



Lesson 5: How Are Air Quality Data Communicated to the Public?

Oklahoma Department of Environmental Quality

Grade Level: 7-12 | PASS Skills: Process Standard (1:3), 3, (4:2-5, 8)/ Standard 1:3, 2:2a, 5:10 (High School)

Objectives: Students will be able to access and use air quality tools to interpret air quality data.

Materials: Computers with internet access, Monitoring Site Data Student Worksheet (.pdf)

Pre-requisite Knowledge: Unit recognition and unit conversion practice will be beneficial to students when completing the accompanying activity. Students must be able to calculate averages.

Activity: Students will use the Air Quality Division web site to record monitoring data, make calculations, and interpret/represent data using a variety of tools. Data interpretation and mathematical skills will be employed in this activity.

Implementation Tips: Allow the students to research the following website for specific information regarding the AQI (<http://airnow.gov/index.cfm?action=aqibasics.aqi>). Discuss the color scale and category descriptors that are represented by ranges of AQI scores.

Demonstrate to students how they can check the AQI for major cities in Oklahoma (OKC, Lawton, and Tulsa) using the Air Quality web site (<http://www.deq.state.ok.us/aqdnew/AQIndex/AQI.htm>) and the AIRNow website (<http://www.airnow.gov/index.cfm?action=airnow.main>) by clicking on the state from the map. The same color coding that is used for the AQI is also used on the map featured on AIRNow, making it easier for the public to check the air quality in their area.

Notes to Teacher: Teachers are encouraged to sign up to receive air quality health advisories to notify their students on the days when the air quality is poor, especially for those students who fall in the category of sensitive groups. Air quality awareness will help students know when they should stay indoors for recess or limit strenuous activities (<http://www.deq.state.ok.us/aqdnew/AdvisorySignUp.htm>).

Additional Resources: www.ozonealert.com/index.htm
www.bettertogetherok.org
www.enviroflash.info/signup.cfm

Air Quality Index	Numerical Value	Meaning
Good	0 to 50	Air Quality is considered satisfactory, and air pollution poses little or no risk
Moderate	51 to 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 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects
Very Unhealthy	201 to 300	Health warnings of emergency conditions. The entire population is more likely to be affected
Hazardous	301 to 500	Health alert: everyone may experience more serious health effects

The Air Quality Index

The Air Quality Index (AQI) is a color-coded scale that defines good, moderate, unhealthy, very unhealthy, and hazardous levels of air quality. There are numeric scores that correspond to the colors, which signal the overall air quality in a given area. The higher the number is, the worse the air quality.

For example, looking at the AQI chart below, you can see that green corresponds to good air

Daily AQI reports are utilized by U.S cities with populations of 350,000 or more. The AQI values in the reports are based upon the previous day's concentrations of the criteria pollutants.

quality, which is also represented by a score ranging from 0 – 50.

Moderate air quality is represented by yellow color-coding and a score between 51 -100. At this level, unusually sensitive groups may want to limit their outdoor activities and exertion levels.

The orange color on the scale signifies unhealthy air quality for sensitive groups (e.g., elderly adults, young children, and those with asthma or other respiratory conditions). A score ranging from 151 – 200 represents the red category on the AQI, which is indicative of unhealthy air quality for everyone.

Anything beyond the red category of the AQI is very unhealthy and even hazardous depending on how high the AQI score.

To access the daily AQI for Oklahoma, you can visit the Air Quality Division's website (<http://www.deq.state.ok.us/AQDnew/AQIndex/AQI.htm>) and select Oklahoma City, Tulsa, or Lawton from a drop down menu on the upper right hand corner.

Also, newspapers such *Tulsa World* and *USA Today* post the AQI in the weather section of their publications. In addition, AIRNow.gov offers an interactive regional map which allows you to view AQI information by clicking on the state of Oklahoma.

Ozone Watches

Aside from the AQI, the Air Quality Division has developed an air quality forecasting tool. If monitoring data, ozone models, and weather forecasts indicate unhealthy levels of ozone across the state, the division calls an ozone watch, so those who are sensitive can avoid exposure to high concentrations of ozone.

An ozone watch can trigger a local ozone Alert in Tulsa, Oklahoma City, and/or Lawton. Alerts may be announced on TV weathercasts, on highway signs and are always posted as a banner at the top of the AQD web site. To sign up for Ozone Watches go to:

Lawton: www.enviroflash.info/signup.cfm

Oklahoma City: www.getsquare.org

Tulsa: www.ozonealert.com/index.htm

Air Quality Health Advisories

Air Quality Health Advisories are another tool used to alert the public about air quality conditions. Advisories are email messages in graphic format advising subscribers when concentrations of air pollution reach unhealthy levels. Unlike ozone watches and alerts, advisories are not forecasts; rather, they provide near real-time information regarding Oklahoma's air quality.

Advisories can be of great benefit to those who have children with developing lungs, those who are elderly and/or have weakened immune systems, those who suffer from respiratory conditions, and those who are frequently outdoors. The health advisories detail the areas of concern, identify which populations are at risk and suggest safety measures to prevent exposure. To sign up for these advisories, visit the Air Quality website.

<http://www.deq.state.ok.us/aqdnewAdvisorysSingUp.htm>

Additional Resources

<http://airnow.gov/index.cfm?action=aqibasics.aqi>

Activity: *Will require the use of multiple computers with internet access

Using the *Air Quality Monitoring Data* map, <http://www.deq.state.ok.us/AQDnew/monitoring/cpdata.htm> select a monitoring site of your choice by clicking on the orange dot that is displayed on the map. Follow the diagram featured in the previous lesson to answer the following questions about the monitoring site you have selected:

Air Quality Monitoring Data

*Data unofficial and subject to change. All Data is considered preliminary until a comprehensive quality review and certification process has been completed.

Get Real-time Data by Pollutant: [More information about the Air Quality Data](#)

or

Get Real-time Data by clicking on the Site symbol below:

1

2

Click on an orange dot to access information about the monitoring site at that specific location. To view the data collected for each pollutant, select the "More info" hyperlink.

The most current air sample measurements can be found by scrolling towards the bottom of the page. The time of collection is displayed in the first column and the measurement for each pollutant is recorded in the columns to the right.

3

Daily Summary Report							
Site: 0651 - Lawton							
02/14/13							
Hour	O3 PPM	PM25 UG/M3	wvWDR DEG	wvWSPD MPH	wvRH PERCENT	wvTAR DEG	
00:00	001	7.2	23	0	79	35	
01:00	001	8.4	3	0	74	34	
02:00	005	8.1	63	0	79	33	
03:00	002	7.1	69	0	76	33	
04:00	005	9.2	73	1	77	33	
05:00	004	11.7	11	0	80	32	
06:00	001	8.7	50	0	83	32	
07:00	006	10.4	52	1	79	34	
08:00	016	13.8	3	3	70	37	
09:00	029	10.8	26	3	55	46	
10:00	039	8.5	44	2	41	54	
11:00							
12:00							
13:00							

The "More info" hyperlink will direct you to an image of the monitoring site and will provide access to the current monitoring data. Select the "Current Monitoring Data" hyperlink in your preferred format and it will display the requested data.

1. What is the site number and where is it located? **Example: Monitoring Site 651, North Lawton**
2. What types of pollutants are monitored at this site? **Example: O₃ , PM_{2.5}**

Type of Pollutant	How to Calculate the Average Used for NAAQS Averaging Period	Avg. Concentration of Pollutant
CO – Carbon Monoxide (8-hr avg.) Units: parts per million (ppm)	Add up the last 8 values reported for CO (do not include the summary data in the gray columns). Find the concentration average by dividing the total by 8.	N/A
NO ₂ – Nitrogen Dioxide (1hr avg.) Units: parts per billion (ppb)	The most recent concentration value recorded by the monitoring equipment is the 1-hr avg.	N/A
O ₃ – Ozone (8-hr avg.) Units: parts per million (ppm) *Note: 1,000 ppb = 1 ppm	Add up the last 8 values reported for O ₃ (do not include the summary data in the gray columns). Find the concentration average by dividing the total by 8. If some hours are absent, use a 6- or 7-hr average.	Total: 0.145ppm <u>Avg: 0.018 ppm</u>

		Daily Summary Report							
		Site: 0651 - Lawton							
		02/19/13							
		O3	PM25	wxWDIR	wxWSPD	wxRH	wxTAR	SRAD	
Hour	PPM	UG/M3	DEG	MPH	PERCENT	DEGF	WM2		
00:00	.027	2.5	40	3	46	41	0		
01:00	.022	1.5	52	0	53	38	0		
02:00	.020	2.5	20	2	59	37	0		
03:00	.023	3.0	33	3	56	36	0		
04:00	.022	3.2	32	2	56	36	0		
05:00	.016	3.1	26	1	59	35	0		
06:00	.004	6.7	339	1	66	32	0		
07:00	.008	5.1	5	2	66	32	25		
08:00	.011	4.4	69	1	55	38	143		
09:00	.023	5.2	133	2	49	41	365		
10:00	.029	4.5	158	5	43	43	529		
11:00	.032	6.8	154	5	40	46	669		
12:00									
13:00									
14:00									

PM _{2.5} – Particulate Matter (24hr avg.) *very fine particles* Units: µg/m³	The 24hr avg. concentration value for PM is found in the gray summary column at the bottom of the <u>FIRST</u> page of the Daily Summary Report.	3.5 µg/m³
PM ₁₀ – Particulate Matter (24-hr avg.) *small particles* Units: (µg/m³)	The 24-hr avg. concentration value for PM is found in the gray summary column at the bottom of the FIRST page of the Daily Summary Report.	N/A
SO ₂ – Sulfur Dioxide (1-hr avg.) Units: parts per billion (ppb)	The most recent concentration value recorded by the monitoring equipment is the 1-hr avg.	N/A

3. Once the average concentrations have been found or calculated, use AIRNow’s AQI Calculator (http://www.airnow.gov/index.cfm?action=resources.conc_aqi_calc) to convert the pollutant concentrations into AQI scores.

- To make conversions, select a pollutant from the pull-down menu—be sure to select the proper time average as listed in the data table shown above, i.e., 24-hr avg., 8-hr avg., 1-hr avg., etc.
- Check to make sure the units match with what is listed in the data table shown above. If the units do not match, change them.
- Type in the average concentration for the corresponding pollutant you calculated and recorded in the previous data table.
- Record the monitored pollutant in the following table and the corresponding AQI score as well as a description of what that score means in terms of the air quality.

AQI Calculator: Concentration to AQI

Pollutant (units)	AQI Score	Air Quality Description
Ozone, ppm	0	Good- Children and people with asthma are the groups most at risk.

PM _{2.5} , µg/m ³	11	Good- People with respiratory or heart disease, the elderly and children are the groups most at risk.
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AQI Calculator: Concentration to AQI



Select a criteria pollutant and enter the pollutant concentration in the specified units above, the Air Quality Index and associated information are calculated below.

Select a Pollutant

PM2.5 - Particulate <2.5 microns (24hr avg) ▾

Units Required: ug/m3

Enter the Concentration: 3.5

AQI 11 AQI Category Good

Sensitive Groups	Health Effects Statements	Cautionary Statements
People with respiratory or heart disease, the elderly and children are the groups most at risk.	None	None