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# 2010 Air Quality Ozone Season Summary for the Coeur d'Alene Area



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## Table of Contents

List of Tables .....	ii
List of Figures .....	ii
Introduction.....	1
Overview of Ozone .....	2
National Ambient Air Quality Standards .....	2
Idaho’s Monitoring Network .....	3
Ozone Monitoring in Kootenai County .....	4
2010 Ozone Season Summary .....	6
Ozone, Temperature, and Solar Radiation .....	10
Ozone and Nitrogen Oxides .....	13
Ozone and Wind.....	14
Potential Standard Changes in 2011 .....	17
Coeur d’Alene Area Emission Sources.....	18
Source Categories.....	18
Sources of Volatile Organic Compounds and Nitrogen Oxides .....	19
Current Public Outreach and Potential Actions .....	21
Current Ozone Air Quality Forecasts.....	21
Potential for Issuing Ozone Alerts .....	21
Information Provided by the Air Quality Index .....	22
Frequently Asked Questions about Ozone.....	23



## List of Tables

Table 1. National Ambient Air Quality Standard for Ozone .....	3
Table 2. Pollutant monitoring methods used at the Lancaster site in 2010 .....	5
Table 3. Meteorology monitoring methods used at the Lancaster site in 2010 .....	5
Table 4. Historical average precipitation compared with 2010 amounts.....	11
Table 5. Meters per second converted to miles per hour .....	15
Table 6. Proposed new National Ambient Air Quality Standard (NAAQS) ozone levels and their implication for 2011 at the Lancaster site.....	18
Table 7. Idaho 2005 estimated criteria air pollutant emission inventory—summary for Kootenai County and Spokane Area.....	19
Table 8. Corresponding Air Quality Index (AQI) category for five criteria pollutants.....	22

## List of Figures

Figure 1. Map of Coeur d’Alene and surrounding areas and ozone monitoring locations.....	1
Figure 2. Lancaster site daily peak 8-hour average ozone (O <sub>3</sub> ) concentration for the 2010 ozone season .....	6
Figure 3. Lancaster site ozone monitoring design values versus ozone National Ambient Air Quality Standard (NAAQS).....	7
Figure 4. Lancaster site’s 10 days with the highest 8-hour average ozone concentrations in 2010 and hour when highest average occurred (in Pacific Standard Time) .....	8
Figure 5. Lancaster site’s 10 days with the highest 8-hour average ozone concentrations in 2010 as a percentage of the ozone National Ambient Air Quality Standard (NAAQS). Hour of highest average reading is given in Pacific Standard Time.....	9
Figure 6. 2010 monthly average temperatures at the Lancaster site versus historical averages....	10
Figure 7. Hourly ozone concentration compared with temperature for July 28–31, 2010 .....	11
Figure 8. Hourly ozone concentration compared with solar radiation for July 28–31, 2010 .....	12
Figure 9. Hourly ozone concentration compared with nitrogen oxides (NO <sub>x</sub> ) for July 28–31, 2010.....	13
Figure 10. Wind rose for the 2010 ozone season.....	14
Figure 11. Pollution rose for the 2010 ozone season .....	15
Figure 12. Map of the Coeur d’Alene area showing wind directions during periods of highest (orange) and lowest (blue) ozone concentrations .....	16
Figure 15. Proposed ozone National Ambient Air Quality Standards (NAAQS), trigger levels (85% of NAAQS), and projected design value for 2011 .....	17
Figure 13. Sources of nitrogen oxides in Kootenai County.....	20
Figure 14. Sources of volatile organic compounds in Kootenai County .....	21



## Introduction

This report presents a summary of monitoring data collected during the 2010 ozone season (April 1–September 30) at the Lancaster Road multipollutant monitoring site (Lancaster site) in Kootenai County, Idaho, and compares the monitoring results to current and proposed National Ambient Air Quality Standards (NAAQS). For the purpose of this report, the Coeur d’Alene Airshed is defined as the Rathdrum Prairie, including the cities of Coeur d’Alene, Hayden, Rathdrum and Post Falls. Preliminary modeling suggests the Coeur d’Alene Airshed experiences significant influences from several eastern Washington counties. Although this report focuses on the 2010 season, a comparison between the NAAQS and the entire applicable data set (2005–2010) is presented. The 2010 data used for this report is considered preliminary and has not been completely quality-assured. Data certification will occur by June 30, 2011.

In Idaho, monitoring for the six criteria air pollutants defined in the Clean Air Act of 1970, including ozone, occurs primarily in high population areas where the potential for human exposure is greatest. As a first step to characterize ozone concentrations in the greater Coeur d’Alene area and Kootenai County, the Department of Environmental Quality (DEQ) installed an ozone monitor, nitrogen dioxide (NO<sub>2</sub>) monitor, and a weather tower at the Lancaster site north of Hayden, during summer 2005 (Figure 1).

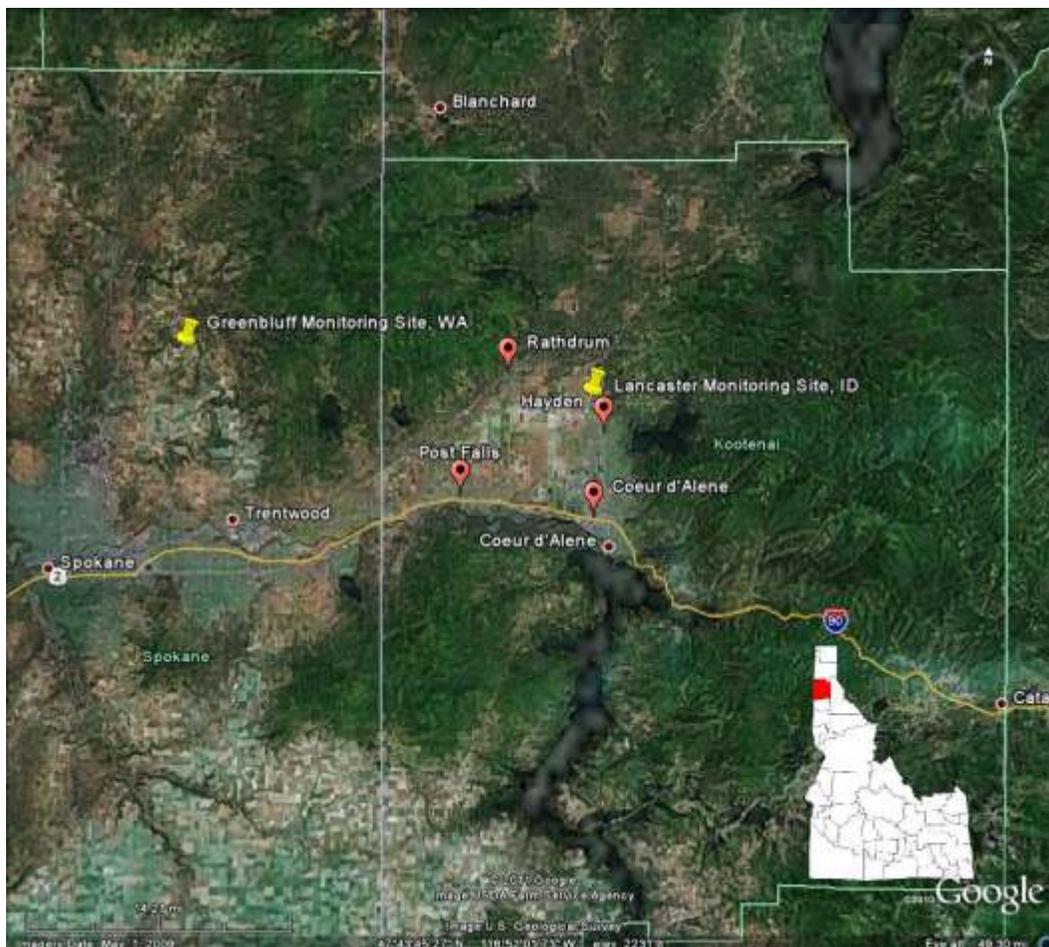


Figure 1. Map of Coeur d’Alene and surrounding areas and ozone monitoring locations



Ozone monitoring in Kootenai County takes place for two reasons. The first is to quantify the impacts of ozone precursors (i.e., pollutants that lead to ozone formation in the presence of sunlight) that may be from eastern Washington—particularly Spokane County—and Kootenai County, Idaho. The time it takes for ozone precursors to travel from sources near the city of Spokane, Washington, and other parts of eastern Washington to the Coeur d’Alene area, during average wind conditions, is roughly the same as the time it takes for the ozone forming reaction to occur during hot weather. This correlation suggests that precursors released in eastern Washington may contribute to increased ozone in areas of Kootenai County. The second reason for monitoring ozone in the Coeur d’Alene area is that the U.S. Environmental Protection Agency’s (EPA’s) AIRNow national ozone maps previously included Kootenai County in with Spokane County because Kootenai County was not monitoring ozone. This inclusion led to Kootenai County being listed in the “moderate” category for ozone on a number of days during each ozone season when it likely should have been listed in the “good” category.

## **Overview of Ozone**

Ozone, a colorless gas molecule with a strong odor, is composed of three atoms of oxygen ( $O_3$ ). In the upper atmosphere ozone is considered beneficial because it helps to protect the Earth from the sun’s ultraviolet rays. In contrast, ozone formed at ground level is a summertime air pollution problem and is unhealthy for plants and animals. Elevated concentrations of ground-level ozone can cause reduced lung function, respiratory irritation and can aggravate asthma. Lung damage caused by ozone usually heals within a few days, but repeated or prolonged exposure may cause permanent damage. People with respiratory conditions should limit outdoor activity 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 by interfering with their ability to grow and produce food.

Ozone can be directly emitted by pollutant sources in certain circumstances, but it is usually formed when photochemical pollutants emitted from gas stations, cars, any combustion sources, industrial sources, and biogenic sources react with sunlight. These pollutants are called ozone precursors and include volatile organic compound (VOCs) and the various oxides of nitrogen ( $NO_x$ ). A VOC is an organic compound that often participates in atmospheric photochemical reactions. This excludes all compounds determined by EPA to have negligible photochemical reactivity and listed in 40 CFR 51.100(s), effective July 1, 1998. Ozone formation is enhanced by temperatures near or above 30 degrees Celsius ( $^{\circ}C$ ) (86 degrees Fahrenheit [ $^{\circ}F$ ]) and intense sunlight.

For additional information on ozone, visit <http://www.epa.gov/air/ozonepollution>. Additional information on ozone in question/answer format is also provided in the final section of this report.

## **National Ambient Air Quality Standards**

The national Clean Air Act (1970), last amended in 1990, requires EPA to set 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 and other vegetation, and buildings. The Clean Air Act directed EPA to establish standards for ambient concentrations of the criteria



air pollutants, often just called criteria pollutants—ozone, carbon monoxide, lead, nitrogen dioxide, particulate matter, and sulfur dioxide.

EPA has periodically revised the original concentration limits and methods of measurement, most recently for ozone in 2008. Table 1 describes the current standard for ozone, which the state of Idaho has adopted. The federal standard (NAAQS) for ozone is based on a 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration. For more information, the EPA air quality standards and supporting rationale are available at <http://epa.gov/air/criteria.html>.

**Table 1. National Ambient Air Quality Standard for Ozone**

Pollutant	Standard	Level
Ozone	The 3-year average of the fourth–highest daily maximum 8-hour average concentration cannot exceed the level measured at each monitor within an area over each year.	0.075 parts per million

When the EPA designated the new 8-hour ozone standard of 0.075 parts per million (ppm) in 2008, they also tried to eliminate some confusion by directing agencies to treat significant figures differently than in the past when determining compliance. The new calculating convention is to truncate (or cut off a number without rounding) the final concentration calculation after three significant figures. For example, a final concentration of 0.0759 would be 0.075 and not rounded to 0.076. The value of 0.075, shown in Table 1, is used to determine if an area is in compliance and is reflected in the graphs in this report.

Each criteria pollutant typically has different standards for different averaging periods (e.g., annual, daily, hourly, and 8-hour averages). These different standards were developed to address varied health impacts that happen as a result of shorter, higher-level exposures versus longer, lower-level exposures. Additional information is available on the EPA website at <http://epa.gov/air/criteria.html>.

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, an area can exceed the standard a few times to allow for possible meteorological aberrances. For example, an 8-hour average ozone concentration of 0.090 ppm clearly *exceeds* the standard; however, the standard is not *violated* if the 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration (called the design value) does not exceed 0.075 ppm. This distinction is very important when evaluating the compliance status of an area.

## Idaho’s Monitoring Network

The Idaho ozone monitoring network is a composite of meteorological and pollutant-specific monitoring equipment. Ozone monitoring stations are located in both urban and rural areas, although many of the precursor compounds that react with sunlight to produce ozone are generated primarily in large metropolitan areas. Data from the ozone network are sent directly to engineers and scientists through a wireless telemetry network. These data are used to update both DEQ and EPA websites with current pollution levels and to update Air Quality Index (AQI) information. The data are quality-assured and submitted to EPA and also disseminated to public and private entities that use the data for a variety of projects.



Real-time ozone monitoring data in the state of Idaho is available April through September on the Internet at <http://airquality.deq.idaho.gov/>. Please visit the DEQ website at <http://www.deq.idaho.gov/> to find more extensive air quality data, educational materials, and discussions of current topics.

## Ozone Monitoring in Kootenai County

Ozone monitoring in the Coeur d'Alene area occurs each summer during the ozone season. For the 2010 season, the EPA adjusted the start of the ozone season from May 1 to April 1. The start date was moved as a result of a study that showed high ozone readings are possible in April in the northern latitudes of the lower 48 states. The season still ends on September 30. This new time period is the accepted ozone season for the northern latitudes of the contiguous United States and is determined to be the portion of each year when ozone formation has the potential to exceed the NAAQS.

While Idaho generally enjoys good air quality, the state's airsheds are faced with new challenges each year. Over the last decade, criteria air pollutant levels in Idaho have generally decreased to levels well below the federal standards due to better control of air pollution; however, ozone levels in the Coeur d'Alene area, while not violating federal standards, are not far below the current standard (0.075 ppm). Because summers in northern Idaho are normally hot and dry, the Coeur d'Alene area tends 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 temperatures are hottest and the sun is highest in the sky.

DEQ chose the Lancaster site for ozone monitoring based on an understanding of basic ozone development processes and the assumption that a majority of the sources of ozone-forming pollutants were located west and, therefore, upwind of Kootenai County. The ozone formation reaction requires ozone-forming pollutants to be subjected to at least 3 hours of heat and intense sunlight to reach peak reactivity. The average wind speeds and predominance of southwesterly winds at the Lancaster site during the ozone season indicated this site would likely measure the maximum ozone concentrations in Kootenai County. As with any monitoring site selection, security, accessibility, and potential interference from nearby activity were also considered. DEQ relied on EPA's *Guideline on Ozone Monitoring Site Selection* to help select this monitoring site.<sup>1</sup> The Lancaster site is currently the only ozone monitoring site located within Kootenai County.

At the Lancaster site, pollutants and meteorological information are measured using EPA-approved reference methods. Table 2 presents the methodology used for measuring ozone and NO<sub>x</sub> concentrations at the site.

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<sup>1</sup> U.S. Environmental Protection Agency (EPA), *Guideline on Ozone Monitoring Site Selection*, EPA-454/R-98-002 (Research Triangle Park, NC: EPA, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, 1998).



**Table 2. Pollutant monitoring methods used at the Lancaster site in 2010**

Measurement	Pollutant Code	Method	Units
Ozone	O <sub>3</sub>	Ultraviolet absorption	Parts per billion (ppb)
Oxides of nitrogen (NO, NO <sub>2</sub> and NO <sub>x</sub> )	NO <sub>x</sub>	Chemiluminescence	Parts per billion (ppb)

The gas monitors used at the Lancaster site are capable of reporting measurements in ppm, which are the units used in the gas NAAQS. Unfortunately, some of DEQ's supporting equipment at the site can only report in parts per billion (ppb). However, DEQ's data acquisition system converts the monitoring outputs into ppm automatically by dividing ppb by 1,000.

Methods used for collecting the meteorological data are presented in Table 3. This data is collected by a variety of instruments on a 10-meter (m) weather tower.

**Table 3. Meteorology monitoring methods used at the Lancaster site in 2010**

Measurement	Parameter Code	Method	Units
Wind speed	WS	Propeller-type anemometer	Meters per second
Wind direction	WD	Tail wind vane	Degrees (0–360)
Solar radiation	SR	Pyranometer	Watts per meter squared
2-meter ambient temperature	2m Temp	Platinum resistance thermometer	Degrees Celsius
10-meter ambient temperature	10m Temp	Platinum resistance thermometer	Degrees Celsius
Relative humidity	Dew Point	Capacitive polymer H chip	Percent
Precipitation as rain	Rain	Tipping rain gauge	Inches (to nearly hundredth)
Barometric pressure	BP	Silicone capacitive pressure sensor	Millibars

When interpreting data from a sampling site, one must consider factors such as temperature, solar radiation, and wind direction, all of which are discussed in the body of this report. Obvious correlations with temperature and solar radiation existed this season, and a less obvious relationship with wind direction was also observed. The wind data suggest that the transport of ozone or its precursors to the site was a factor in the highest readings at the Lancaster site. Additional studies are needed to determine if a definitive link between high ozone concentrations and wind direction exists at this site.

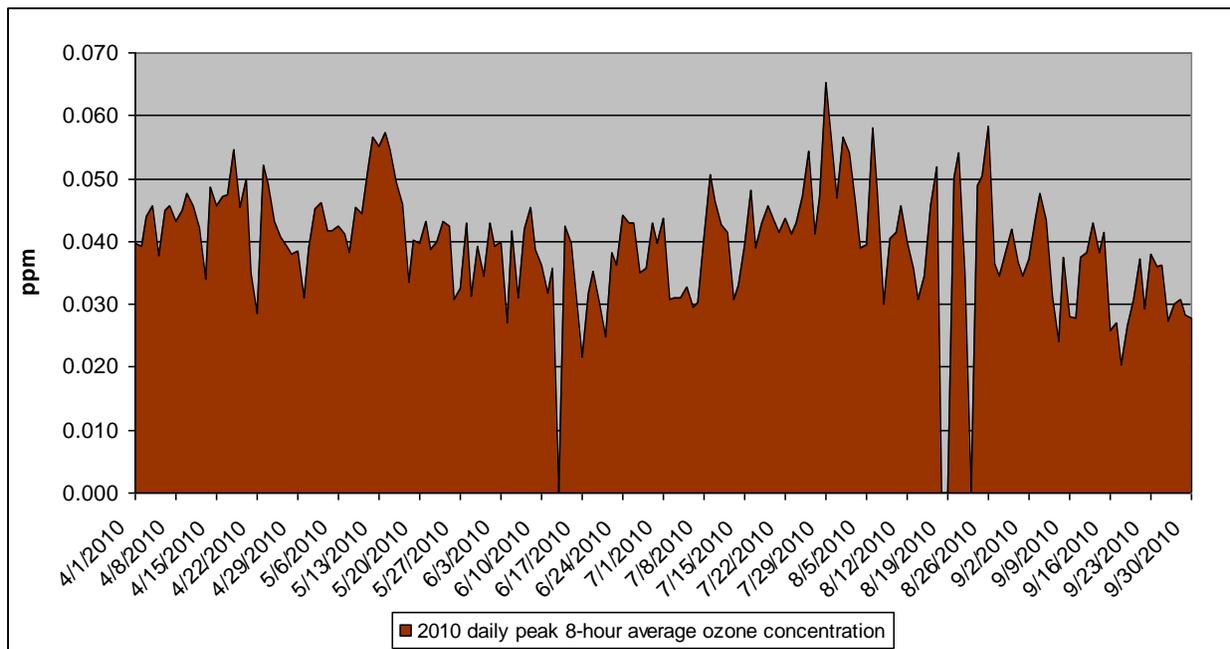
NO<sub>x</sub> are also an important component of ozone formation and can be a limiting factor for ozone development. For this reason, DEQ monitors NO<sub>x</sub> at the Lancaster site during the ozone season. In this report, NO<sub>x</sub> results will not be compared to the NAAQS for NO<sub>2</sub> but will illustrate the relationship between ozone formation and NO<sub>x</sub> concentrations. This relationship is critical for evaluating the airshed and forecasting daily ozone levels.



## 2010 Ozone Season Summary

The 2010 ozone season was distinguished by an early period of temperatures near the historical average and then below-average temperatures the rest of the season. These cooler temperatures were not optimal for ozone formation, so ozone levels were relatively low again this year. Ozone concentrations only reached the moderate range on the AQI scale once during 2010. The highest 8-hour average ozone reading of the year was 0.065 ppm on July 29.

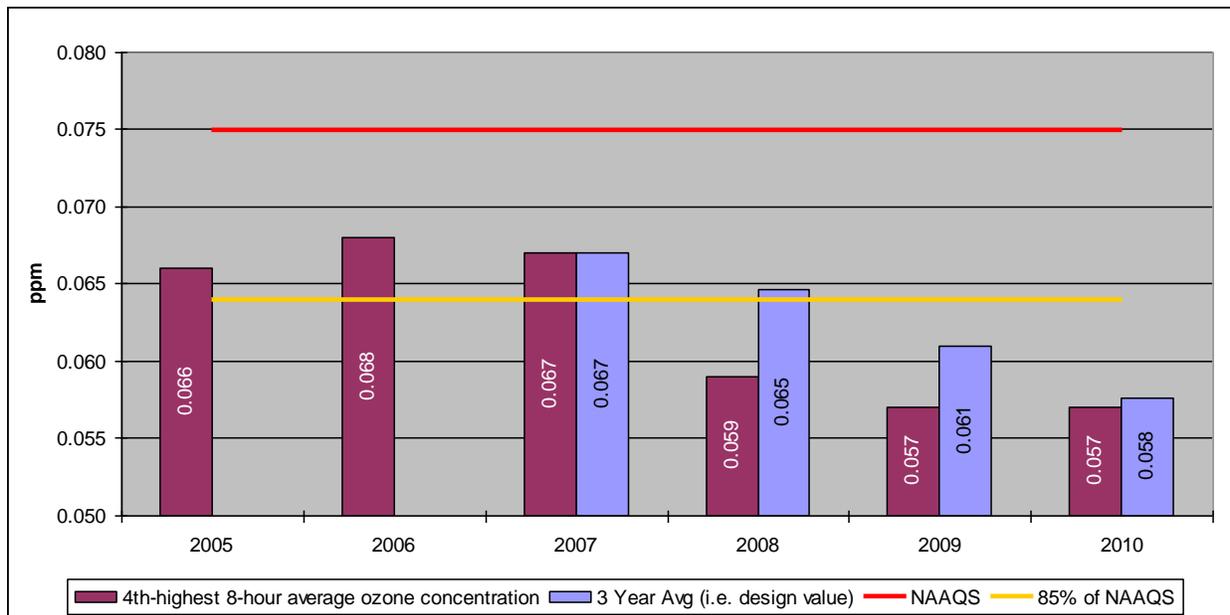
Figure 2 presents a simple overview of the ozone season at the Lancaster site. It shows the higher readings earlier in the season, with the highest 8-hour average reading on July 29, and the lower readings late in the summer during what is normally the hotter part of the year. Zero values indicate instrument maintenance or breakdowns.



**Figure 2. Lancaster site daily peak 8-hour average ozone (O<sub>3</sub>) concentration for the 2010 ozone season**



The Lancaster site’s ozone concentrations remained below the NAAQS for 2010. A true comparison to the ozone NAAQS is made by averaging the annual fourth-highest daily maximum 8-hour average ozone concentration over the past 3 years (Figure 3). For the 2010 season, that calculation includes the fourth-highest 8-hour values for 2008–2010. This 3-year average is called the design value. Comparisons to the ozone NAAQS will not be completed until the 2010 ozone data for the Coeur d’Alene area is accepted by the EPA in mid-2011. The 2010 ozone data used for this report is considered preliminary until it is verified by EPA on or before June 30, 2011. Figure 2 and Figure 3 are used only to illustrate how 2010 ozone levels relate to the ozone standard and do not indicate a determination of whether the NAAQS was exceeded.



**Figure 3. Lancaster site ozone monitoring design values versus ozone National Ambient Air Quality Standard (NAAQS)**

Figure 3 depicts values from the Lancaster site versus the ozone NAAQS. The NAAQS line is set at 0.075 ppm; 85% of the NAAQS line—which represents a trigger level for implementation of increased control of ozone precursors established by the Idaho legislature in Idaho Code 39-116B—is set at 0.064 ppm. The fourth-highest daily 8-hour average ozone concentration is shown for each year since sampling started in 2005. For the 2010 season, the fourth-highest average was 0.057 ppm, which makes 2010 a lower-than-average year for ozone formation compared to the previous five years. The purple bars show the 3-year averages of the fourth-highest daily values (i.e., the design values). The ozone NAAQS determination requires three years of data to be evaluated and compared to NAAQS limits. Data from 2008, 2009, and 2010 produce a design value of 0.058 ppm for 2010, which puts Kootenai County at 77% of the current ozone NAAQS.



Figure 4 shows the 10 days with the highest 8-hour average ozone concentrations and the hour when the highest average occurred. Time is noted in Pacific Standard Time. The values ranged from 0.054 to 0.065 ppm for the 10 highest days. These values all fall well below the NAAQS of 0.075 ppm for ozone. The ozone NAAQS is measured in a running 8-hour average format.

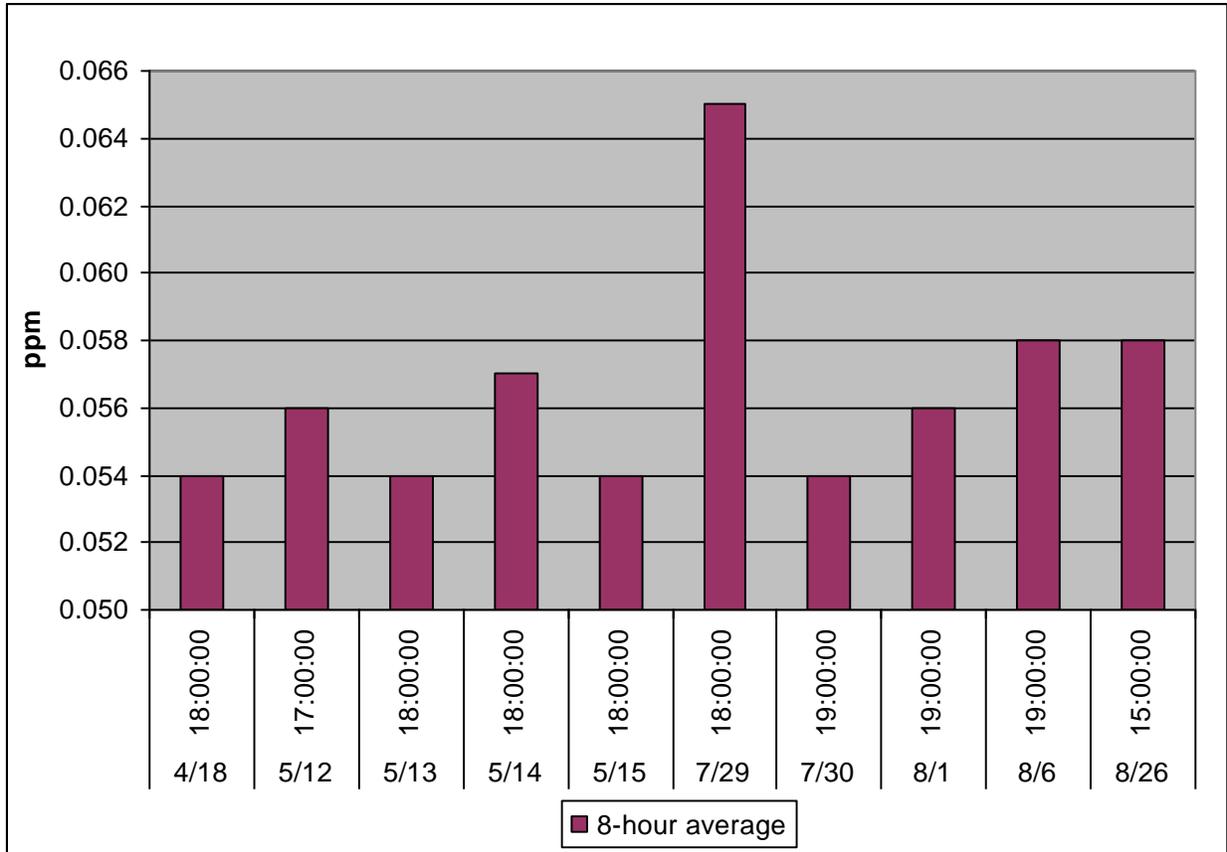


Figure 4. Lancaster site's 10 days with the highest 8-hour average ozone concentrations in 2010 and hour when highest average occurred (in Pacific Standard Time)



Because temperature is one factor in the formation of ozone, the lower temperatures during summer 2010 most likely had some role in reduced ozone formation. With no days hitting the 100 °F level, summer 2010 did not have peak ozone production. Nevertheless, ozone in the area still measured at 72%–87% of the NAAQS during highest concentration days (Figure 5).

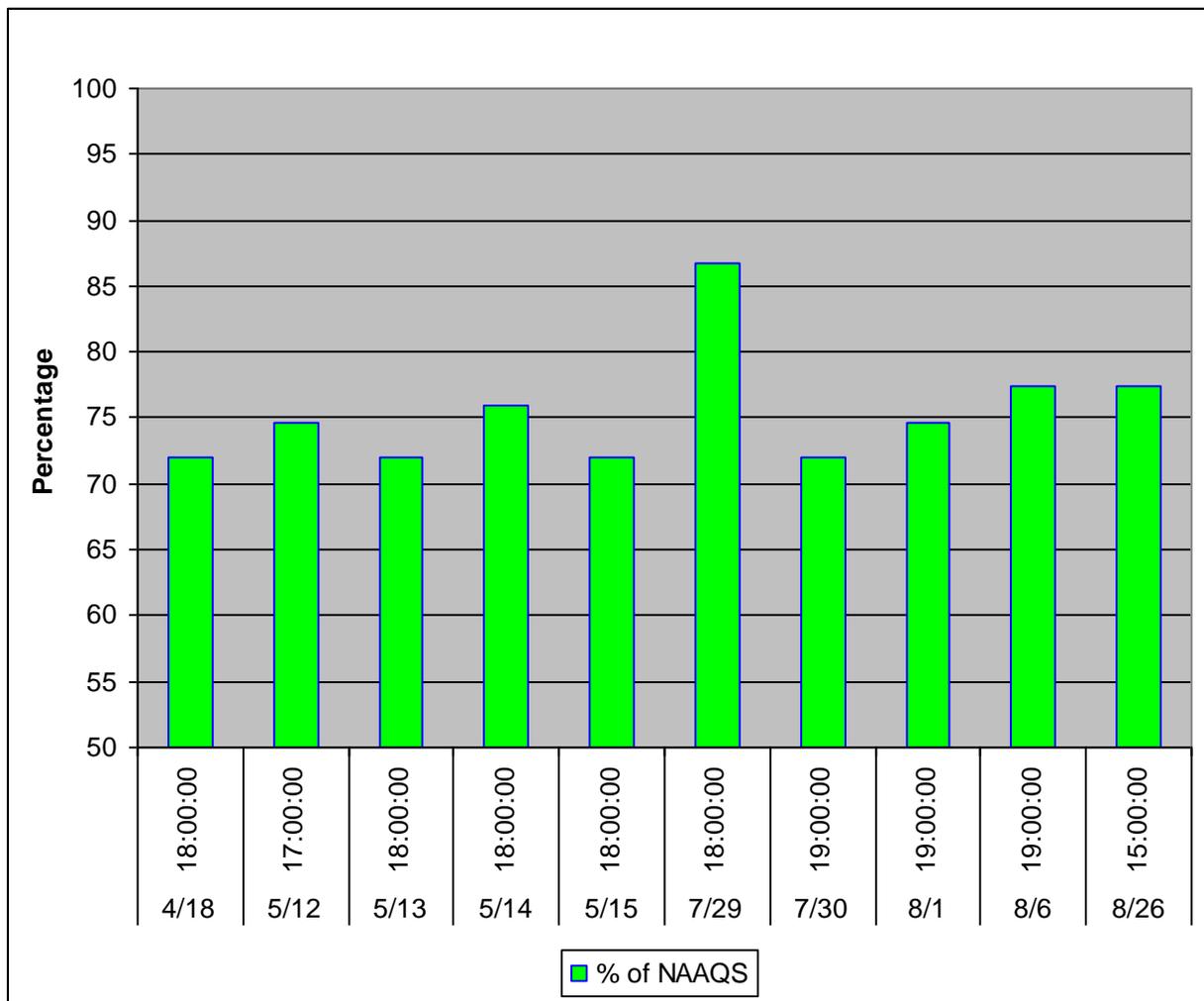
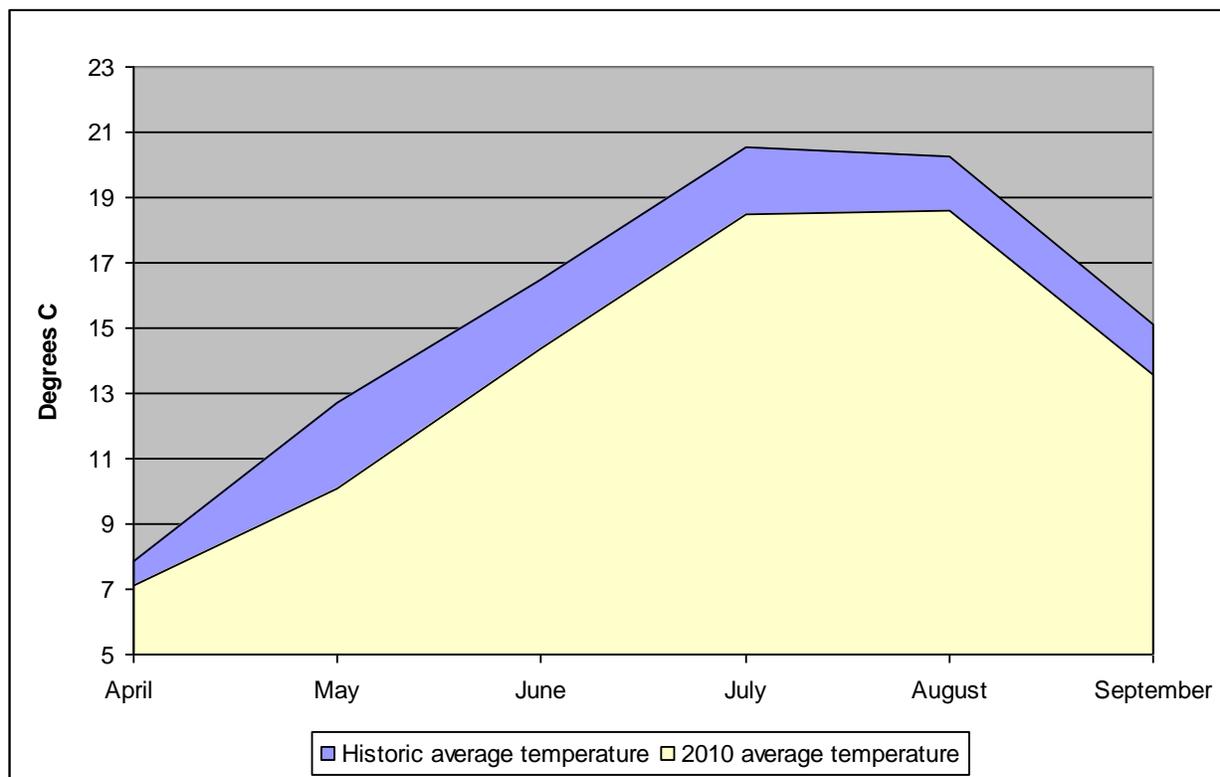


Figure 5. Lancaster site's 10 days with the highest 8-hour average ozone concentrations in 2010 as a percentage of the ozone National Ambient Air Quality Standard (NAAQS). Hour of highest average reading is given in Pacific Standard Time.



## Ozone, Temperature, and Solar Radiation

Figure 6 shows the average monthly temperatures at the Lancaster site during the 2010 ozone season as well as the historical average temperatures for April–September. The Lancaster 2010 averages were computed from data measured at the monitoring site, and the historical averages were from measurements at the Coeur d’Alene Airport. Overall, the 2010 ozone season was 1.8 °C cooler than in a typical year. Temperatures were markedly below average for July and August, which are typically when the highest ozone concentrations occur.



**Figure 6. 2010 monthly average temperatures at the Lancaster site versus historical averages**

Precipitation does not directly affect ozone formation, but when it occurs, it generally is accompanied by decreased temperatures and increased cloud cover. The lower temperatures inhibit ozone formation as does the decreased solar radiation due to the cloud cover. Therefore, less precipitation generally correlates with higher levels of ozone. Table 4 compares the historical average precipitation amounts for the April through September ozone season to the actual 2010 precipitation amounts. Current rainfall data are collected at the Lancaster site, but the historical averages are for the National Weather Service site in Spokane, Washington. Although the 2010 season was marked by lower than average precipitation, this was not reflected by higher ozone levels. The lower temperatures for the season likely played a big role in keeping ozone levels down.

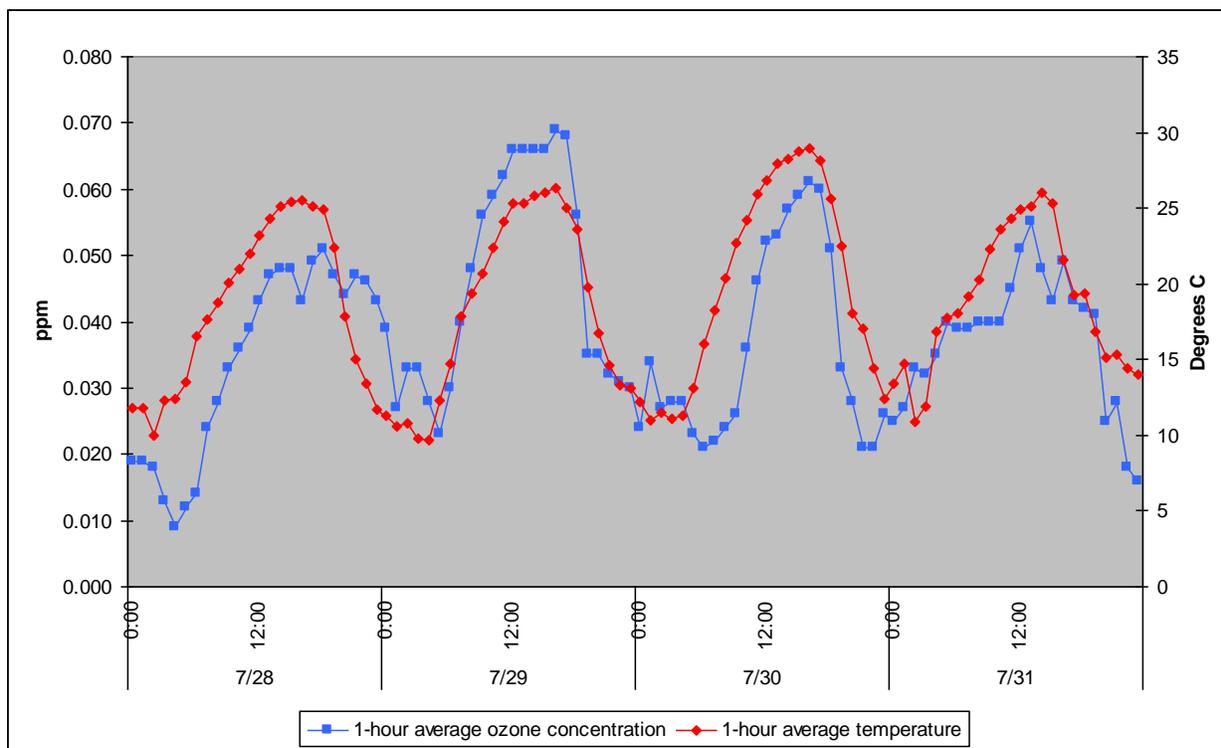


**Table 4. Historical average precipitation compared with 2010 amounts**

Month	Historical average (inches)	2010 season (inches)
April	1.73	1.30
May	(2.01) <sup>a</sup>	Equipment failure
June	1.80	2.23
July	0.72	0.43
August	0.92	0.38
September	1.27	0.97
<b>Total</b>	<b>6.44</b>	<b>5.31</b>

a. This figure was not included in the total historical average since May data were not available for the 2010 ozone season.

The relationship between temperature and ozone concentration can be seen in Figure 7, which compares temperature and ozone concentrations over a 4-day period in late July. The temperature values come from the Lancaster site, where temperature is measured at 2 m above the ground in degrees Celsius. The contours of the two lines follow the same general pattern of highs and lows, suggesting that temperature has an influence on the ozone concentration. The figure also clearly shows that ozone formation does not have a perfectly linear relationship with temperature. The availability of precursors, transport of ozone into the area, and cloud cover also has strong effects on the ozone levels on any given day.



**Figure 7. Hourly ozone concentration compared with temperature for July 28–31, 2010**



Unlike temperature, which closely correlates with ozone levels, solar radiation tends to peak before the ozone concentration. This phenomenon occurs partly because of our latitude and the resultant sun angles. Figure 8 shows the correlation between solar radiation and the resulting ozone concentrations for a 4-day period in late July. Solar radiation is measured in watts per meter squared ( $W/m^2$ ) and represents the amount of solar energy available to drive the chemical reactions that form ozone.

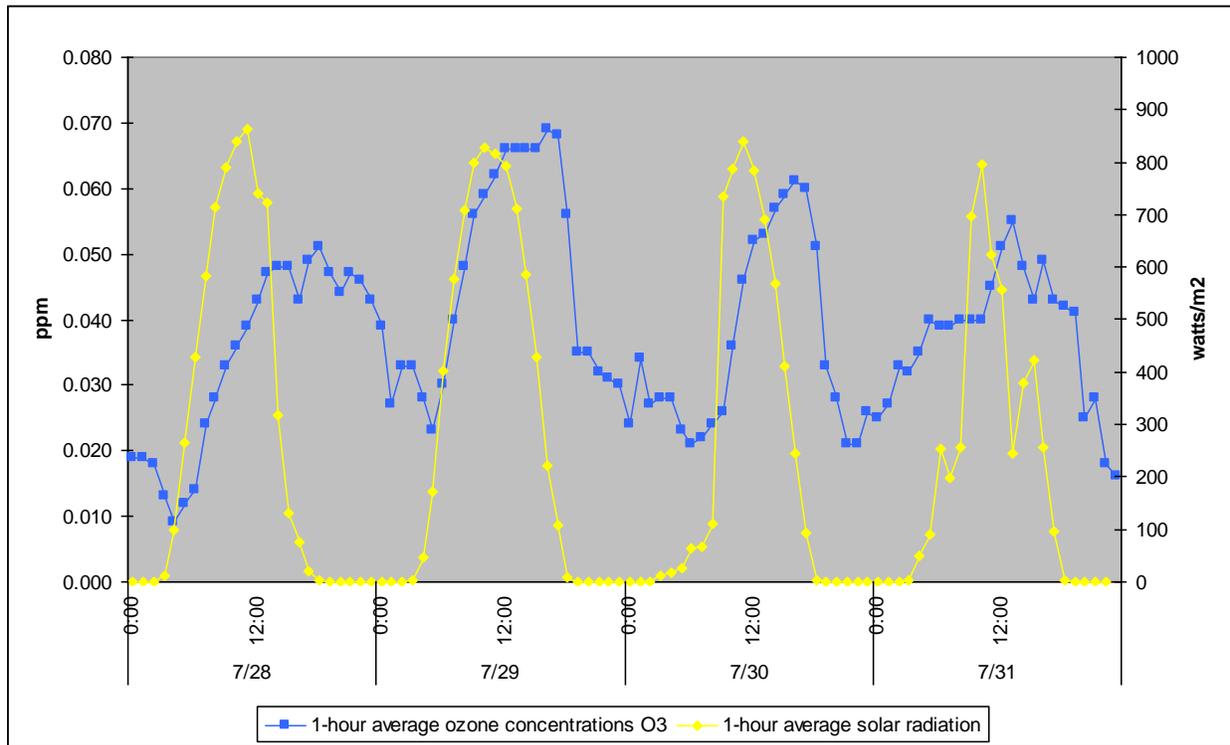
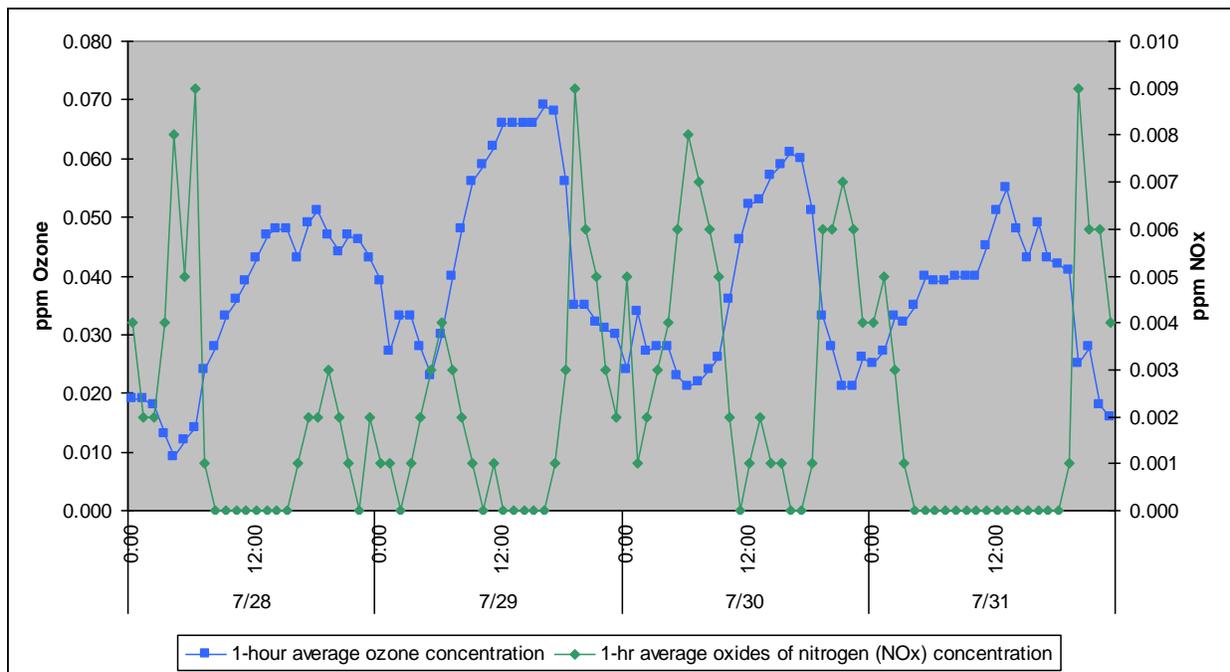


Figure 8. Hourly ozone concentration compared with solar radiation for July 28–31, 2010



## Ozone and Nitrogen Oxides

While  $\text{NO}_2$  (one component of  $\text{NO}_x$ ) is another EPA criteria pollutant, it is not monitored at the Lancaster site expressly for compliance determination. It is mainly monitored to help forecast ozone levels. When ozone is at its peak concentration for the day,  $\text{NO}_x$  concentrations are at their lowest (Figure 9). When ozone concentrations start to drop late in the day,  $\text{NO}_x$  concentrations rise and  $\text{NO}_x$  reaches its peak early in the morning at the lowest ozone levels. This inverse relationship is a representation of the fact that as the day warms up and sunlight is at its strongest,  $\text{NO}_x$  and other available precursors are converted to ozone. As the sun sets and temperatures cool,  $\text{NO}_x$  begins to reform as the ozone molecules disassociate, allowing  $\text{NO}_x$  concentrations to build again.



**Figure 9. Hourly ozone concentration compared with nitrogen oxides ( $\text{NO}_x$ ) for July 28–31, 2010**

The early morning  $\text{NO}_x$  peak is related to the morning commute traffic, while the rise in  $\text{NO}_x$  in the evening coincides with evening commute. The location and amount of traffic relative to a monitoring site can create some issues with  $\text{NO}_x$  and ozone measurement because  $\text{NO}_x$  is emitted by combustion engines. Excess  $\text{NO}_x$  near a monitoring site (fresh  $\text{NO}_x$ ) has been shown to cause a “scouring” effect and will inhibit ozone development in sufficient concentrations to bias ozone results to the low side. This scouring effect is counterintuitive because one would think that increased production of a precursor should lead to more ozone. However, “fresh”  $\text{NO}_x$  tends to have more  $\text{NO}$ , which is very reactive and scavenges an oxygen molecule from ozone ( $\text{O}_3$ ) to make  $\text{NO}_2$  and oxygen ( $\text{O}_2$ ). This reaction in effect scours some ozone from the air that would normally be present. There is still some debate over the ability to truly isolate monitors from the effects of emissions from commuter traffic.

Another factor to take into account when analyzing ozone at the Lancaster site is its proximity to the Coeur d’Alene Airport. An active airport could influence local ozone concentrations. The Coeur d’Alene Airport likely produces some ozone precursor emissions, but these emissions probably do not contribute to increased ozone development measured at the Lancaster site. If the



wind is blowing, the emissions at the airport would not likely have time to convert into ozone before they reach the Lancaster site. On days when significant stagnant weather conditions are prevalent, impacts from airport VOC emissions are more likely. On the other hand, fresh  $\text{NO}_x$  emissions from the airport could be a limiting factor for ozone development, as discussed above, because the scouring effect actually breaks down ozone molecules. DEQ suspects that the influence from the airport is minimal at this site but additional investigation is needed to confirm this theory.

## Ozone and Wind

A wind rose (Figure 10) depicts the direction wind is coming from; as detected by a fixed point such as a wind sensor. The different spokes around the wheel indicate wind speed, duration, and direction. The length of each spoke is related to the percentage of time the wind is coming from that direction. The different colored sections of the spokes represent the wind speeds, and length of the different colored sections shows the percentage of time the wind was travelling at that speed from that direction. Wind speed is shown in meters per second; Table 5 shows the equivalents for wind speed in miles per hour.

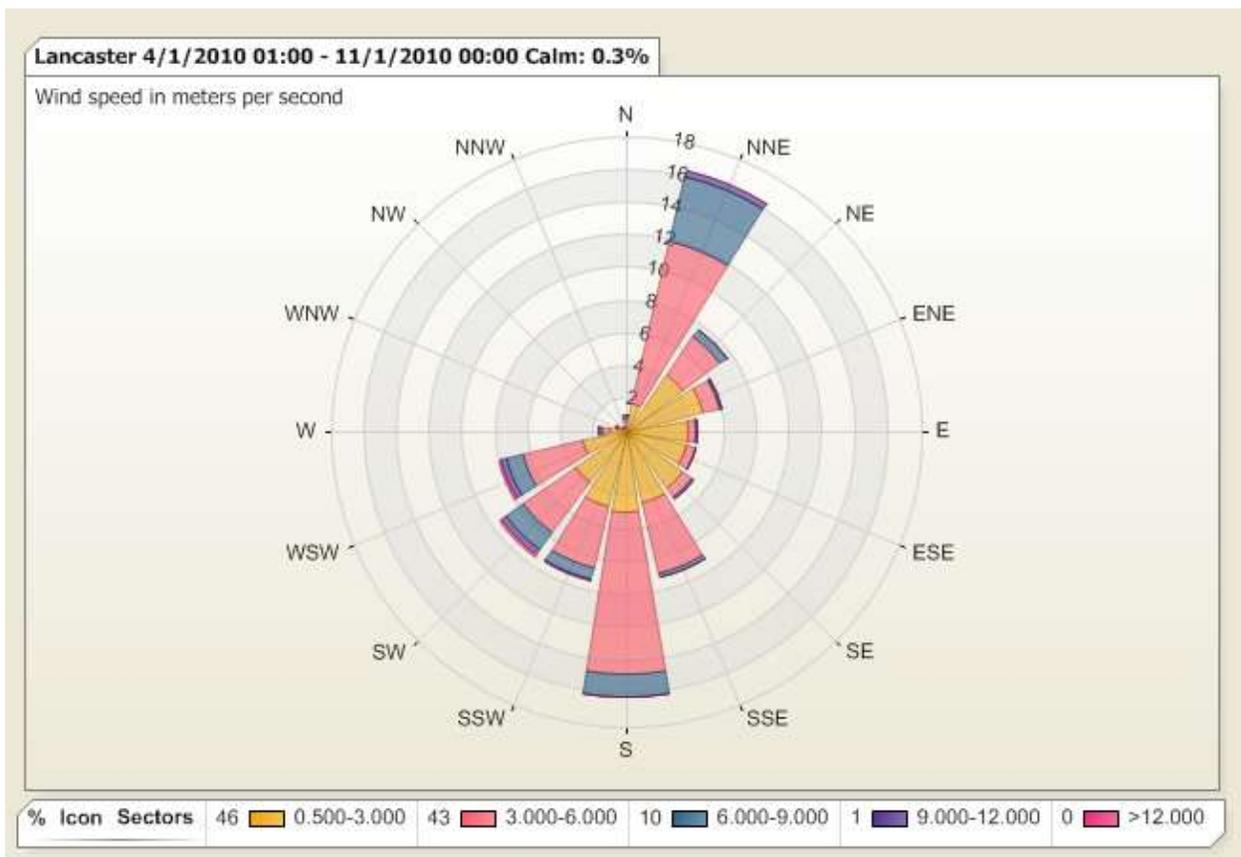


Figure 10. Wind rose for the 2010 ozone season

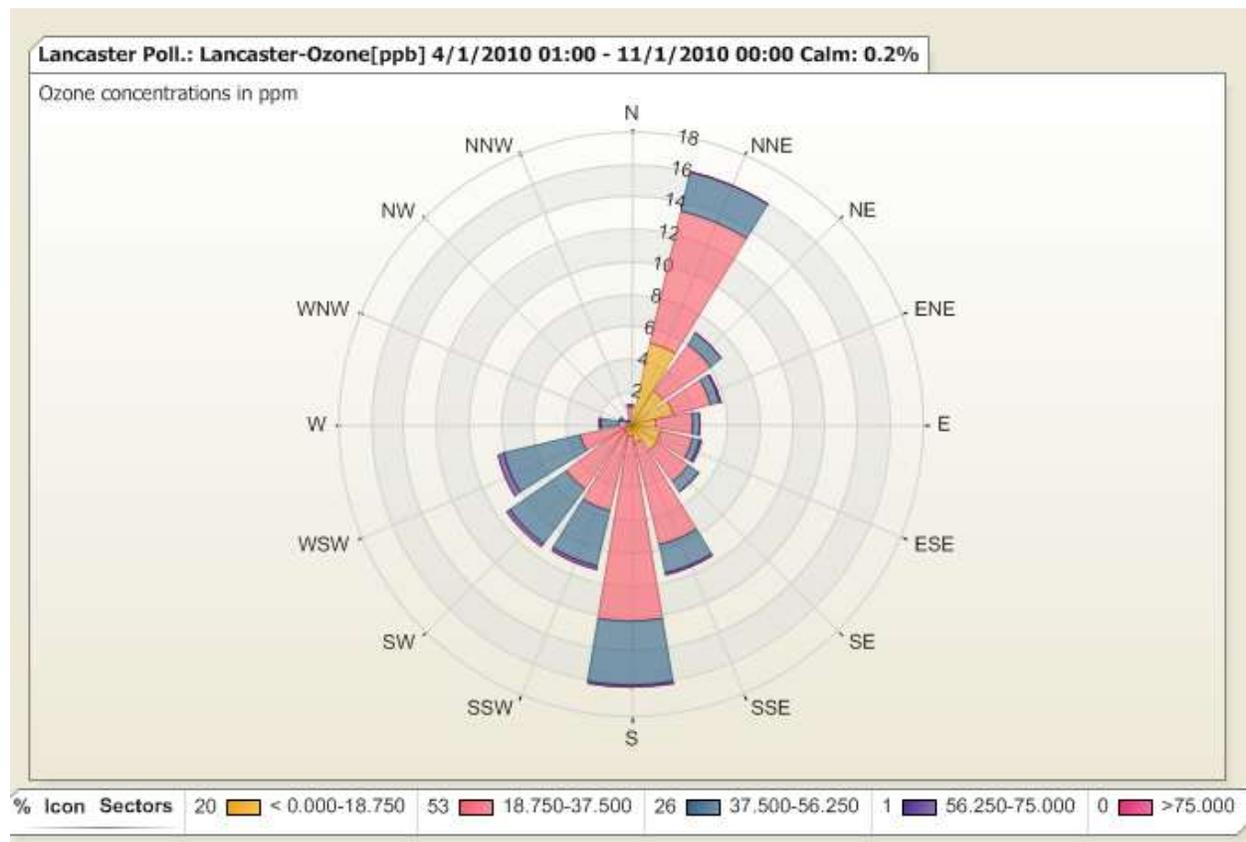


The wind rose in Figure 10 includes the entire 2010 ozone season at the Lancaster site. The purpose of the graph is to give an impression of the prevailing wind directions for the season. Wind at the Lancaster site came mainly from the north-northeast and between west-southwest and south. Upwind, when winds are from the southwesterly directions, are large urban and industrial areas. The Lancaster site is located approximately three hours downwind at typical wind speeds (roughly 30 miles) from the urban and industrial areas to the west and southwest (i.e., Spokane). This distance is significant because the photochemical reactions necessary to form ozone take approximately 3–4 hours to occur.

**Table 5. Meters per second converted to miles per hour**

Meters per second	Miles per hour
0.500-3.000	1.118–6.711
3.000–6.000	6.711–13.422
6.000–9.000	13.422–20.132
9.000–12.000	20.132–26.843

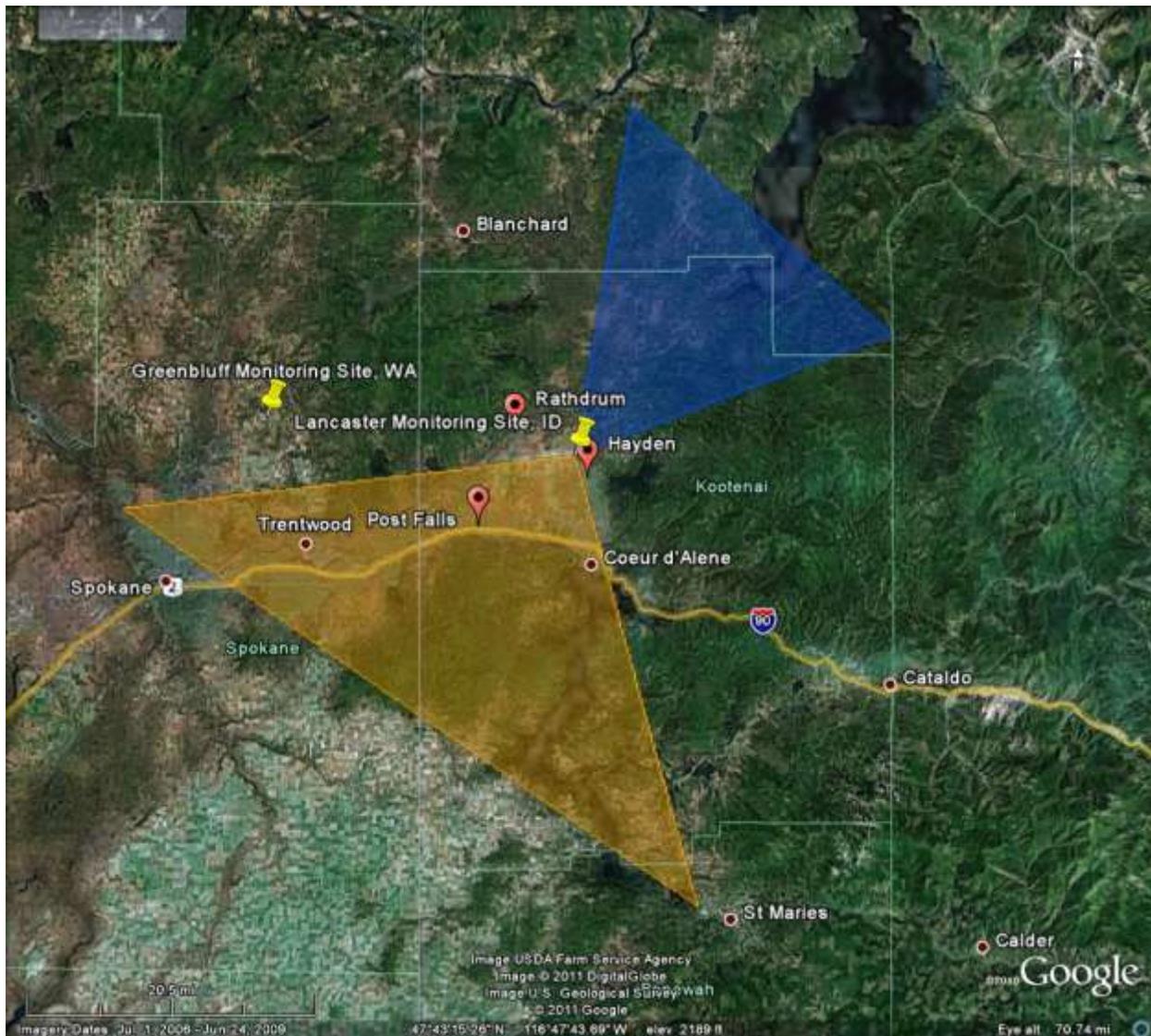
Rather than comparing wind speed to wind direction, a pollution rose (Figure 11) compares hourly ozone concentrations to wind direction. The predominant wind directions with the highest concentrations are between west-southwest and south. Once again, this finding suggests that either ozone or its precursors are being transported to the monitoring site from the urban and industrial areas to the southwest and south.



**Figure 11. Pollution rose for the 2010 ozone season**



Figure 12 shows the Lancaster site with predominant wind directions during the highest and lowest ozone concentrations. The orange-shaded triangle indicates the dominant wind directions during periods with the most ozone, while the blue-shaded triangle shows the dominant wind directions during periods with the least ozone. This map indicates that transport of ozone from the urban areas located southwest and south of the site played a part in higher ozone concentrations at the site on the highest ozone days. The break in the mountains to the southwest of the Lancaster site likely funnels the winds coming from the west towards the site. This theory warrants further study to determine its validity.



**Figure 12. Map of the Coeur d'Alene area showing wind directions during periods of highest (orange) and lowest (blue) ozone concentrations**

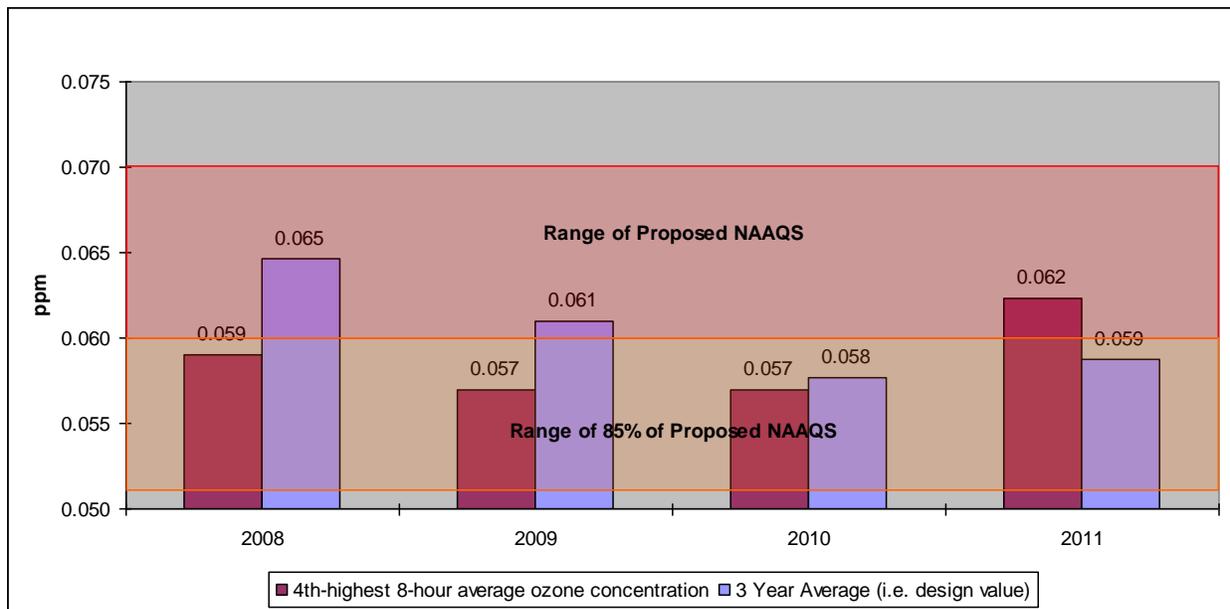


## Potential Standard Changes in 2011

In early 2010, the EPA proposed a new ozone NAAQS to be set between 0.060 and 0.070 ppm. The current standard is 0.075 ppm. This proposed standard was to be established in August 2010 but has been postponed until sometime in 2011. Because of this change, it is possible that ozone NAAQS determinations in 2011 will likely be under the new standard. The proposed ozone NAAQS levels are to be between 0.060 and 0.070 ppm for the design value, putting the trigger level for the increased precursor control discussed earlier between 0.051 and 0.060 ppm design values (85% of the NAAQS).

In Figure 13, a fourth-highest 8-hour average ozone concentration of 0.062 ppm is projected for the 2011 season, resulting in a design value of 0.059 ppm. This projection is based on an average of the fourth-highest 8-hour averages over the past 6 ozone seasons. These results show that, with the new standards, the chance of breaking the 85% trigger level is likely and the potential for exceeding the NAAQS becomes a possibility.

Figure 13 is based on projected numbers for 2011. If the summer is cooler than average again—as in the last three years—the projected numbers are high. If the summer is average or warmer-than-average, the actual numbers will likely be closer to the projection.



**Figure 13. Proposed ozone National Ambient Air Quality Standards (NAAQS), trigger levels (85% of NAAQS), and projected design value for 2011**



Table 6 presents the implications of the proposed new ozone NAAQS at various levels. If the NAAQS is set at 0.065 ppm, the area will not likely violate this standard. However, the design value would likely be greater than 85% of the NAAQS and would have the potential to trigger control measure requirements. This scenario depends on EPA determining the new level and setting a start date for the new requirement.

**Table 6. Proposed new National Ambient Air Quality Standard (NAAQS) ozone levels and their implication for 2011 at the Lancaster site**

Proposed ozone NAAQS	Projected 2011 design value	2011 design value limit to remain under NAAQS <sup>a</sup>	85% of the NAAQS	2011 design value limit to remain under 85% of NAAQS <sup>b</sup>
0.075 ppm (current NAAQS)	0.059 ppm	0.109 ppm	0.064 ppm	0.075 ppm
0.070 ppm	0.059 ppm	0.094 ppm	0.060 ppm	0.062 ppm
0.065 ppm	0.059 ppm	0.079 ppm	0.055 ppm	0.049 ppm
0.060 ppm	0.059 ppm	0.064 ppm	0.051 ppm	0.037 ppm

a. The 2011 design value must be less than this value to avoid exceeding the NAAQS.

b. The 2011 design value must be less than this value to avoid exceeding 85% of the NAAQS.

## Coeur d’Alene Area Emission Sources

DEQ completed an air emission inventory for NO<sub>x</sub> and volatile organic compounds (VOCs) in June 2008 to identify the sources of pollutants for Kootenai County and the Spokane area. Identifying pollution sources can help efforts to reduce emissions through improved technologies, education, encouragement to change behaviors, and economic incentives.

### Source Categories

Five general categories characterize air emission sources (with virtually hundreds of subcategories):

- Point sources—These include large industries that emit pollutants each year from a single location.
- On-road mobile sources—This category includes both gasoline- and diesel-powered vehicles and accounts for a significant amount of Idaho’s air pollution.
- Non-road sources—These sources include farm and construction vehicles, aircraft, locomotives, and garden equipment.
- Stationary area sources—These are smaller but more numerous than point sources and include commercial businesses, such as dry cleaners, printers, and small construction operations, and everyday activities like wood burning.
- Biogenic sources—Biogenic emissions come from natural sources and include emissions from vegetation, soils, volcanoes, lightning, and sea salt.

The first four categories describe emissions of criteria air pollutants. The fifth category (biogenics) is for emissions that are natural and, therefore, probably unavoidable but their effects need to be considered.

DEQ’s June 2008 emission inventory for the Coeur d’Alene area summarized the quantities of criteria air pollutants from sources in the first four categories described above. The inventory



also included anthropogenic (human-generated) and biogenic (naturally-generated) sources of VOCs, which are not criteria air pollutants but are important for understanding and evaluating ozone pollution.

### Sources of Volatile Organic Compounds and Nitrogen Oxides

For the purposes of ozone monitoring, the key findings of the emissions inventory are those related to sources of NO<sub>x</sub> and VOCs (ozone precursors). Table presents the amounts of NO<sub>x</sub> and VOCs contributed by source category for Kootenai County and the Spokane area. For both areas, on-road mobile sources are the major source of NO<sub>x</sub> emissions, while biogenic sources account for the most VOC emissions.

**Table 7. Idaho 2005 estimated criteria air pollutant emission inventory—summary for Kootenai County and Spokane Area**

Source Category	Oxides of nitrogen (NO <sub>x</sub> ) (tons/year)		Volatile organic compounds (VOCs) (tons/year)	
	Kootenai County	Spokane Area	Kootenai County	Spokane Area
Point sources	275	783	296	788
On-road mobile sources	3,231	10,244	2,123	6,516
Non-road mobile sources	810	2,240	1,739	3,280
Stationary area sources	893	2,950	3,842	6,836
Biogenics	0	983	22,528	20,871
<b>Total</b>	<b>5,209</b>	<b>17,200</b>	<b>30,528</b>	<b>38,291</b>

Sources of NO<sub>x</sub> and VOCs as pollutants in Kootenai County are presented graphically in Figure 14 and Figure 15, respectively. The combination of all vehicles and equipment (i.e., all on-road and non-road mobile areas sources) is the greatest source of NO<sub>x</sub> emissions in Kootenai County, making up 79% of the total source contribution (Figure 14). The largest subcategories for these contributors of NO<sub>x</sub> are non-road vehicles and equipment and on-road gasoline vehicles. The small stationary area source facilities make up the bulk of the remaining contribution with 21%.

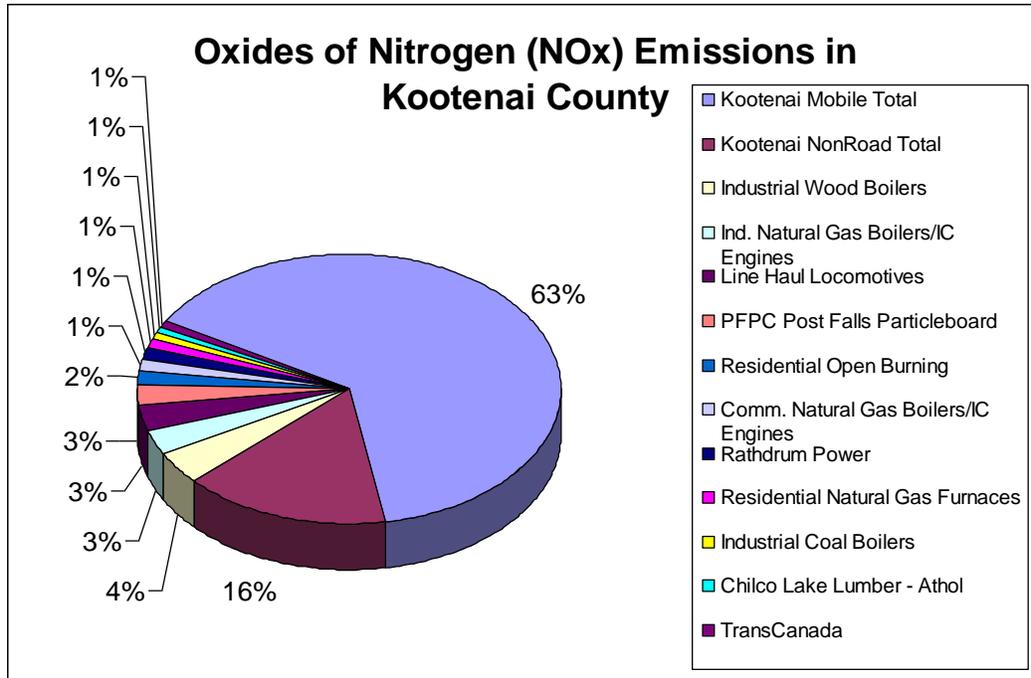


Figure 14. Sources of nitrogen oxides in Kootenai County

Although VOCs are not criteria air pollutants, they are included in discussion of the criteria air pollutants emission inventory because they are a primary precursor for ozone which is a criteria pollutant. Aside from biogenics (78%), vehicles and associated equipment (e.g., all on-road and off-road mobile areas sources) contribute the greatest portion of VOCs to the atmosphere in Kootenai County, making up 13% of the total (Figure 15). The largest contributing subcategories for stationary area sources are asphalt applications, cold cleaning (parts degreasing), and indoor wood burning.

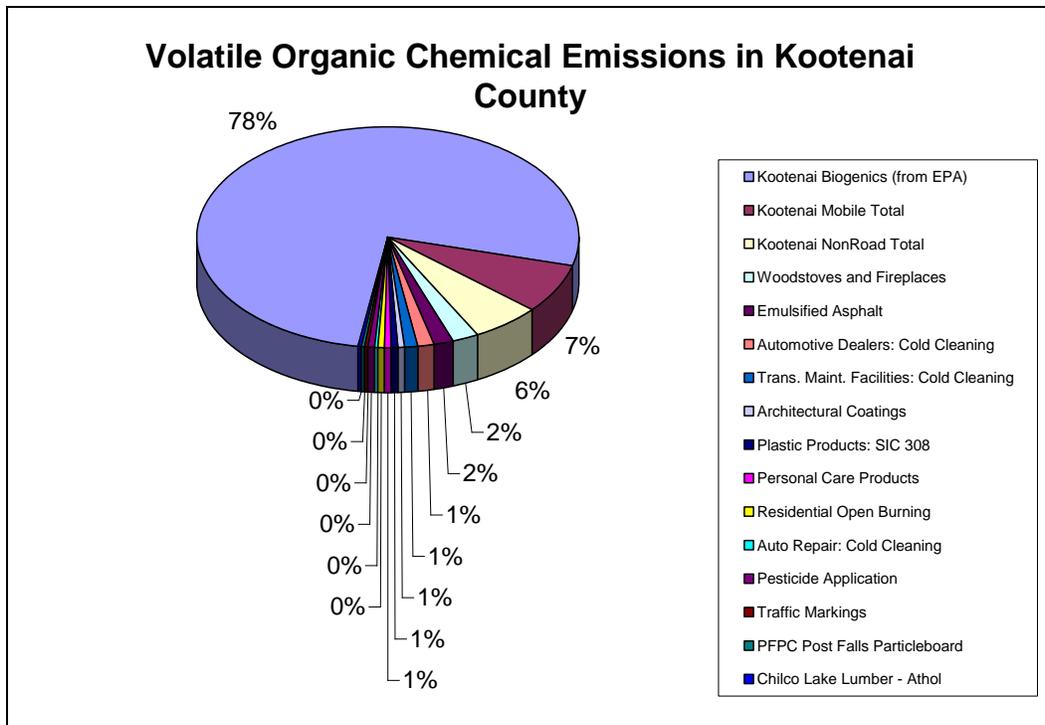


Figure 15. Sources of volatile organic compounds in Kootenai County

## Current Public Outreach and Potential Actions

### Current Ozone Air Quality Forecasts

During ozone season, DEQ currently provides forecasts of pollution conditions for ozone in the Coeur d’Alene area. DEQ makes forecasts for each day of the week using pollutant monitoring data and meteorological information. Ozone pollution can rise to very high levels when the area experiences hot days with little-to-no cloud cover. These optimal conditions for ozone formation are also optimal for outdoor activities.

Since ozone tends to be at its worst when the weather is “best” for outdoor activities, ozone forecasts are a helpful tool for those who are easily affected. These forecasts help people who are sensitive to ozone pollution plan their day. Additionally, forecasts allow concerned citizens to plan their activities to lower their impact on ozone precursors during high pollution periods. The ozone forecasts are available on DEQ’s website, [www.deq.idaho.gov](http://www.deq.idaho.gov), as well as the EPA’s AIRNow website, [www.airnow.gov](http://www.airnow.gov).

### Potential for Issuing Ozone Alerts

Since we have no control over weather characteristics, controlling ozone means controlling what we put into our air. DEQ and EPA are currently considering the possibility of issuing alerts for the area and conducting associated activities to help curb ozone formation during high-concentration episodes. For current postings relating to these decisions, see the DEQ website, [www.deq.idaho.gov](http://www.deq.idaho.gov), and EPA’s AIRNow website, [www.airnow.gov](http://www.airnow.gov). Possible future activities could include sending press releases to local media outlets and to others through an email notification list to notify the public of high-ozone conditions. Actions that could be requested of



the public when ozone concentrations are high may include limiting driving and open burning, using mass transit, and delaying lawn mowing until after the alert has ended.

### Information Provided by the Air Quality Index

The AQI is an EPA-calculated index for reporting daily air quality. The AQI reports how clean or polluted the air is for a certain area and what associated health effects might be a concern. The AQI focuses on health effects people may experience within a few hours or days after breathing polluted air. It is a broader air quality forecast than the ozone forecast mentioned above because it evaluates air quality based on five criteria air pollutants regulated by the Clean Air Act: ground-level ozone (measured as both a 1-hour and 8-hour average), particle pollution (also known as particulate matter and measured for particles with diameters less than 2.5 micrometers and particles with diameters less than 10 micrometers), carbon monoxide, sulfur dioxide, and nitrogen dioxide (Table 6). For each of these pollutants, EPA has established NAAQS to protect public health. Ground-level ozone and particulate matter are the two pollutants that pose the greatest threat to human health in this country.

An AQI value of 100 generally corresponds to the NAAQS for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally regarded as good to moderate. When AQI values are above 100, air quality is considered to be unhealthy; initially, for certain sensitive groups of people, then for everyone as AQI values increase.

For more detailed information about the AQI and the pollutants it measures, visit the EPA website at [www.airnow.gov](http://www.airnow.gov).

**Table 6. Corresponding Air Quality Index (AQI) category for five criteria pollutants**

Concentration ranges for criteria pollutants							AQI categories	
Ozone (ppm) <sup>a</sup>		Particulate matter (µg/m <sup>3</sup> ) <sup>c</sup>		Carbon monoxide (ppm)	Sulfur dioxide (ppm)	Nitrogen dioxide (ppm)	AQI value	Category
8-hour average	1-hour average <sup>b</sup>	<2.5 micrometer diameter	2.5–10 micrometer diameter					
0.000–0.059	—	0.0–15.3	0–54	0.0–4.4	0.000–0.034	— <sup>d</sup>	0–50	Good
0.060–0.075	—	15.4–35.4	55–154	4.5–9.4	0.035–0.144	— <sup>d</sup>	51–100	Moderate
0.076–0.095	0.125–0.164	35.5–65.4	155–254	9.5–12.4	0.145–0.224	— <sup>d</sup>	101–150	Unhealthy for sensitive groups
0.096–0.115	0.165–0.204	65.5–150.4	255–354	12.5–15.4	0.225–0.304	— <sup>d</sup>	151–200	Unhealthy
0.116–0.374	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
— <sup>e</sup>	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
— <sup>e</sup>	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 ppm = parts per million

b. Areas are generally required to report the AQI based on 8-hour average ozone values. However, there are a small number of areas where an AQI based on 1-hour average 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.

c µg/m<sup>3</sup> = micrograms per meter cubed

d Nitrogen dioxide has no short-term National Ambient Air Quality Standard and can generate an AQI only above a value of 200.

e 8-hour ozone values are not used to define AQI values above 300. AQI values above 300 are calculated with 1-hour ozone concentrations.



## Frequently Asked Questions about Ozone

- **How is it formed?**

Ozone forms when photochemical pollutants, which come mostly from vehicle, biogenic, and industrial sources, react in the presence of heat and sunlight. Ozone-forming pollutants include NO<sub>x</sub> and VOCs. Although transportation and industrial sources are the biggest contributors to ozone levels, even gasoline-powered yard equipment, paints, solvents, and off-road vehicle motors contribute.
- **When does it form?**

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<sub>x</sub> and VOCs into ozone.
- **Who is affected?**

The groups most affected by ozone levels are children, the elderly, people who are active outdoors, people with respiratory diseases such as asthma, and people with unusual sensitivity to ozone. During physical activity, ozone penetrates deeper into the lungs and can do more damage.
- **What are the impacts of ozone?**

Ozone is a very reactive gas. For this reason, high concentrations of ozone can cause respiratory distress and disease in humans, decreased agricultural and forest yields, and damage to some rubber products, plastics, and paints used outdoors. National crop losses from ozone exposure are estimated at \$3–5 billion annually. Forest losses are harder to estimate.
- **What are the health effects of ozone?**

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. Ozone-caused lung damage heals within a few days, but repeated or prolonged exposure may cause permanent damage.
- **What can I do to minimize the health effects of ozone exposure?**

If ozone levels are high and you have a respiratory condition or are normally active outdoors; limit your outdoor exertion.
- **What can I do to help reduce ozone formation?**

You can help reduce ozone formation by limiting vehicle travel and using alternative transportation, avoiding the use of gas-powered yard equipment during the hottest part of the day, and avoiding topping of your gas tank.
- **What is the government doing about it?**

In the United States, management of ozone and other photochemical oxidants has been a major goal of federal and state clean air legislation such as the Clean Air Act. Although many of the pollution control efforts required by the Clean Air Act have been implemented, efforts to decrease ozone pollution have been only partially successful. In the Coeur d'Alene Airshed, ozone concentrations are elevated but still within the federal standards.
- **Where is ozone measured?**

Unlike other pollutants monitored in Idaho, ozone is formed by precursors that react in the atmosphere. Winds transport ozone and chemical emissions from one area to another. For the Coeur d'Alene area, ozone precursors are emitted into the air in industrial areas of the airshed to the south and southwest and subsequently travel north and northwesterly to more rural areas as they react to form ozone. As a result, DEQ currently has one ozone monitor on the Rathdrum Prairie at the Lancaster site.