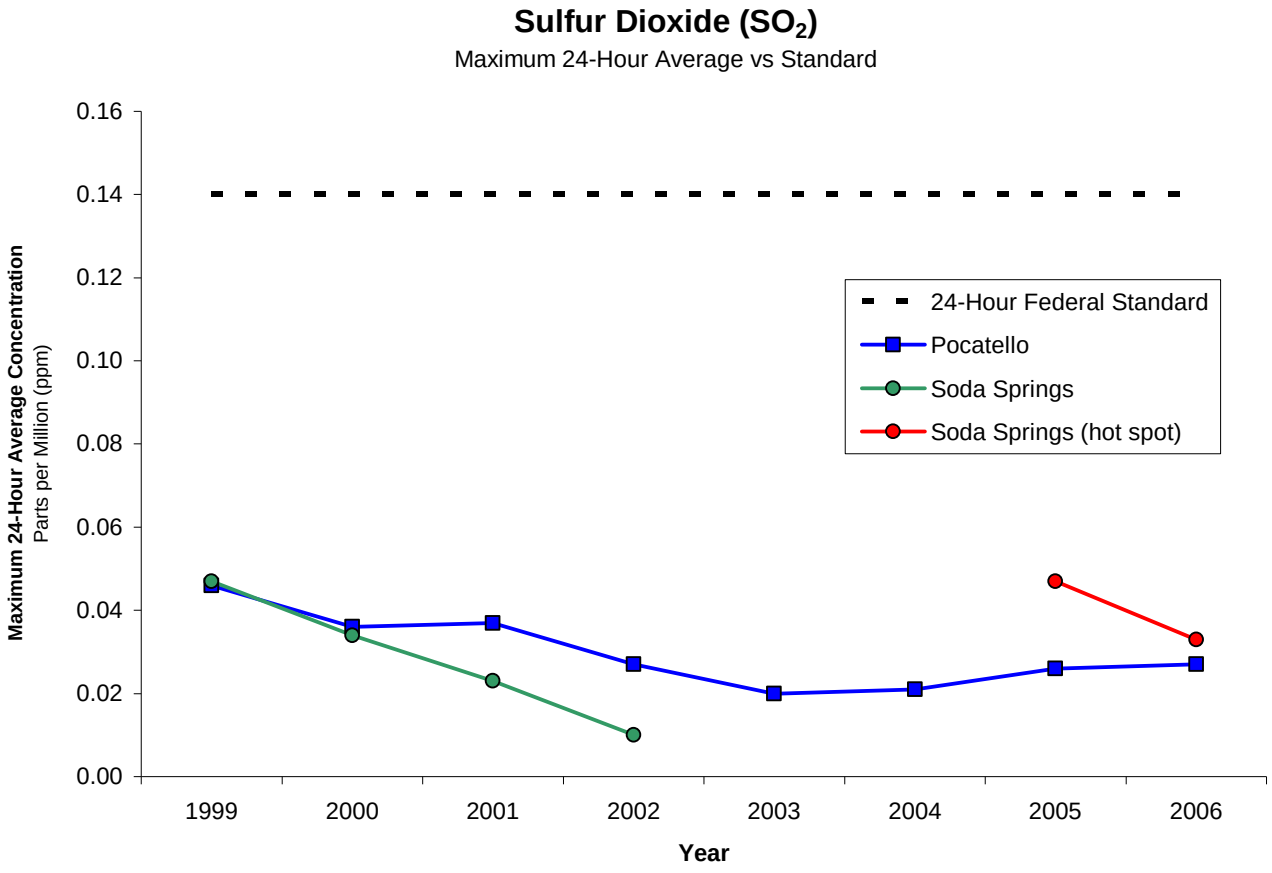
Sulfur dioxide (SO_2) is a colorless, reactive gas produced by burning fuels containing sulfur, such as coal and oil, and by industrial processes. Historically, the greatest sources of SO_2 were industrial facilities that derived their products from raw materials like metallic ore, coal, and crude oil, 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 SO_2 emissions to the air.

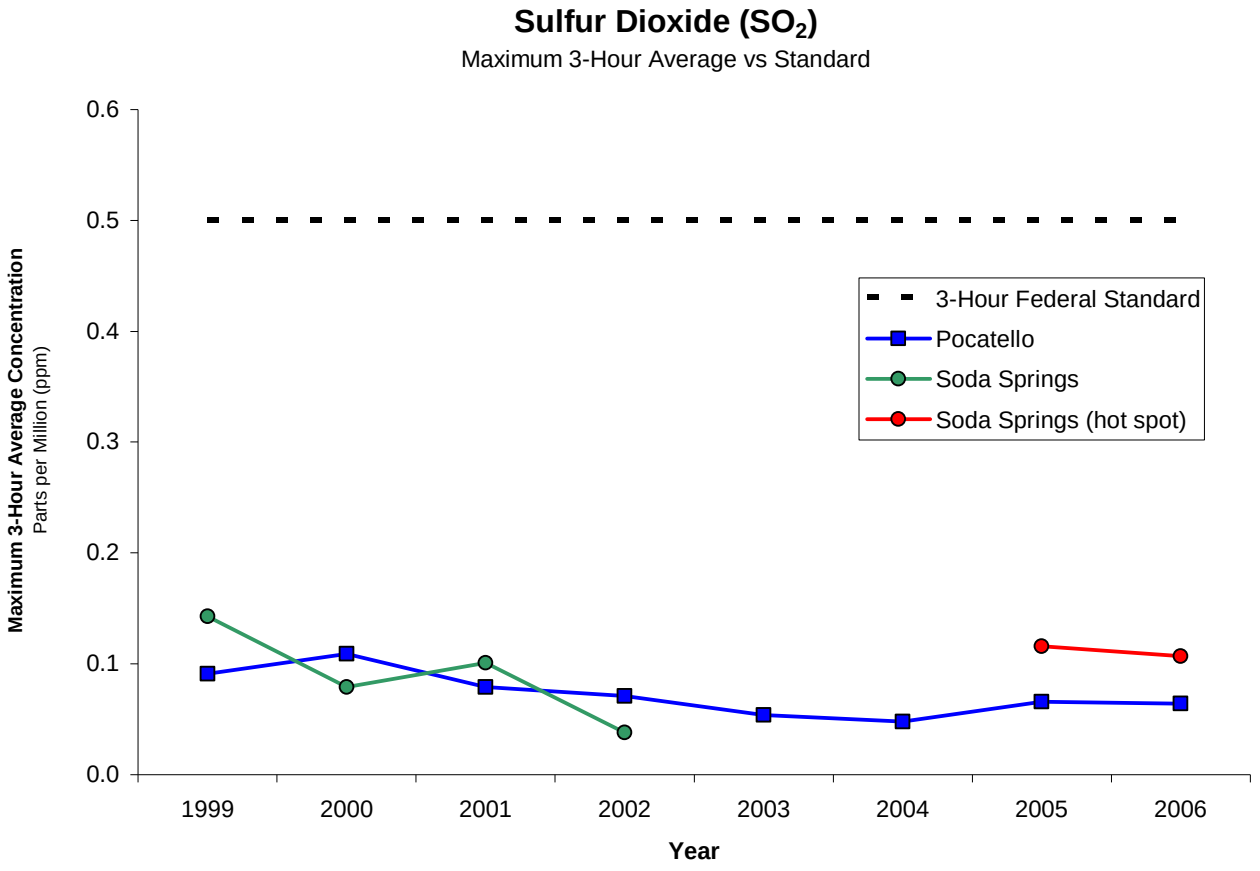
People with asthma who are active outdoors may experience bronchoconstriction, where symptoms include wheezing, shortness of breath, and tightening of the chest. People should limit outdoor exertion if SO_2 levels are high.

The graph on page 31 shows that Idaho is well below the annual standard for SO_2. The maximum measured SO_2 concentrations in 2006 were significantly below the federal standards as well. The graphs on pages 32 and 33 show the maximum 24-hour and 3-hour concentrations, respectively, at Idaho's monitoring sites. The maximum 24-hour and 3-hour averages were 0.033 ppm and 0.107 ppm, respectively. Note that the 2005-2006 Soda Springs monitor is at a different location than it was in 1999-2002. DEQ changed from population exposure monitoring to "hot spot" monitoring at Soda Springs. 'Hot spot' refers to monitoring that is designed to investigate pollution sources on a local scale. This allows for the assessment of air quality emanating from a point source, but rather than emissions being monitored directly from a stack or chimney, the air is measured as it moves towards areas where it may impact on human health or quality of life.

Additional SO_2 data are located in the Appendix, and information on SO_2 is available at www.epa.gov/air/urbanair/so2/index.html. SO_2 information is also provided in question/answer format in the definitions section of this document.


Sulfur Dioxide (SO_2)
Annual Average vs Standard
Maximum 1-Hour Average Concentration
Parts per Million (ppm)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1999
2000
2001
2002
2003
2004
2005
2006
Year
Annual Federal Standard
Pocatello
Soda Springs
Soda Springs (hot spot)


Sulfur Dioxide (SO_2)
Maximum 24-Hour Average vs Standard
Maximum 24-Hour Average Concentration
Parts per Million (ppm)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1999
2000
2001
2002
2003
2004
2005
2006
Year
24-Hour Federal Standard
Pocatello
Soda Springs
Soda Springs (hot spot)


Sulfur Dioxide (SO_2)
Maximum 3-Hour Average vs Standard
Maximum 3-Hour Average Concentration
Parts per Million (ppm)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1999
2000
2001
2002
2003
2004
2005
2006
Year
3-Hour Federal Standard
Pocatello
Soda Springs
Soda Springs (hot spot)

Lead

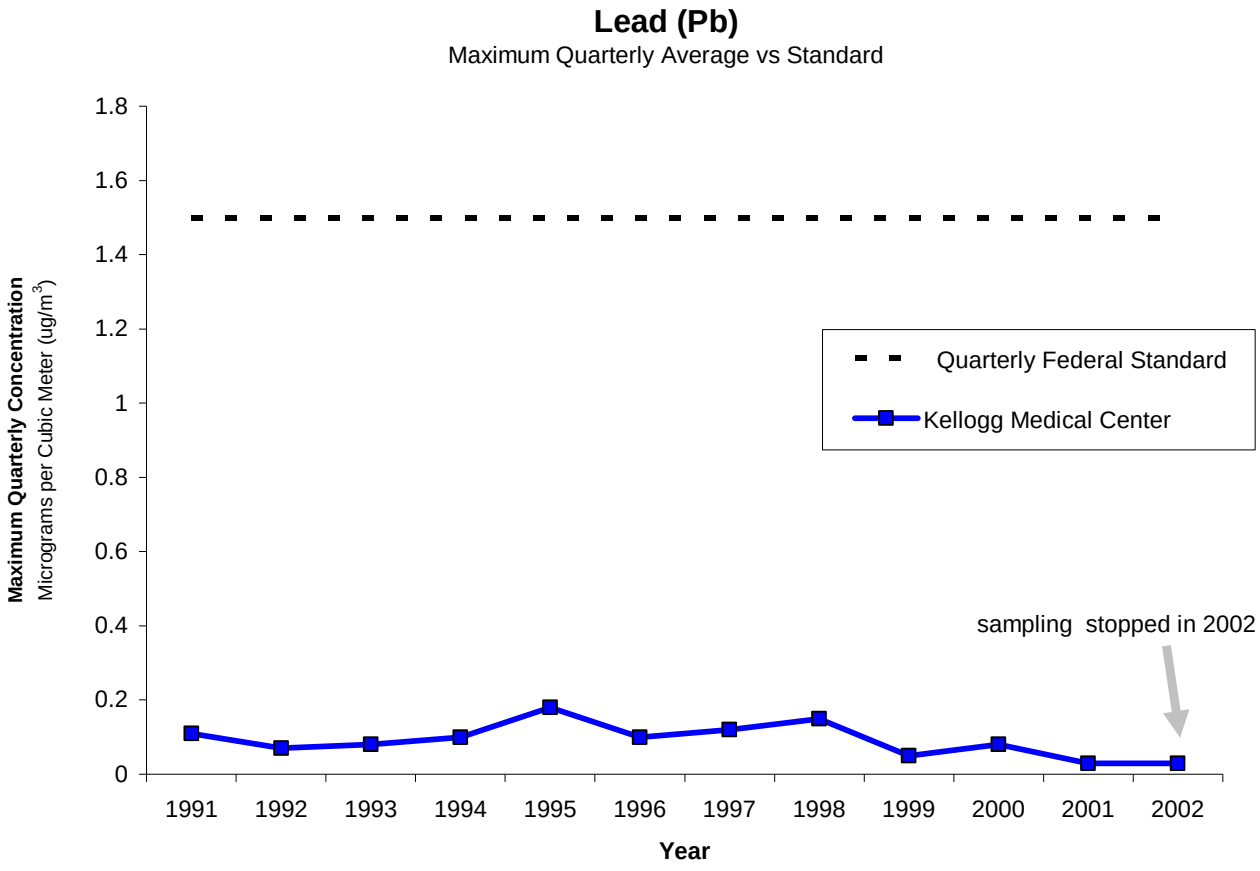
Lead is a highly toxic metal that was used for many years in household products, automobile fuel, and industrial chemicals. Airborne lead was associated primarily with automobile exhaust and lead smelters. The large reductions in lead emissions from motor vehicles have changed the nature of the air quality lead problem in 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 the EPA Web site www.epa.gov/ttnatw01/hlthef/lead.html for ways to limit your exposure to these lead sources.

Lead has not been monitored in Idaho since 2002. With the phase-out of lead in fuel and the closure of the Bunker Hill lead smelter in Kellogg, airborne lead is no longer a public health concern in Idaho. The graph on page 35 is included to show the historical monitoring of airborne lead in Kellogg.

For additional information on lead, visit www.epa.gov/air/urbanair/lead/index.html. Lead information is also available in a question/answer format in the definitions section of this document.


Lead (Pb)
Maximum Quarterly Average vs Standard
Maximum Quarterly Concentration
Micrograms per Cubic Meter (ug/m3)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Quarterly Federal Standard
Kellogg Medical Center
sampling stopped in 2002
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year

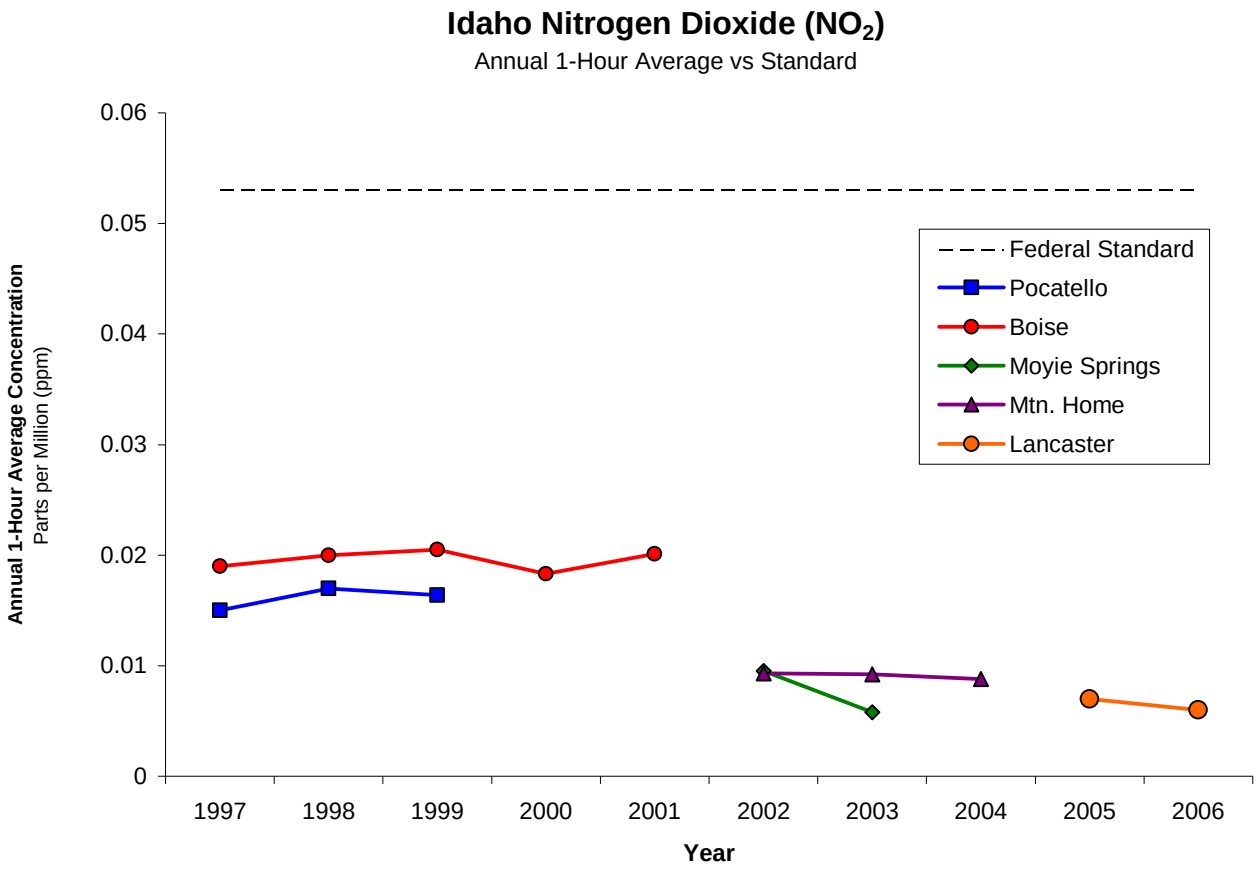
Nitrogen Dioxide

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. The term "NO_X", which is frequently used, refers to both NO and NO_2. NO_2 will react with VOCs and can result in the formation of ozone. On-road vehicles like trucks and automobiles are the major sources of NO_X. Industrial boilers and processes, home heaters, and gas stoves can also produce NO_X. NO_2 pollution is greatest in cold weather.

NO_2 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 2006, DEQ only maintained one monitoring site for nitrogen dioxide at the Lancaster site near Coeur d'Alene. The monitoring objective is primarily to assess ambient NO_X concentrations for evaluating ozone formation processes. The annual average for each year has consistently been less than half of the NAAQS standard, as shown in the graph on page 37 and in data in the Appendix. The maximum 1-hour average of NO_2 measured in 2006 was 0.038 ppm. NO_X monitoring at this site was stopped on December 31, 2006. NO_X data is now collected only during the ozone monitoring season.

For additional information on NO_2, visit www.epa.gov/air/urbanair/nox/index.html.


Idaho Nitrogen Dioxide (NO_2)
Annual 1-Hour Average vs Standard
Annual 1-Hour Average Concentration
Parts per Million (ppm)
0.06
0.05
0.04
0.03
0.02
0.01
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year
Federal Standard
Pocatello
Boise
Moyie Springs
Mtn. Home
Lancaster

Air Quality Index

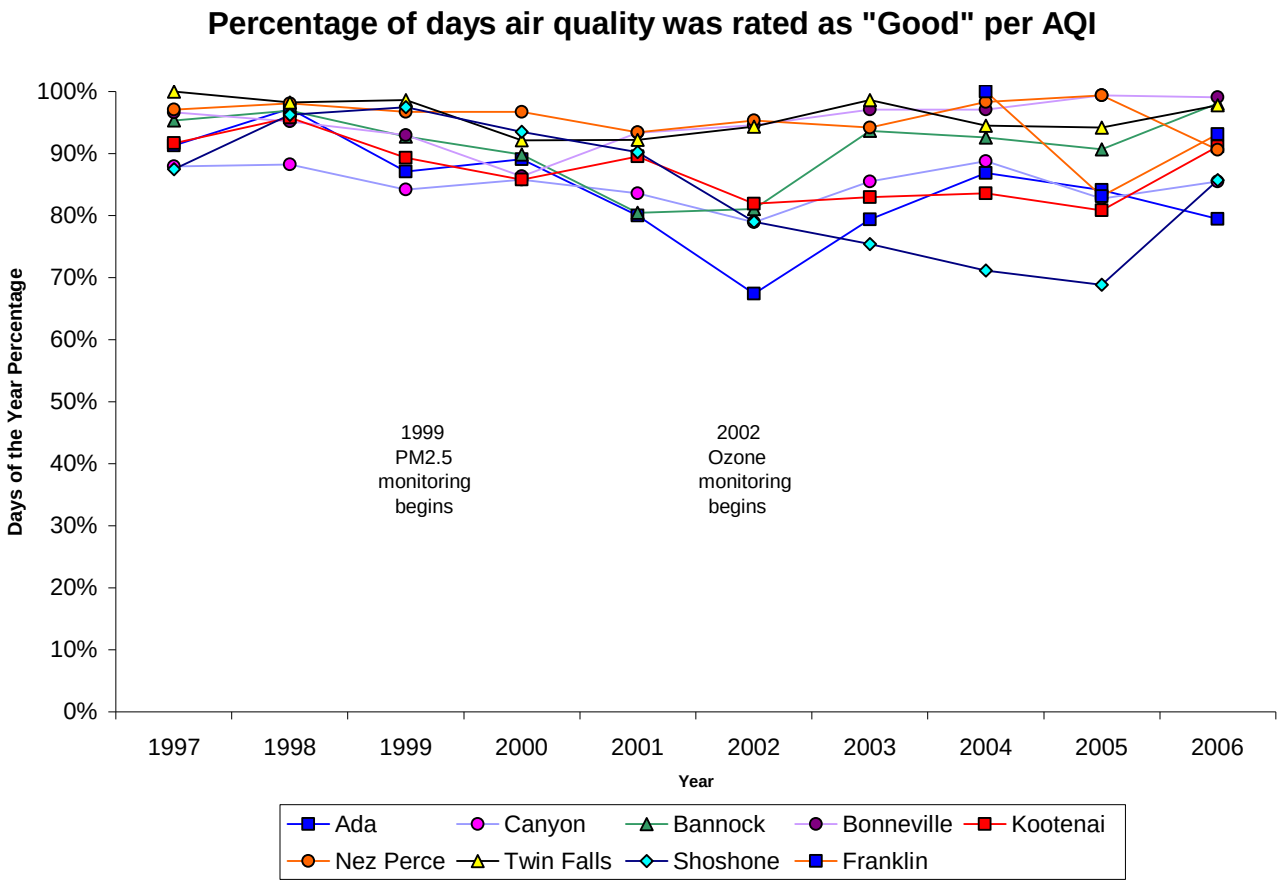
The AQI is reported according to a 500-point scale for each of the major criteria air pollutants: ozone, particulate matter ($PM_{2.5}$ & PM_{10}), carbon monoxide, nitrogen dioxide, and sulfur dioxide. The "worst denominator" determines the ranking. For example, if an area has a carbon monoxide value 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 below, with pollution concentration breakpoints for each category.

Levels of Health Concern	Numeric Value	Meaning
Good	0-50	Air quality is considered 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 very 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	300-500	Health warnings of emergency conditions. The entire population is more likely to be affected.

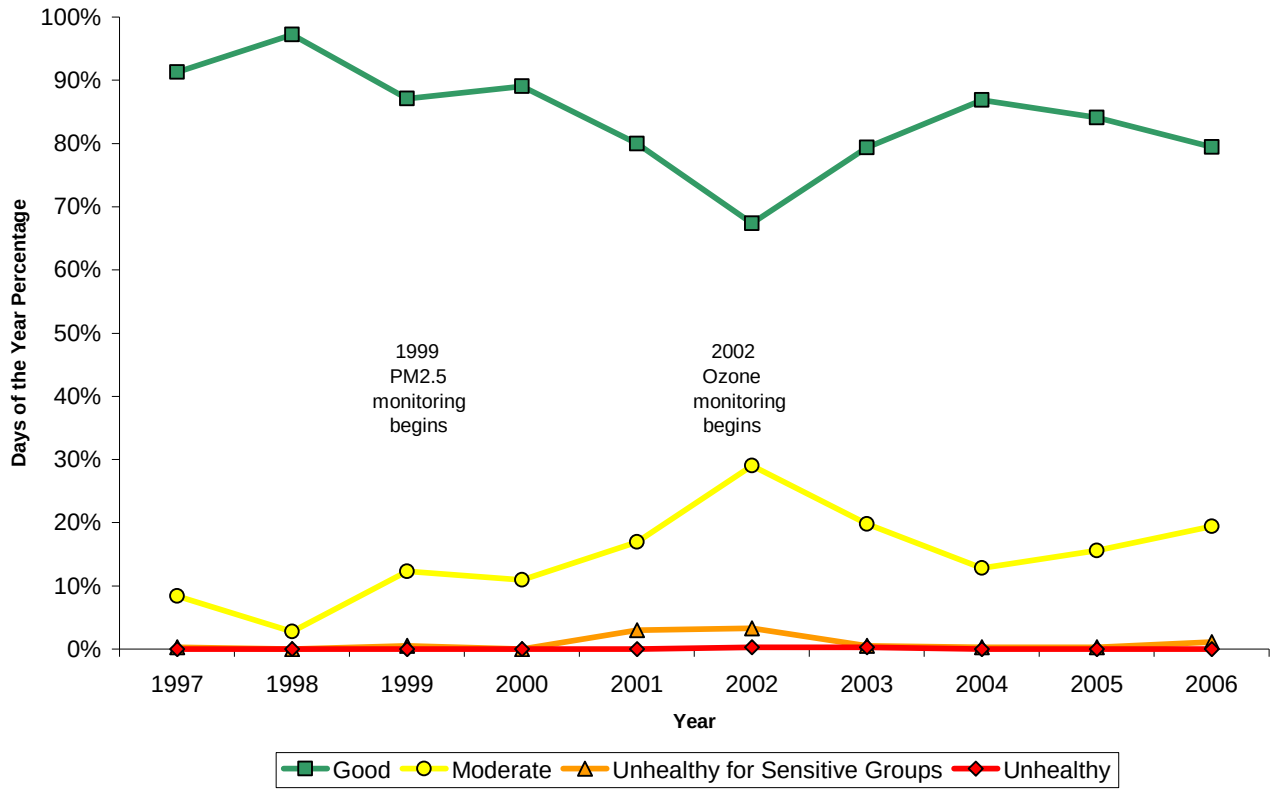
The AQI is a national index, so the values and colors used to show local air quality and the associated level of health concern will be the same everywhere in the U.S.A. The number of "good" air quality days continues to dominate regionally in Idaho. However, there were brief periods when the air quality degraded into "moderate," "unhealthy for sensitive groups," and "unhealthy." The table presented on page 49 shows the AQI breakdown by percentage in each category for the year.

The graph on page 39 presents the annual number of "good" days for several Idaho counties. The number of "good" days has remained relatively high over the last few years for each county. Current reduction in the number of "good" days cannot be directly compared with the numbers before 1999. In that year, $PM_{2.5}$ was added to the index and the "unhealthy" category was divided into "unhealthy" and "unhealthy for sensitive groups." In 2002 ozone monitoring was added to the AQI calculation in the Treasure Valley with ozone contributing to the number of moderate days in the following years. Ozone monitoring began at the Lancaster site near Coeur d'Alene in 2005.

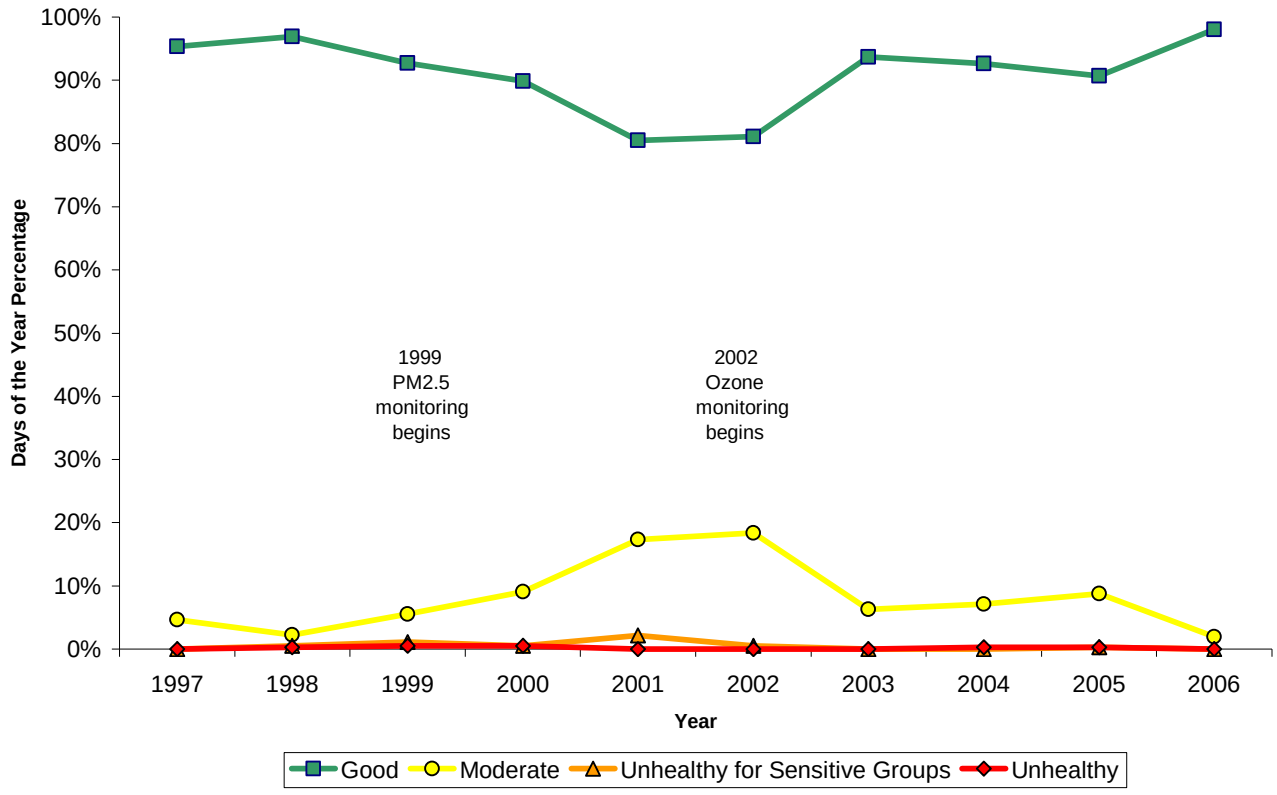
The AQI Graphs on pages 40-48 present the distribution of AQI categories recorded for nine Idaho counties. The AQI data summaries for each county that support the graphs are located in the Appendix.


Percentage of days air quality was rated as "Good" per AQI
Days of the Year Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year
1999 PM2.5 monitoring begins
2002 Ozone monitoring begins
Ada
Canyon
Bannock
Bonneville
Kootenai
Nez Perce
Twin Falls
Shoshone
Franklin

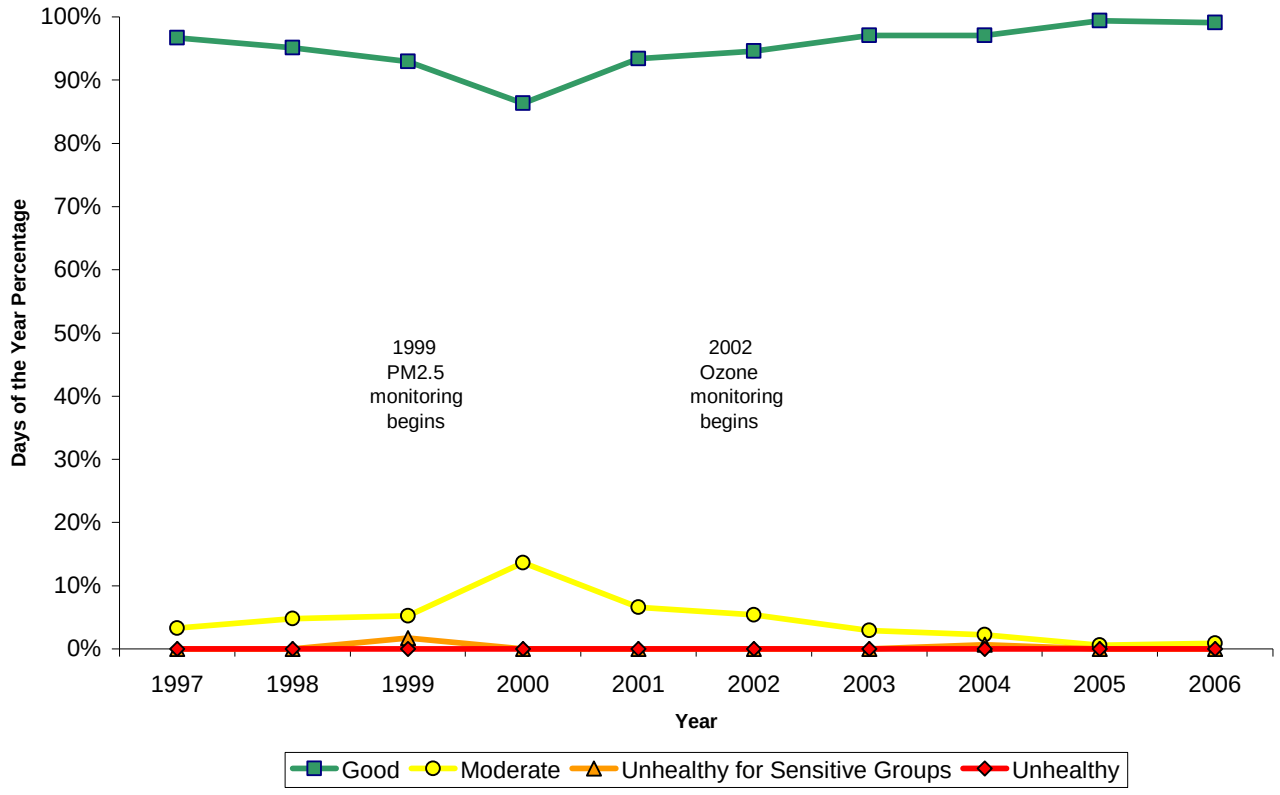
Air Quality for Ada County



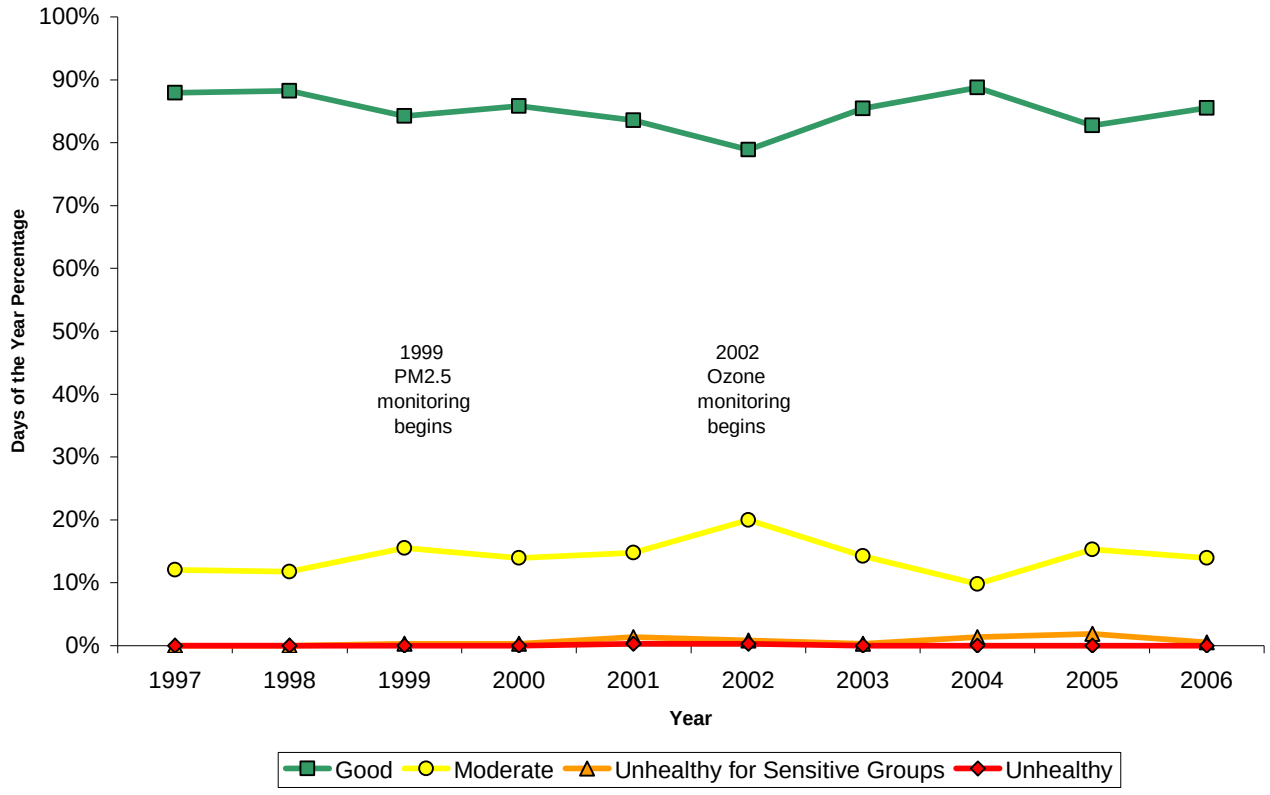
Air Quality for Bannock County

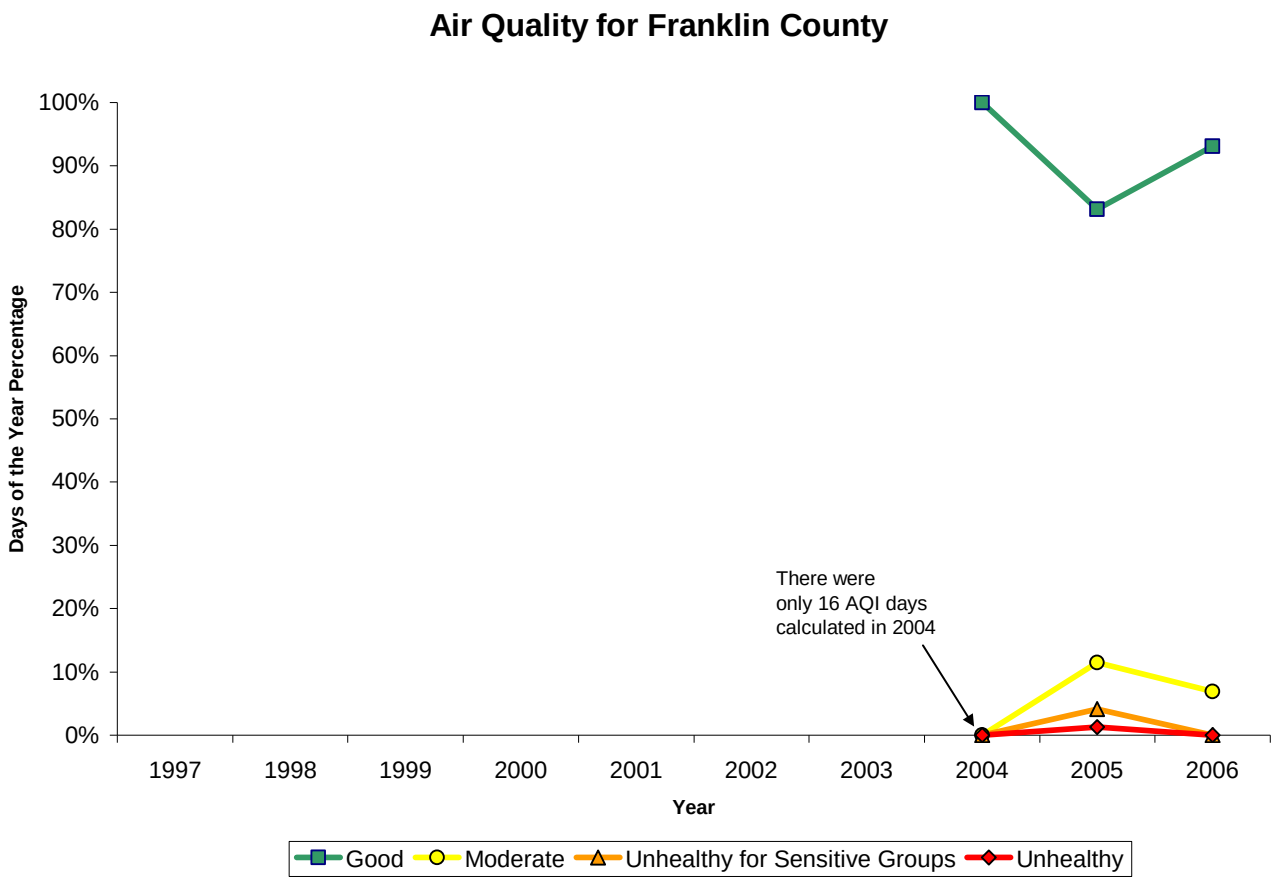


Air Quality for Bonneville County

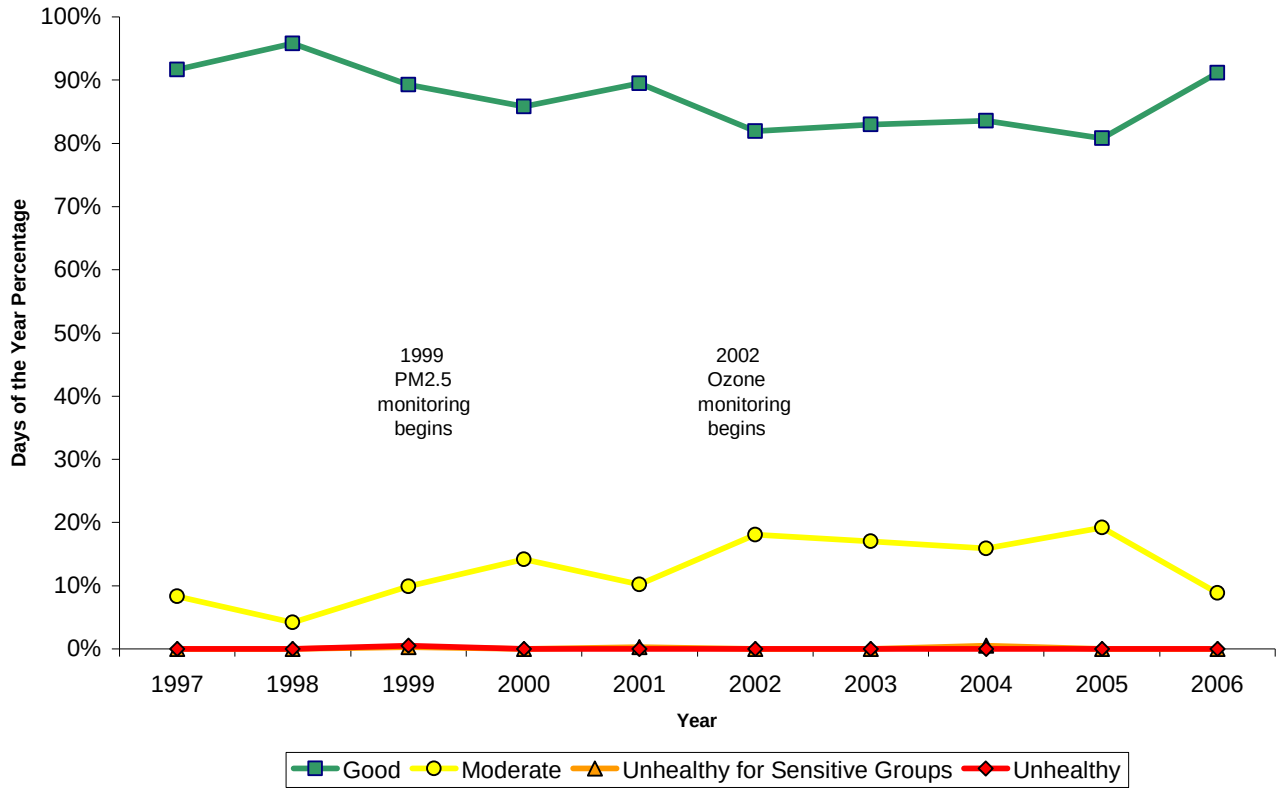


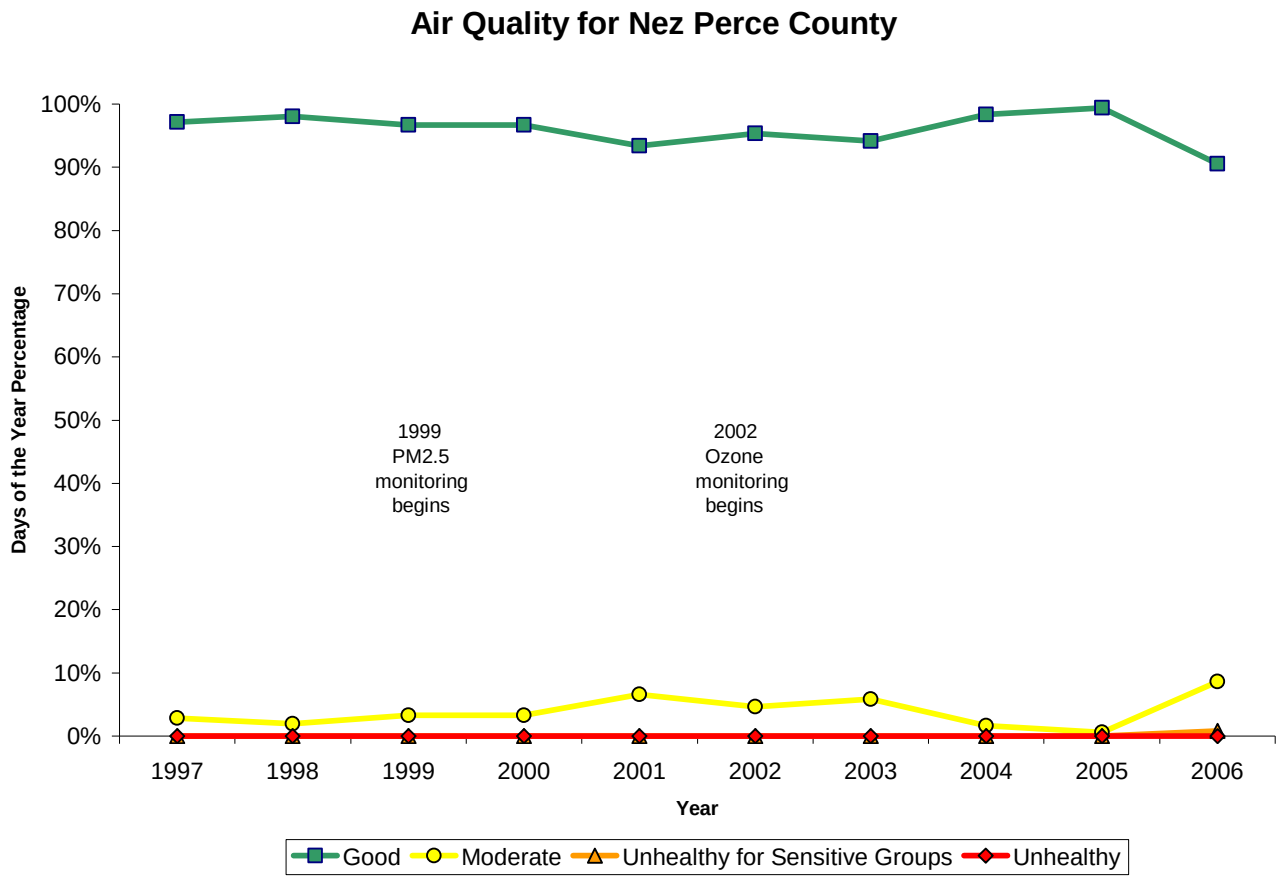
Air Quality for Canyon County

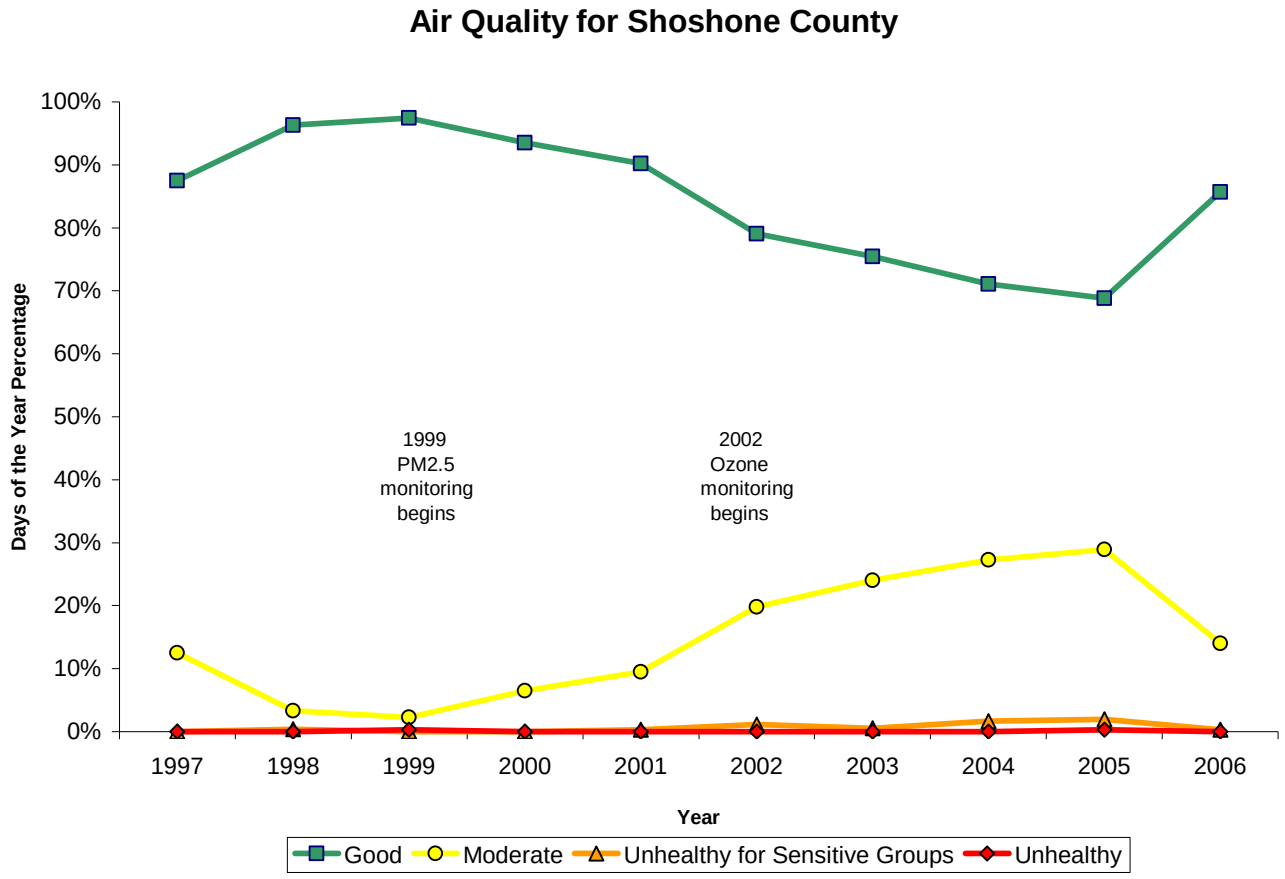


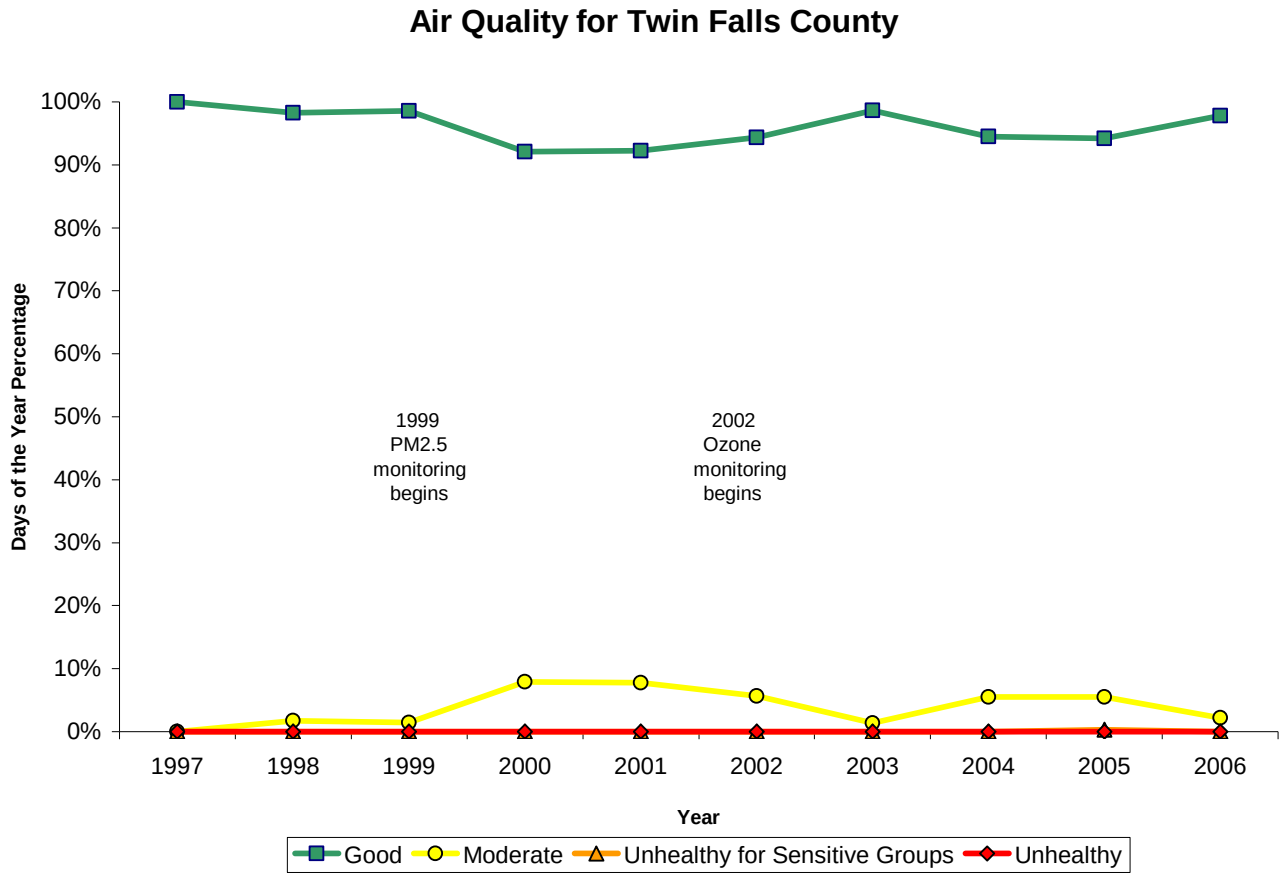

Air Quality for Franklin County
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Days of the Year Percentage
There were
only 16 AQI days
calculated in 2004
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy

Air Quality for Kootenai County




Air Quality for Nez Perce County
Days of the Year Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1999 PM2.5 monitoring begins
2002 Ozone monitoring begins
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy


Air Quality for Shoshone County
Days of the Year Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1999
PM2.5
monitoring
begins
2002
Ozone
monitoring
begins
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy


Air Quality for Twin Falls County
Days of the Year Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1999 PM2.5 monitoring begins
2002 Ozone monitoring begins
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year
Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy

The number of "good" AQI days continues to dominate regionally in Idaho; however, there were brief periods when the air quality degraded into "moderate," "unhealthy for sensitive groups," or "unhealthy." The table below shows the AQI breakdown by percentage in each category where air quality is monitored. In 2006, the highest AQI value of 171 was recorded in Lemhi County on August 23 for $PM_{2.5}$. This value was in the unhealthy range.

	2006	AQI Rating (% of Year)				
County	# AQI Days	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Highest AQI
Ada	365	79.5%	19.5%	1.1%		138
Bannock	365	98.1%	1.9%			66
Benewah	124	87.1%	12.1%	0.8%		115
Boise	46	56.5%	37.0%	4.3%	2.2%	160
Bonner	359	96.1%	3.9%			78
Bonneville	224	99.1%	0.9%			57
Butte	365	100.0%				40
Canyon	359	85.5%	13.9%	0.6%		108
Caribou	272	100.0%				49
Franklin	291	93.1%	6.9%			100
Idaho	233	91.8%	7.3%	0.9%		132
Kootenai	272	91.2%	8.8%			91
Latah	250	94.0%	5.2%	0.8%		123
Lemhi	208	86.5%	12.0%	0.5%	1.0%	171
Nez Perce	244	90.6%	8.6%	0.8%		107
Power	230	94.8%	4.8%	0.4%		146
Shoshone	350	85.7%	14.0%	0.3%		113
Twin Falls	227	97.8%	2.2%			70
Valley	65	61.5%	33.8%	4.6%		147

There were no NAAQS violations in 2006 for any pollutants. In most cases, pollutant concentrations fell well below standards.

Impaired Air Quality

Winter Burn Bans

Idaho has a winter-impaired air quality program primarily targeting sources of particulate matter from wood stoves and fireplaces. Idaho's program is generally implemented through local ordinances in those areas that have historically had winter inversion problems. Generally, these ordinances specify that a wood burning ban will be declared whenever DEQ reports an AQI value of 74 or greater for any pollutant measured by an approved monitor and air stagnation conditions are forecasted to continue for at least 24-hours. In some areas, open burning (even if a valid permit has been issued) is prohibited when DEQ reports an AQI value of 60 or higher for any pollutant measured in the city/region/airshed.

The DEQ online Current Air Quality Report lists the daily air quality in many cities and regions in Idaho. Each report will list the pollutant being monitored, the AQI, and burn restrictions, if any, for the day. Anyone wanting to know if they can burn can go to this site to see what the forecast is for their area.

From November 1 through March 31, alert between 2:00 and 4:00 p.m. each day, when the air quality is forecasted to be poor, DEQ will issue an air quality to notify the local community of the next day's air quality condition forecasted for their airshed. If conditions are expected to be poor for the weekend, alerts will continue to be issued at the regular time on Saturday and Sunday. These alerts will be reported to local media outlets and to others through an email notification list.

Summer Ozone Alerts

DEQ forecasts pollution conditions for ozone in the Treasure Valley Monday through Friday (and weekends when needed) 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 very 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 very 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 keep vehicles maintained, limit driving, combine trips, comply with open burning restrictions, refuel after 7:00 p.m. and to not top off the tank, mow lawns in the evening, and don't use lighter fluid on the barbecue. These alerts will be reported to local media outlets and to others through an email notification list. The plan can be viewed at: http://www.deq.state.id.us/air/data_reports/reports/ada_co/pollution_response_plan_summer.pdf.

DEFINITIONS

General 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 Idaho air rules in IDAPA 58.01.01.585 and 586 (http://adm.idaho.gov/adminrules/rules/idapa58/0101.pdf). Hazardous air pollutants (see below) are included in this list to identify them as a subset of air toxics.

Criteria Air Pollutant (CAP)

The Clean Air Act of 1970 defined six *criteria pollutants* and established ambient concentrations to protect public health. EPA periodically has revised the original concentration limits and methods of measurement, most recently in 1997. See page 3 for the list and the allowed ambient concentrations.

Hazardous Air Pollutant (HAP)

A *hazardous air pollutant* is an air contaminant identified as toxic in the Federal Clean Air Act, Section 112(b). 188 pollutants are currently listed as HAPs. They are listed by EPA at 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 (VOC)

An organic compound 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 you have, 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.

Pollution Sources

Area Sources

Countywide categories of pollution sources, in which each individual source emits pollutants below the thresholds for a point source facility designation.

Biogenics

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 non-methane hydrocarbons originating from human sources. Isoprene, one of the major constituents of biogenic emissions, is very photoreactive and makes biogenic VOCs a contributor in the formation of ozone.

Emission Factor

A value derived from source tests, material balance calculations, or engineering comparisons with similar processes. Used to estimate emissions from process quantities.

Non-road Mobile Sources

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

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 1000 tons per year of CO; 100 tons per year of NO_X, PM_{10}, $PM_{2.5}$, SO_x, or VOCs; or 5 tons per year of lead.

Registered Facility

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

Area Sources

Also called non-point sources. Pollution sources where each individual facility or source emits pollutants below the thresholds for point source classification. Sources include wood stoves/fireplaces, outdoor burning, architectural surface coating, automobile painting, commercial/consumer solvents, dry

cleaning, printing, stationary diesel engines, small utility engines, small industrial facilities, gas stations, and construction activities.

Criteria Air Pollutants

Ozone (O_3)

- **What is it?**
  Ozone, 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 very reactive gas. For this reason, high concentrations of ozone 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). Although many of the pollution control efforts required by the CAA have been implemented, efforts to decrease ozone pollution have been only partially successful.

In the Treasure Valley airshed the ozone trend is flat and is marginally within the Federal standards.

- **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 various locations. Another ozone monitor has been running in the Coeur d'Alene area since 2005.

Particulate Matter ($PM_{2.5}$ and PM_{10})

- **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 peaks in $PM_{2.5}$ in urbanized areas suggest that $PM_{2.5}$ levels peak in association with traffic flow and rush hour periods.
- **Who is affected?**
  People with asthma and heart or lung disease, the elderly, and children. $PM_{2.5}$ 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 PM, both $PM_{2.5}$ and PM_{10} are monitored in various population-oriented locations throughout Idaho.

Carbon Monoxide (CO)

- **What is it?**
  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 doesn't burn completely. Vehicle exhaust contributes 60% of all CO. In cities, that can be a 95% contribution.
- **When does it happen?**
  CO pollution is at its worst in cold weather because fuels burn less efficiently in low temperatures. CO 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 CO can affect alertness and vision even in healthy individuals.
- **What can I do about it?**
  If CO levels are high, limit exertion and avoid sources of CO such as heavy traffic.
- **Where is it measured?**
  CO monitoring stations are located in urban canyon areas with heavy traffic congestion. These include central business areas, roadsides, and shopping malls.

Sulfur Dioxide (SO_2)

- **What is it?**
  Sulfur dioxide is a colorless, reactive gas.
- **How is it caused?**
  SO_2 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 SO_2 are usually near large industrial sources.
- **Who is affected?**
  People with asthma who are active outdoors.
- **What are the health effects?**
  Bronchoconstriction, which can cause wheezing, shortness of breath, and tightening of the chest. When exposure to SO_2 ends, the symptoms should clear up within an hour.

- **What can I do about it?**
  If SO_2 levels are high, limit your outdoor exertion.
- **Where is it measured?**
  Because the large primary sources of SO_2 in Idaho are industrial, DEQ monitors for SO_2 near large facilities with high SO_2 emissions. The only monitors running in 2006 were in Pocatello and Soda Springs.

Lead (Pb)

- **What is it?**
  Lead 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. Also, the Kellogg Bunker Hill Mine ceased operations in 1981.
- **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 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 Web site 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 no longer monitors for airborne lead. Historical monitoring was continued until 2002 but was discontinued due to the low levels being measured.

Nitrogen Dioxide (NO_2)

- **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. NO_2 will react with VOCs and can result in the formation of ozone.

- **How is it caused?**
  High temperature combustion sources such as power plants and automobiles are major producers of NO. Home heaters and gas stoves can also produce NO.
- **When does it happen?**
  NO_2 pollution is greatest in cold weather. It follows a similar trend to CO.
- **Who is affected?**
  People with respiratory diseases such as asthma; also children.
- **What are the health effects?**
  NO_2 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 NO emissions from cars and trucks. It is not a significant pollution problem in Idaho.
- **Where is it measured?**
  NO_2 is not a major concern in Idaho. It was measured during 2006 at the Lancaster site near Coeur d'Alene, but was curtailed December 31, 2006 and will now only be monitored during ozone season.

Appendix

Calculation and Breakpoints for the Air Quality Index (AQI)

Breakpoints for Criteria Pollutants							AQI Categories	
0_3 (ppm) 8-hour	0_3 (ppm) 1-hour[a]	$PM_{2.5}$ ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	CO (ppm)	SO_2 (ppm)	NO_2 (ppm)	AQI value	Category
0.000–0.064	—	0.0–15.4	0–54	0.0–4.4	0.000–0.034	(b)	0–50	Good
0.065–0.084	—	15.5–40.4	55–154	4.5–9.4	0.035–0.144	(b)	51–100	Moderate
0.085–0.104	0.125–0.164	40.5–65.4	155–254	9.5–12.4	0.145–0.224	(b)	101–150	Unhealthy for sensitive groups
0.105–0.124	0.165–0.204	65.5–150.4	255–354	12.5–15.4	0.225–0.304	(b)	151–200	Unhealthy
0.125–0.374	0.205–0.404	150.5–250.4	355–424	15.5–30.4	0.305–0.604	0.65–1.24	201–300	Very unhealthy
(c)	0.405–0.504	250.5–350.4	425–504	30.5–40.4	0.605–0.804	1.25–1.64	301–400	Hazardous
(c)	0.505–0.604	350.4–500.4	505–604	40.5–50.4	0.805–1.004	1.65–2.04	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 NO_2 has no short-term National Ambient Air Quality Standard (NAAQS) and can generate an AQI only above a value of 200.

c 8-hour O_3 values do not define higher AQI values (above 300). AQI values above 300 are calculated with 1-hour 0_3 concentrations.

For more detailed information about the AQI and the pollutants it measures, go to www.epa.gov/airnow/aqibroch

US EPA - AirData Air Quality Index Report
Monday: 21-May-2007 at 11:4:58 AM (USA Eastern time zone)
Geographic Area: Idaho
Pollutant: See http://www.epa.gov/airnow/aqibroch/
Year: 2006

Data Year	County	# AQI data days	Number of Days AQI was:				Max AQI	90th % AQI	Median AQI	Number of Days Main AQI Pollutant was:					
			Good	Mod	Unhealthy Sensitive Groups	Un-healthy				CO	NO2	O3	SO2	PM2.5	PM10
2006	Ada	365	290	71	4		138	62	28	25		113		130	97
2006	Bannock	365	358	7			66	31	17				87	101	177
2006	Benewah	124	108	15	1		115	55	24					124	
2006	Boise	46	26	17	2	1	160	93	44					46	
2006	Bonner	359	345	14			78	36	19					232	127
2006	Bonneville	224	222	2			57	27	17					224	
2006	Butte	365	365				40	29	22			365			
2006	Canyon	359	307	50	2		108	56	30	2		74		177	106
2006	Caribou	272	272				49	4	1				272		
2006	Franklin	291	271	20			100	42	16					291	
2006	Gem	9	9				50	50	24					9	
2006	Idaho	233	214	17	2		132	46	17					233	
2006	Kootenai	272	248	24			91	49	32			112		156	4
2006	Latah	250	235	13	2		123	35	13					250	
2006	Lemhi	208	180	25	1	2	171	57	25					208	
2006	Nez Perce	244	221	21	2		107	46	18					244	
2006	Power	230	218	11	1		146	35	15						230
2006	Shoshone	350	300	49	1		113	57	24					270	80
2006	Twin Falls	227	222	5			70	39	22					227	
2006	Valley	65	40	22	3		147	78	34					65	

*** US EPA - AirData Monitor Values Report - Criteria Air Pollutants**
*** Tuesday, 22-May-2007 at 4:40:16 PM (USA Eastern time zone)**
*** Geographic Area: Idaho**
*** Pollutant: Particulate (size < 2.5 micrometers)**
*** Year: 2006**

Data Year	County	24-Hour PM2.5							Annual Mean	Annual # Exceed	Monitor Number	Site ID	Site Address	City
		# Obs	1st Max	2nd Max	3rd Max	4th Max	98th Pct	# Ex-ceed						
2006	Ada	15	35	17	15	14	35	0	9.1	0	1	160010010	520 S. Eagle Road, Meridian	Meridian
2006	Ada	49	29	24	22	22	29	0	8	0	1	160010011	Mtn View School/3500 Carbarton La	Boise
2006	Bannock	10	9	9	7	3	9	0	4.1	0	2	160050015	G&G/Corner Of Garret & Gould	Pocatello
2006	Bannock	59	23	21	20	17	21	0	6.4	0	1	160050015	G&G/Corner Of Garret & Gould	Pocatello
2006	Bannock	24	14	8	6	6	14	0	4	0	1	160050018	Highway 30 - Inkom, Idaho	
2006	Benewah	52	48	33	24	23	33	0	9.7	0	1	160090010	9th And Center	
2006	Benewah	52	26	17	15	15	17	0	7	0	1	160090011	850 A Street, Plummer	
2006	Canyon	29	28	21	16	14	28	0	9.1	0	2	160270004	Northwest Nazarine College (Nnc)	Nampa
2006	Canyon	105	27	24	22	21	22	0	7.6	0	1	160270004	Northwest Nazarine College (Nnc)	Nampa
2006	Franklin	284	40	35	31	29	27	0	6.2	0	1	160410001	Franklin - Water Treatment Facility	Franklin
2006	Franklin	48	15	14	11	9	15	0	5.1	0	1	160410002	Preston Jr. High - 450 E. Valley Vie	Preston
2006	Idaho	55	26	25	25	25	25	0	9.5	0	2	160490003	Intersection Of Apple And Pine, Kamiah	
2006	Idaho	57	37	26	25	25	26	0	10	0	1	160490003	Intersection Of Apple And Pine, Kamiah	
2006	Shoshone	115	47	34	34	30	34	0	11.5	0	1	160790017	Pinehurst/Pinehurst School, Pinehu	Pinehurst

*** US EPA - AirData Monitor Values Report - Criteria Air Pollutants**
*** Tuesday, 22-May-2007 at 4:14:0 PM (USA Eastern time zone)**
*** Geographic Area: Idaho**
*** Pollutant: Particulate (size < 10 micrometers)**
*** Year: 2006**

		24-Hour PM10											
Data Year	County	# Obs	1st Max	2nd Max	3rd Max (24-Hr PM10)	4th Max (24-Hr PM10)	# Exceed-Actual (24-Hr PM10)	Annual Mean (PM10)	Annual # Exceed (PM10)	Mon #	Site ID	Site Address	City
2006	Ada	308	97	89	69	69	0	23	0	3	160010009	Fire Station #5/16th & Front	Boise
2006	Ada	49	56	56	45	43	0	21	0	1	160010011	Mtn View School/3500 Carbarton Lane	Boise
2006	Bannock	116	62	53	52	48	0	21	0	1	160050015	G&G/Corner Of Garret & Gould	Pocatello
2006	Bannock	16	45	35	35	29	0	20	0	2	160050015	G&G/Corner Of Garret & Gould	Pocatello
2006	Bannock	315	47	45	44	43	0	14	0	3	160050015	G&G/Corner Of Garret & Gould	Pocatello
2006	Bonner	351	68	62	52	52	0	18	0	1	160170004	310 South Division Street	Sandpoint
2006	Canyon	311	106	96	87	83	0	26	0	2	160270002	Nampa Fire Stn/923 1st St	Nampa
2006	Kootenai	155	55	47	40	39	0	15	0	3	160550006	Lakes Middle School/930 N 15th St	Coeur D'Alene
2006	Power	116	161	150	107	89	1	26	0	1	160770011	S Of Hwy 30 And E Of Weaver Rd	
2006	Power	57	130	110	94	78	0	25	0	2	160770011	S Of Hwy 30 And E Of Weaver Rd	
2006	Power	167	245	99	78	76	1	18	0	3	160770011	S Of Hwy 30 And E Of Weaver Rd	
2006	Shoshone	343	52	52	47	44	0	19	0	3	160790017	Pinehurst/Pinehurst School, Pinehurst	Pinehurst

*** US EPA - AirData Monitor Values Report - Criteria Air Pollutants**
*** Monday, 21-May-2007 at 4:17:6 PM (USA Eastern time zone)**
*** Geographic Area: Idaho**
*** Pollutant: Ozone**
*** Year: 2006**

Data Year	County	8-Hour Ozone 1st Max	2nd Max	3rd Max	4th Max	Days >Std	Required Days	# Days	% Days	Monitor Number	Site ID	Site Address	City
2006	Ada	0.078	0.076	0.074	0.074	0	143	120	84	1	160010019	3311 W. State Street, Boise	Boise
2006	Ada	0.090	0.088	0.083	0.082	2	153	134	88	1	160010030	Whitney Elementary School	Boise
2006	Butte	0.051	0.047	0.046	0.046	0	153	149	97	1	160230101	Craters Of The Moon National Mon, Idaho	
2006	Canyon	0.075	0.074	0.072	0.071	0	117	93	79	1	160270007	5 South 3rd Avenue West	
2006	Kootenai	0.075	0.07	0.068	0.068	0	153	120	78	1	160550003	North Of Lancaster Road - Near Hayden, I	

*** US EPA - AirData Monitor Values Report - Criteria Air Pollutants**
*** Tuesday, 22-May-2007 at 5:48:23 PM (USA Eastern time zone)**
*** Geographic Area: Idaho**
*** Pollutant: Carbon Monoxide**
*** Year: 2006**

Data Year	County	1-Hour CO				8-Hour CO			Monitor #	Site ID	Site Address	City
		# Obs	1st Max	2nd Max	# Exceed	1st Max	2nd Max	# Exceed				
2006	Ada Co	8068	4.8	3.5	0	2.1	2.1	0	1	160010014	Eastman Bldg/166 N. 9th St	Boise

*** US EPA - AirData Monitor Values Report - Criteria Air Pollutants**
*** Thursday, 24-May-2007 at 2:59:48 PM (USA Eastern time zone)**
*** Geographic Area: Idaho**
*** Pollutant: Nitrogen Dioxide**
*** Year: 2006**

Data Year	County	1-Hour NO2 # Obs	1-Hour NO2 1st Max	1-Hour NO2 2nd Max	Annual NO2 Mean	Annual NO2 # Exceed	Monitor #	Site ID	Site Address	City
2006	Kootenai	8417	0.038	0.037	0.006	0	1	160550003	North Of Lancaster Road - Near Hayden, I	

*** US EPA - AirData Monitor Values Report - Criteria Air Pollutants**
*** Thursday, 24-May-2007 at 1:30:56 PM (USA Eastern time zone)**
*** Geographic Area: Idaho**
*** Pollutant: Sulfur Dioxide**
*** Year: 2006**

Data Year	County	1-Hr SO2			3-Hr SO2		24-Hr SO2			Annual SO2		Mon #	Site ID	Site Address	City
		# Obs	1st Max	2nd Max	1st Max	2nd Max	1st Max	2nd Max	# Exceed	Mean	# Exceed				
2006	Bannock	8606	0.09	0.079	0.064	0.061	0.027	0.024	0	0.005	0	2	160050004	Stp/Batiste & Chubbuck Rd	Pocatello
2006	Caribou	6567	0.115	0.114	0.107	0.09	0.033	0.024	0	0.002	0	1	160290031	5 Mile Road	Soda Springs

US EPA - AirData Monitor Values Report - Criteria Air Pollutants
Friday, 21-Oct-2005 at 11:25:31 AM (USA Eastern time zone)
Geographic Area: Idaho
Pollutant: Lead
Year: 1999 - 2002

Data Year	County	24-Hour Lead			Qtr 1	Qtr 2	Qtr 3	Qtr 4	# Exceed	Monitor Number	Site ID	Site Address	City
		# Obs	1st Max	2nd Max									
1999	Shoshone	59	0.14	0.13	0.04	0.03	0.05	0.04	0	1	160790006	Medical Clinic/204 Oregon	Kellogg
2000	Shoshone	61	0.49	0.10	0.04	0.04	0.08	0.04	0	1	160790006	Medical Clinic/204 Oregon	Kellogg
2001	Shoshone	58	0.06	0.04	0.03	0.03	0.03	0.03	0	1	160790006	Medical Clinic/204 Oregon	Kellogg
2002	Shoshone	30	0.05	0.04	0.03	0.03			0	1	160790006	Medical Clinic/204 Oregon	Kellogg