



Girl Scout Cadettes Journey – Breathe Air Quality

AIR QUALITY ACTIVITY FOR GIRL SCOUT CADETTES

Air - Suggested Discussion

Today we're going to talk about air. Even though air is all around us, we don't often think about it unless we can "see" it -- like when the wind makes flags wave, rustles the leaves on trees, or spins the petals of a pinwheel.

Without thinking about it, we breathe air all day and all night long. So it's easy to take air for granted. This lesson will remind you that clean air is one of our greatest natural resources – one on which our lives depend.

How important is air to each of us? Think about this:

- A: How long could you live without food to eat?
- B: How long could you live without water to drink?
- C: How long could you live without air to breathe?

Answers

A: *You can live 3 to 4 weeks without food.*

B: *You can live 3 to 4 days without water.*

C: *You can only live a few minutes without air to breathe. Activity: Have them hold their breath and count how many seconds they can hold their breath (usually less than a minute). Give the example of swimming underwater and the need to come up for a breath of air.*

Did you ever think about how many breaths you take each day?

Activity: Have them count how many breaths they take during one minute. An inhale and exhale counts as one breath. Have them share their results. Scientists have determined that on average an adult breathes 14 times per minute. A child breathes faster.

Let's do the math:

$$\begin{aligned} 14 \text{ breaths} \times 60 \text{ minutes per hour} &= 840 \text{ breaths per hour} \\ 840 \times 24 \text{ hours per day} &= \underline{20,160 \text{ breaths per day}} \end{aligned}$$

So, we must have air to live and we know we need a lot of air each day. We want the air we breathe to be clean because dirty air is unhealthy. Dirty air can cause coughing, wheezing and chest pain. It can trigger asthma attacks and even heart attacks and strokes in some people. Dirty air can also damage the lungs and keep them from working as well as they should.

What makes the air dirty? Different things can cause air pollution. Power plants, industrial processes, cars, diesel engines (found in trucks, ships, and other vehicles), and wood burning in fire places and wood stoves contribute to microscopic particles in the air called particle pollution. Ozone pollution forms on hot, summer days when the sun “cooks” pollutants that come from cars, power plants, gasoline vapors and factories.

Particle pollution and ozone are two of the most common pollutants that the Environmental Protection Agency regulates.

How does the EPA tell people if the air quality is good or bad? EPA uses the Air Quality Index (AQI) to report daily air quality. It tells you how clean or polluted your air is, and what health effects might be a concern for you.

Air Quality Index (AQI) Colors

EPA has assigned a specific color to each AQI category to make it easier for people to understand whether air pollution is reaching unhealthy levels in their communities. For example, the color orange means that conditions are "unhealthy for sensitive groups" (including kids and the elderly), while red means that conditions may be "unhealthy for everyone."

Here’s how the **AQI numbers** match up with the **AQI colors**:

Air Quality Index (AQI) Numbers	Air Quality Index (AQI) Colors	Levels of Health Concern
0 to 50	Green	Good
51 to 100	Yellow	Moderate
101 to 150	Orange	Unhealthy for Sensitive Groups*
151 to 200	Red	Unhealthy
201 to 300	Purple	Very Unhealthy
301 to 500	Maroon	Hazardous

* Unhealthy for Sensitive Groups: people with lung disease such as asthma, people with heart disease, children, and older adults.

SUGGESTED ACTIVITY: AIR STRIPS

I. SETTING THE STAGE

Ask “How do we know air pollution exists? Are air pollutants visible? Invisible? Have students give examples of visible air pollutants (smoke, dust, smog, etc.) Define particle pollution and share the “Background Information.”

II. ACTIVITY

A. Make the Air Strips

1. Give each student a copy of the student sheet “Air Strip.” Provide the materials to make the strips and have the students follow the directions on the sheet. Make an air strip for yourself. Use this strip to show the students how their finished strip should look.

B. Hang the Air Strips

1. Have the students hang the strips at different places around the meeting location. Outside, hang the strips in trees, along main walks, and at all entrances. The air strips should be able to move freely without bumping other surfaces.
2. After one week, have the students collect the strips. Tell them to be careful not to touch the sticky side of the tape.

C. Analyze the Results

1. Distribute magnifying glasses and have the students try to identify as many particles on the tape as possible...dust, ash, soot, and/or other particles may be present. Depending upon the time of year, the strip may have also collected pollen. You may choose to have students use microscopes instead of, or in addition to, magnifying glasses.
2. Ask students to draw conclusions about particle pollution in the test areas. Are there differences in the particles based on where the air strips were placed?

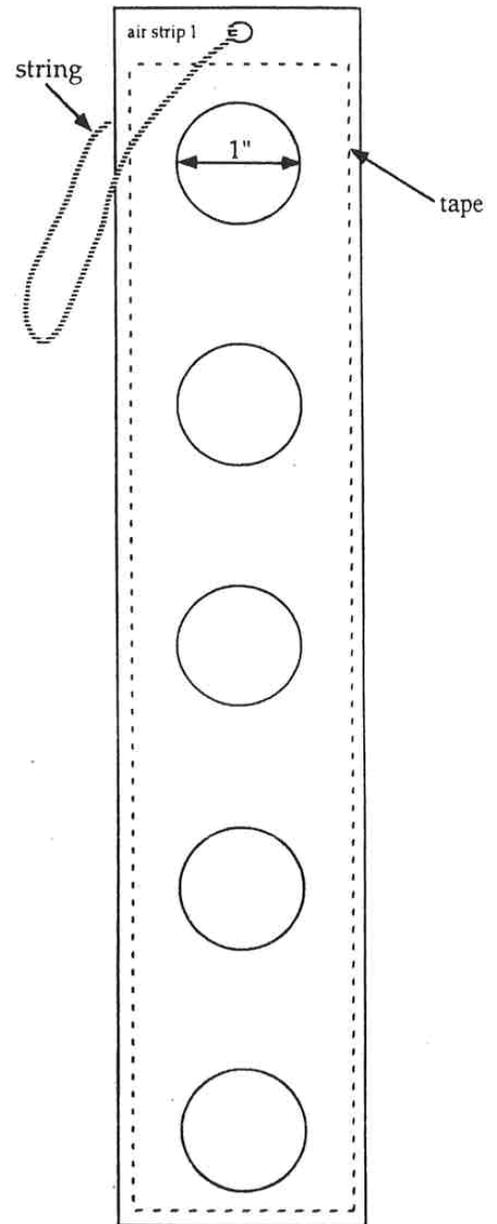
III. IF YOU WANT TO DO MORE...

A. Place air strips in a variety of other places for a week: school, home, church, stores, the bumpers of cars or school buses. Have the students compare the particulates collected from the different areas.

B. Have students consider possible factors such as the weather, wind direction, lawn mowers, nearby roads and nearby industrial or business sources.

DIRECTIONS FOR AIR STRIPS:

1. Using a ruler to measure, cut a strip of paper or cardstock 2 inches wide and 10 Inches long.
2. Cut 5 holes, each about an inch in diameter, in the strip. Use a round object to draw the circles - such as a quarter.
3. Use a hole punch to put a small hole in one end of the strip. Tie a string through the hole; the string will be used to hang the strip.
4. Put a long piece of clear tape over one side of the strip. Be sure to completely cover all 5 holes. Depending upon the width of the tape, you may need 2 or more pieces.
5. The sticky side of the tape will collect particulate matter from the air. Make sure you do not touch the sticky side of the tape over the holes.
6. Before hanging the air strip at a selected site use a permanent marker to write on the top edge of the strip the date, location and your name.



BACKGROUND INFORMATION

OZONE

What is Ground-Level Ozone?

There are two kinds of ozone - stratospheric ozone is in the upper atmosphere and protects us from harmful ultraviolet (UV) radiation. Tropospheric ozone, or ground-level ozone, is harmful to breathe. At ground-level, ozone is an air pollutant that damages human health, plants and crops, and is a key ingredient of smog.

Ozone: Good Up High, Bad Nearby

How Does Ground-Level Ozone Form?

Ozone has the same chemical structure (O₃) whether it occurs miles above the Earth or at ground-level. At ground-level, "bad" ozone is formed when certain compounds react in the presence of sunlight.

VOCs, (volatile organic compounds) are widely used as ingredients in household products such as paints and disinfectants. NO_x, (nitrogen oxide gases) are colorless and odorless and comes from motor vehicles, power plants, and other sources that burn fuels. When high levels of VOCs and NO_x are present in the air, they can react. When they react in the presence of sunlight and hot weather, ground-level ozone forms.

VOCs + NO_x + Sunlight = Ozone

PARTICLE POLLUTION

What is Particle Pollution?

Particles in the air are mostly dust and soot so small that it floats. Soot comes from burning anything. When you burn gasoline in your car engine or wood in a fireplace, soot happens! Dust comes from lots of places, too. When a company or business grinds things up very small or when someone drives down a dirt road, dust is thrown into the air. Soot and dust make the air look hazy.

Some particles in the air are so small you can't see them. It's not good to breathe in too many of these small particles, because they can get deeper into your lungs than larger particles. Airborne particles can make you cough, make it hard for you to take a deep breath, or make you more susceptible to colds. If you already have asthma or problems with your heart, particle pollution could make you sick enough to go to the hospital. To reduce exposure to particle pollution when the Air Quality Index is orange or red, don't play near busy streets where there is a lot of traffic. If smoke is from a wildfire, try to avoid vigorous activities.



AIR QUALITY AWARENESS: WHAT YOU CAN DO TO HELP!

Encourage your school and the schools in your community to adopt the **School Flag Program**.

The **School Flag Program** alerts schools to the local air quality forecast and helps them to take actions to protect students' health, especially those with asthma.

Here's how it works: Each day the school raises a flag that corresponds to how clean or polluted the air is. The color of the flag matches EPA's Air Quality Index (AQI) on www.airnow.gov.

On unhealthy days, schools can use this information to adjust physical activities to help reduce exposure to air pollution.

The school can start a flag program with four easy steps:

1. Purchase flags (~ \$100)
2. Educate the school and the community
3. Sign up for a daily email about the air quality forecast and fly the corresponding flag
4. Take actions when the air quality is unhealthy

The Coordinator's Handbook, fact sheet, activity guidelines, participants list, resources and registration form are available at www.airnow.gov/schoolflag. Schools that adopt the program should **complete the online registration form**.

Speak to the school nurse, the environmental science teacher or principal about starting the flag program at a school near you.

If you have questions, contact Donna Rogers at rogers.donna@epa.gov or (919) 541-5478.

You can Receive the Air Quality Forecast through Email or Cell Phone

EnviroFlash provides the air quality forecast through your email or cell phone for the area you live in. Air quality information allows you to modify your outside activities when necessary on unhealthy air quality days. EnviroFlash is a free service...subscribe at www.airnow.gov/enviroflash.

EPA's AirNow App

There's an app to check Air Quality by your zip code for the majority of metropolitan areas. The app displays the Ozone and Particle index forecast for today and tomorrow with color codes. The air quality data is reported by the U.S. EPA AirNow. Go to iTunes, Weather, Air Quality-AQI to download the app.

*The journey lesson was provided by the United States Environmental Protection Agency (EPA).
The EPA is a federal government agency that works to keep the land, air, and water clean.
EPA's mission is to protect human health and the environment.*