Air Quality Flag Program Handbook

ADEQ
Arizona Department of Environmental Quality

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How to Get Started

The School Flag Program uses brightly colored flags to help children, parents, school personnel, and the community be aware of daily air quality conditions. Knowing the air quality conditions can help protect individuals both at school and at home. The flag colors correspond to four of the colors used in the U.S. Environmental Protection Agency Air Quality Index (AQI), which forecasts how clean or polluted the air is for that day. Arizona only uses four colors because our current and historical air quality data have not reached the highest AQI levels.

When members of the school and the surrounding community know what the daily air quality is, they can adjust their activities to reduce their exposure to air pollution and can help people make decisions to minimize polluting activities. Regular physical activity, at least 60 minutes a day, promotes health and fitness. The purpose of a school flag program is to help children continue to exercise while protecting their health when the air quality is unhealthy.

A flag program can also be implemented by before and after school programs, during athletic activities at schools or parks and recreation facilities. ADEQ's Air Quality Flag Program is in place at schools, head start centers, businesses, and community health care facilities. Each day, participants raise a flag that corresponds to the local air quality forecast:

GREEN
- the air quality is good.

YELLOW
- air quality is acceptable, but there might be some health concerns for some.

ORANGE *- air quality is unhealthy for sensitive groups – people with lung or cardiac disease, children including teenagers, after older adults add and those participating in lengthy and rigorous outdoor activities. Please follow the Outdoor Activity Guidance (p.14).*

RED *- air quality is unhealthy. Everybody may begin to feel some health effects. Outdoor activity should be limited for all children and sensitive individuals should stay indoors. Please follow the Outdoor Activity Guidance (p.14).*

Air quality can become unhealthy due to pollutants such as ground-level ozone and particle pollution. Ozone is especially damaging to the lungs of children and those who work and play outside. Particle pollution – especially fine particles such as those found in smoke, haze or dust – contains microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems.

Children (including teenagers) are at greater risk from air pollution because their lungs are still developing and they breathe more air per pound of body weight than adults. People with asthma are also more likely to have symptoms when pollution is in the air. Children, including those with asthma, can continue to stay active even when air quality is unhealthy by modifying their activities or, in some cases, moving their activities indoors.

The School Flag Program is a great way to teach people about their local air quality, how air pollution impacts our health, and what actions we can take to protect ourselves. You'll find more information about the School Flag Program, the AQI, ground-level ozone and particle pollution, and the health effects of air pollution in the Background Information and Resources sections of this handbook. This handbook describes the four steps a School Flag Program coordinator needs to take to implement a successful flag program.

Step 1:
Request Flags from ADEQ

You will need four flags: green, yellow, orange, and red. ADEQ provides, flags, educational material and has developed an online toolkit at ***http://www.azdeq.gov/ceh/flag.html*** which includes materials for outreach and a letter to parents and a press template. These can be adapted for your school's or organization's specific need. The ready-made flag program and online resources are provided to help you successfully launch and implement the ADEQ School Flag Program. ADEQ's Office of Children's Environmental Health offers additional training upon request.

Step 2:
Educate and inform the school and the community at the start of the program

Choose a date to begin flying your flags then begin to educate and inform your school and the surrounding community. Some suggestions on when to start are Earth Day (April 22), however, the program is flexible and so easy to adapt that any date will do!

Train school personnel about the Air Quality Index and the Flag Program so they can help administer the program and teach the students. You can request help with this training from ADEQ's Air Quality Flag Program coordinator. Give all teachers a copy of the "Air Quality and Outdoor Activity Guidance for Schools" *(p.16)*. It includes not only actions for each air quality color but also includes questions and answers that help explain the program. Encourage teachers to take advantage of the many resources available on ADEQ's School Flag Program website at: ***http://www.azdeq.gov/ceh/flag.html***

You can also visit the Environmental Protection Agency's Air Now interactive school flag program webpage at ***www.airnow.gov/schoolflag***.

Some of the resources available include:

- a children's picture book
- interactive games
- lesson plans about air quality
- an air quality simulator
- asthma resources for schools

Make announcements to the school community through newsletters, emails, flyers, and other communication routes. You can also notify members of the larger community through a local newspaper, newsletter, or radio station. Here is an example of a newsletter announcement:

New Flag Program

How much pollution is in the air outside today? Soon, our entire school community will have a simple way to find out…just look up!

Starting [insert date], we'll be flying a brightly colored flag below our American and Arizona flags that will show how clean or polluted the air is. This new flag program will help us continue to promote exercise while protecting health.

Each colored flag corresponds to an air quality level:

GREEN – good air quality

YELLOW – moderate air quality

ORANGE – unhealthy for sensitive groups, including all children and those with asthma or other respiratory issues

RED – unhealthy for everyone

On green and yellow days, teachers and coaches will encourage students to get outside and get moving! When air quality is orange or red, it is still OK to play outside, but we will encourage kids to take breaks and cut back on activities that involve lots of running. In addition to helping us plan for exercise, the flags will help students and staff with asthma get to know whether their symptoms get worse when air quality is poor and whether they need to take extra steps to protect their health.

The flag program is used in many U.S. cities and we're proud to adopt it. In addition to the new flags, we will have in-class activities [include when] to learn more about air pollution, how it affects us, and what we can do to make the air cleaner.

We will post more information about this exciting new program and our [date] flag raising event on our school website.

Step 3:
Find out the daily air quality forecast and fly the corresponding flag

Like the weather, air quality changes from day to day. Visit ADEQ's website to check the daily forecast at:
http://www.azdeq.gov/environ/air/assessment/hpa.html.

You can also subscribe to receive the daily forecast by email or by receiving text messages at:
https://public.govdelivery.com/accounts/AZDEQ/subscriber/new.

The daily air quality forecast predicts the AQI color for both ozone and particle pollution. The forecast appears shortly after noon and predicts the air quality for the next day.

In this example, "Today's High" is forecast to be orange (unhealthy for sensitive groups) so the orange flag should be flown to reflect this. "Tomorrow's High" is forecast to be yellow (moderate) so the yellow flag should be flown. The "Pollutant Details" tell you the specific pollutant that is driving the forecast. For the current day, particles PM-10 is the pollutant that is causing the air quality color to be orange.

FORECAST DATE NOTICES (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY SUN 04/07/2013 NONE Highest AQI Reading/Site (Preliminary data only)	TODAY MON 04/08/2013 PM-10 HIGH POLLUTION ADVISORY NWS WIND ADVISORY NWS BLOWING DUST ADVISORY	TOMORROW TUE 04/09/2013 PM-10 HEALTH WATCH	EXTENDED WED 04/10/2013 NONE
O3*	64 BLUE POINT & TONTO NAT'L MON	58 MODERATE	45 GOOD	48 GOOD
CO*	09 PHOENIX SUPERSITE	06 GOOD	07 GOOD	07 GOOD
PM-10*	38 CENTRAL PHOENIX	142 UNHEALTHY FOR SENSITIVE GROUPS	90 MODERATE	53 MODERATE
PM-2.5*	34 DURANGO	74 MODERATE	52 MODERATE	37 GOOD

* O3 = Ozone CO = Carbon Monoxide PM-10 = Particles 10 microns & smaller PM-2.5 = Particles smaller than 2.5 microns

This Air Quality Forecast example shows the severity and pollutants for that particular day which determines the color of the flag that needs to be used.

Each morning, assign someone at your school to raise the flag that shows the current day's AQI color. It is a key for the assigned person to check the air quality forecast in the morning before the flag is raised. ADEQ and local air quality agencies will update the current day's forecast by noon to a different color if pollution is worse than originally expected. If you subscribe to emails, you can choose to be notified via email of forecast updates at ***https://public.govdelivery.com/accounts/AZDEQ/subscriber/new***.

Fly only the flag showing the current day's forecast. For example, if you receive tomorrow's forecast in the late afternoon, do not change the flag to show tomorrow's color.

Some ideas to involve students and teachers in the flag program:

- Encourage everyone with an email account to sign up for ADEQ's Daily Air Quality Forecast area.
- Establish student teams to be in charge of checking the forecast and raising the flag each morning.
- Have each classroom teacher assign a rotating student to post the day's air quality color in the classroom and learn more about the science of air quality and what they can do to improve air quality.
- Add a message about the day's air quality color to the daily actions and announcements.
- Get the current AQI forecast link added to your school's website.

Step 4:
Know what actions to take when the air quality is unhealthy

General Actions When Ozone or Particle Pollution Levels are Unhealthy

Ozone and particle pollution are the most widespread air pollutants. When either ozone or particle pollution is at an unhealthy level, the chances of being affected increase the longer a person is active outdoors and the more strenuous the activity. Since exercise is good for your health, it's important to stay active and know when to make changes. Children (including teenagers) and those with asthma are two groups EPA considers "sensitive" because they have more health effects at lower pollution levels.

Actions:
As either ozone or particle pollution levels become unhealthy, the general advice is to reduce: (1) how hard you exercise, and (2) the length of time you exercise. For example, on code orange days, it is still acceptable for children to play outside, but they should reduce activities that involve running and take more frequent breaks.

Sensitive groups, including children and people with asthma, should start taking it easier at code orange alert levels. When either ozone or particle pollution is in the air, adults and children with asthma are more likely to have symptoms such as coughing or shortness of breath. Be alert for symptoms and follow the child's asthma action plan. If a child has a quick relief inhaler, be sure it is always handy. Note that even students who do not have asthma could experience symptoms when exposed to unhealthy levels of air pollution.

Specific Actions When Ozone Pollution is at an Unhealthy Level

Ozone is formed when pollutants emitted by industrial facilities and power plants, motor vehicle exhaust, and other sources react in the presence of heat and sunlight. Since heat and sunlight drive ozone formation, warm sunny days have more ozone than cool or cloudy days. Ozone levels are generally much lower in the mornings.

Actions:

- When unhealthy levels of ozone are expected, you can reduce exposure by playing and exercising outdoors before noon.
- For specific guidance on what action to take for each flag color, refer to the Quality and Outdoor Activity Guidance for Schools.

Specific Actions to Reduce Exposure to Particle Pollution

In some locations (such as the western United States) where wood is burned for heat, particle pollution levels can be especially high during wintertime inversions. An inversion occurs when a layer of cooler air is trapped near the ground by a layer of warmer air above. When the air cannot rise, pollution at the surface is trapped and can accumulate, leading to higher pollutant concentrations. A variety of conditions can cause inversions to form. The most common is a nighttime inversion, when cloudless skies allow air at the surface to cool faster than the air above.

Actions:

- Choose areas away from busy streets for children to walk, exercise and play.
- Make sure children avoid standing or playing near vehicles that are idling.
- Implement policies and education programs to limit idling by school buses, delivery vehicles and personal vehicles (parent drop off/pickup) on school grounds.
- Limit outdoor activity when there is smoke in the air.
- Do not burn wood on No Burn days.
- Eliminate the use of leaf blowers and gasoline powered equipment during health alerts and high pollution days.

Use Your Judgment

Based on the recommended actions listed here and the chart provided on the last page of this handbook, school staff should use their judgment to decide how to modify planned outdoor activities when air quality is unhealthy. This should take into account the flag color, the intensity of the activity and the length of time involved.

Additional Information & Resources

What is Ozone?

Ozone is a colorless gas found in the air we breathe. Naturally occuring ozone high above the earth's surface protects our planet from solar radiation. When ozone is created near the ground it is unhealthy to breathe and can also damage trees and crops.

Ozone is created at ground level by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Emissions from industrial facilities and power plants, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC. Because ground-level ozone needs sunlight to form, it is usually highest during the hot, sunny days of summer, spring, and fall.

Within the last decade, however, high ozone concentrations have also been observed under specific circumstances in cold months. Specifically, there are a few high elevation areas in the Western U.S. where high levels of local VOC and NOx emissions have formed ozone when snow is on the ground and temperatures are near or below freezing. Ozone contributes to what we typically experience as "smog" or haze, which still occurs most frequently in the summertime, but can occur throughout the year in some southern and mountain regions.

Health Effects of Ground-level Ozone

- Constriction of airways forcing the respiratory system to work harder to provide oxygen
- Coughing, pain when taking a deep breath, wheezing and inflammation of the airways including the deep portions of the lungs
- Increased fatigue
- Reduced athletic performance
- Aggravated lung disease

For ozone, people with lung disease, children, older adults, and people who are active outdoors are considered sensitive and therefore at greater risk.

What is Particle Pollution?

Particles in the air are a mixture of solids and liquid droplets that vary in size and are often referred to as "particulate matter." Some particles - those less than 10 micrometers in diameter - pose the greatest health concern because they can pass through the nose and throat and get deep into the lungs. Ten micrometers in diameter is just a fraction of the diameter of a single human hair. Particles larger than 10 micrometers do not usually

reach your lungs, but they can irritate your eyes, nose and throat. Particle pollution, unlike ground-level ozone, can occur year-round.

Very small particles with diameters less than 2.5 micrometers are called "fine" particles. They are produced any time fuels such as coal, oil, diesel or wood are burned. Fine particles come from fuel used in everything from power plants to wood stoves and motor vehicles (e.g., cars, trucks, buses and marine engines). These particles are also produced by construction equipment, agricultural burning, trash and brush burning, and forest fires. In fact, forest fires (wildfires) are responsible for some of the worst particle pollution events.

"Coarse" dust particles range in size from 2.5 to 10 micrometers in diameter. Particles of this size are produced during crushing or grinding and from vehicles traveling on paved or unpaved roads.

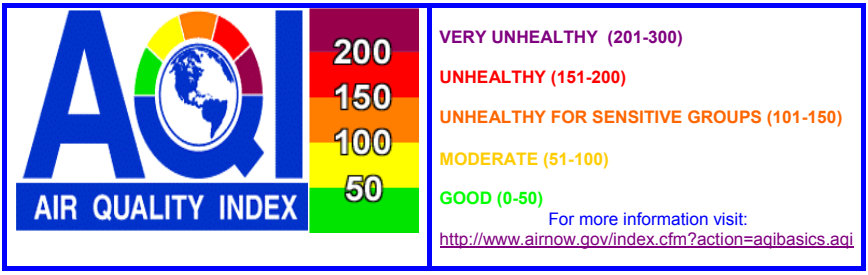
Health Effects of Particle Pollution

- Increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing
- Decreased lung function
- Aggravated asthma
- Development of chronic bronchitis
- Irregular heartbeat
- Heart attacks
- Premature death in people with heart or lung disease

For particle pollution, people with heart or lung disease, older adults, and children are considered sensitive and therefore at greater risk.

What is the Air Quality Index (AQI)?

The Air Quality Index (AQI) is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air.



How Does the AQI Work?

The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI level of 50 represents good air quality with little potential to affect public health, while an AQI value over 201 represents very unhealthy air quality.

An AQI value of 100 generally corresponds to the National Ambient Air Quality Standard (NAAQS) for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI levels are above 100, air quality is considered to be unhealthy – at first for certain sensitive groups of people, then for everyone as AQI values get higher.

The purpose of the AQI is to help you understand what local air quality means to your health. To make it easier to understand, the AQI is divided into categories. Each category corresponds to a different level of health concern. The levels of health concern and what they mean are:

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	... air quality conditions are:	... as symbolized by this color:
0 – 50	GOOD	Green
51 – 100	MODERATE	Yellow
101 – 150	UNHEALTHY for Sensitive Groups	Orange
151 – 200	UNHEALTHY	Red
201 – 300	VERY UNHEALTHY	Purple
... meaning		
Air quality is considered satisfactory, and air pollution poses little or no risk.		
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.		
Members of sensitive groups may experience health effects. The general public is not likely to be affected.		
Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.		
Health alert: everyone may experience more serious health effects.		

Air Quality and Outdoor Activity Guidance for Schools

Regular physical activity promotes health and fitness. CDC recommends that children get 60 or more minutes of physical activity each day. ***www.cdc.gov/healthyyouth/physicalactivity/guidelines.htm***

The table below shows when and how to modify outdoor physical activity based on the Air Quality Index. This guidance can help protect the health of all children, including teenagers, who are more sensitive than adults to air pollution. Check the air quality daily at: ***http://www.azdeq.gov/environ/air/assessment/hpa.html***.

Air Quality Index	
	Great day to be active outside!
	Good day to be active outside! Students who are unusually sensitive to air pollution could have symptoms, so watch for coughing or shortness of breath. These are signs to take it easier.
	It's OK for students to be active outside, especially for short activities such as recess and physical education (PE) class. For longer activities such as athletic practice, students should take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. Students with asthma should follow their asthma action plans and keep their quick relief medicine handy.
	For all outdoor activities, students should take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. Consider moving activities indoors or rescheduling. Students with asthma should follow their asthma action plans and keep their quick relief medicine handy.

Frequently Asked Questions

How long can students stay outside when the air quality is unhealthy?

There is no exact amount of time. The worse the air quality, the more important it is to take breaks, do less intense activities, and watch for symptoms. Remember that students with asthma will be more sensitive to unhealthy air.

Why should students take breaks and do less intense activities when air quality is unhealthy?

Students breathe harder when they are active for a longer period of time or when they do more intense activities. More pollution enters the lungs when a person is breathing harder. It helps to:

- reduce the amount of time students are breathing hard (e.g., take breaks; rotate players frequently)
- reduce the intensity of activities so students are not breathing so hard (e.g., walk instead of run)

Are there times when air pollution is expected to be worse?

Ozone pollution is often worse on hot sunny days, especially during the afternoon and early evening. Plan outdoor activities in the morning, when air quality is better and it is not as hot.

Particle pollution can be high any time of day. Since vehicle exhaust contains particle pollution, limit activity near idling cars and buses and near busy roads, especially during rush hours. Also, limit outdoor activity when there is smoke in the air.

How can I find out the daily air quality?

Go to ***www.azdeq.gov***. Many cities have an Air Quality Index (AQI) forecast that tells you what the local air quality will be later today or tomorrow, and a current AQI that tells you what the local air quality is now. The ADEQ forecast also tells you whether the pollutant of concern is ozone or particle pollution. To learn more about Arizona's ADEQ's Air Quality Flag Program please visit ***www.azdeq.gov/ceh/flag.html***.

If students stay inside because of unhealthy outdoor air quality, can they still be active?

It depends on which pollutant is causing the problem:

Ozone pollution: If windows are closed, the amount of ozone should be much lower indoors, so it is OK to keep students moving.

Particle pollution: If the building has a forced air heating or cooling system that filters out particles then the amount of particle pollution should be lower indoors, and it is OK to keep students moving. It is important that the particle filtration system is installed properly and well maintained.

What physical activities can students do inside?

Encourage indoor activities that keep all students moving. Plan activities that include aerobic exercise as well as muscle and bone strengthening components (e.g., jumping, skipping, sit-ups, pushups). If a gymnasium or open space is accessible, promote activities that use equipment, such as cones, hula hoops, and sports balls. If restricted to the classroom, encourage students to come up with fun ways to get everyone moving (e.g., act out action words from a story). Teachers and recess supervisors can work with physical education teachers to identify additional indoor activities.

What is an asthma action plan?

An asthma action plan is a written plan developed with a student's doctor for daily management of asthma. It includes medication plans, control of triggers, and how to recognize and manage worsening asthma symptoms. See ***www.cdc.gov/asthma/actionplan.html*** for a link to sample asthma action plans. When asthma is well managed and well controlled, students should be able to participate fully in all activities.

For a booklet on "Asthma and Physical Activity in the School," see ***http://bit.ly/activewithasthma***.

Additional Tips

For a list of additional resources, visit ***www.airnow.gov/schoolflag*** and choose "Teacher, Student and School Resources." The links include lesson plans, student pages, interactive games, asthma resources for schools, and further information on pollutants and health effects.

What is an asthma action plan?

Air pollution can make asthma symptoms worse and trigger attacks. Symptoms of asthma include coughing, shortness of breath, wheezing, and chest tightness. Even students who do not have asthma could experience these symptoms when exposed to unhealthy levels of air pollution.

Plan Ahead for Ozone

There is less ozone in the morning. On days when ozone is expected to be at unhealthy levels, plan outdoor activities in the morning.

Daily Air Pollution Forecast

The heart of the program is the daily air pollution forecast. By 1p.m. Sunday through Friday, ADEQ's meteorologists prepare individualized air pollution forecasts for the pollutants of concern in nonattainment areas in Maricopa, Santa Cruz and Yuma counties. Forecasted air pollution concentrations are expressed consistently with the color-coded AQI, so that recipients know whether air quality will be good, moderate, or unhealthful for sensitive people.

If concentrations are predicted to be close to or exceed health-based standards, ADEQ issues high pollution advisories or health watches that are announced through email subscriptions, press releases and social media (Facebook and Twitter).

With this information, flag program participants know which flag color to raise to indicate the expected air pollution level. By comparing the colored flags to the AQI using the outdoor activity guide and educating the community, teachers, school nurses, coaches and parents will know what actions to take to protect their students' health and learn to take measures to control air pollution.

Strong partnerships have been crucial to the success of the program. ADEQ's Office of Children's Environmental Health coordinates the school and community flag program and provides the ADEQ daily forecast, program training, flags and outreach materials at no cost.

Through its Clean Air Make More campaign, the Maricopa County Air Quality Department promotes business participation in its fee-based program by providing flags, ADEQ daily forecasts, and supporting materials.

The Pinal County Air Quality Department prepares and distributes its own forecast and has implemented the program at more than 50 schools and education-related facilities.

In Santa Cruz County, the Mariposa Community Health Center coordinates local outreach with flags, forecasts and training from ADEQ.

The Yuma County Health and Wellness Coalition implements the program and trains local participants with forecasts, education materials, sets of flags and guidance from ADEQ. Flag participants include three health community centers, Gadsden School District schools, Chicanos Por La Causa Head Start Centers, Desert View Academy and Carver Elementary. Contact Laura Aviles, Program Coordinator at (928) 317-4580 ext. 1663 for more information.

Helpful Links:

ADEQ Daily Air Pollution Forecast
https://azdeq.gov/environ/air/assessment/hpa.html

Maricopa County's Initiative to Promote Cleaner Air and Healthier Lives
http://cleanairmakemore.com

Pinal County Air Quality Department
http://pinalcountyaz.gov/departments/airquality/pages/Home.aspx

Mariposa Community Health Center
http://www.mariposachc.net/

Thank you for being a School Flag Program Coordinator. We hope that you find this handbook helpful. Questions and comments about Arizona Department of Environmental Quality (ADEQ) Flag Program should be directed to ADEQ's State Flag Program Coordinator, Julie Finke at jac@azdeq.gov or by calling 602-771-2231.

Notes

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