Montana

WILDFIRE SMOKE RESPONSE TOOLKIT

FOR SCHOOLS

- How to Protect Indoor Air
- Guide for Athletics & Activities
- Lesson Plans for Teachers
- Email Templates
- Social Media Graphics

MONTANA DPHHS
DEPARTMENT OF PUBLIC HEALTH & HUMAN SERVICES

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Introduction

The Wildfire Smoke Response Toolkit for Schools is intended to provide school officials with the information they need to create a healthy learning environment for their students, manage the health risks of more vulnerable populations and communicate with teachers and families about the dangers (both indoors and outdoors) of wildfire smoke.

All children ages 0-17 are considered to be more sensitive to wildfire smoke, as their lungs are still developing, and they may have an unknown underlying health condition. Those most at risk, however, are younger children (who are more active and take more breaths throughout the day), those with existing lung or heart conditions, and athletes. Please note that there are additional resources for these populations in this document.

The toolkit provides:

- Suggested School Wildfire Smoke Response Policy
- Email templates for Principals to send to families and staff
- Activity Guidelines based on Air Quality
- Informational flyers and Social Media Templates
- Resources for School Nurses
    - Email template for staff
    - 504 Recommendations for students with chronic conditions
    - Informational flyer about most vulnerable students
- Resources for Coaches
    - Informational flyer
    - Wildfire Smoke Response Practice Protocol
- Lesson Plans, Games and Stories about Air Quality for Teachers
- Purple Air Monitors in Schools partnership flyer for high schools
- Information about the Air Quality Flag Program for schools
- Social Media Posts for Schools

Resources for Administrators

- Air Quality Monitoring and Response Policy for Schools
- Email to Parents and Families Template
  Consider attaching:
  Outdoor Activity Guidelines Based on Air Quality
  Wildfire Smoke & Your Health Informational Flyer
- Email to Teachers and Staff Template
  Consider attaching:
  Outdoor Activity Guidelines Based on Air Quality
  Wildfire Smoke & Your Health Informational Flyer
  Lesson Plan Link
- Information for School Nurses
- Information for Coaches and Athletic Directors
- Social Media Posts
- Free Air Quality Flag Program for Montana Schools
- **FOR HIGH SCHOOL PRINCIPALS:** PurpleAirs in Schools Project
  (free indoor and outdoor air monitors for your building)

Air Quality Monitoring & Control Policy
_____ School/District

1. Determine outdoor air quality using the DEQ PM 2.5 readings and/or Air Quality and Activity Guidelines. If there is uncertainty about the air quality in the area, the school may contact the local county air quality specialist if available or the DEQ Air Quality Monitoring Section (406-444-6695) for assistance.

2. Teachers and staff will be asked to close classroom windows to prevent smoke from easily entering the building through these openings.

3. Signage will be placed on exterior doors with instructions to keep doors closed as much as possible and discourage propping doors open during times of poor outdoor air quality.

4. HVAC system efficiency will be assessed and adjustments will be made to reduce the amount of outdoor air introduction into the classroom. Changes made to the operation of the HVAC system are in compliance with the most recent building and mechanical codes adopted by the state of Montana.

5. HVAC system filters will be changed to efficiency MERV 13 or greater depending on system capabilities.

6. Individual air conditioning units will be switched to recirculate if possible. If recirculate option is not available, the units will be closed to outside air.

7. HEPA air purifier units will be placed in classrooms, with the priority being classrooms with sensitive individuals (i.e. students with asthma and other lung or heart conditions).

8. A clean air space will be established where sensitive individuals can go for relief from elevated levels of PM 2.5. (A clean indoor air space is a room with little to no outdoor air infiltration. HEPA air purifiers can help clean the air in these spaces).

9. Passive vents allowing outdoor air to infiltrate the building will be shut if possible.

10. School officials will notify parents of the precautions taken to maintain the cleanest indoor air possible.

(Replace with school logo)

DEPARTMENT OF
PUBLIC HEALTH &
HUMAN SERVICES

Email Template for Principals to Parents

Subject: School Wildfire Smoke Plan

Dear Parents and Guardians,

I hope this message finds you well. As you may be aware, our region is currently experiencing significant wildfire activity, which has led to poor air quality. The health and safety of our students and staff are our top priorities. We monitor the outdoor air quality and when it reaches unhealthy levels, all outdoor activity will be moved indoors.

Key Actions in Our Wildfire Smoke Plan:

1. Indoor Air Quality: We are keeping all windows closed to prevent smoke from entering the building. External doors have signage instructing to keep doors closed as much as possible. Portable HEPA air cleaners are being used in classrooms where available.
2. Outdoor Activities: All outdoor activities, including recess and physical education, will be moved indoors when outdoor air quality becomes unhealthy. We also encourage parents to arrange alternate transportation for students who usually walk or bike to school.
3. Sensitive Individuals: All children ages 0-17 are considered to be more sensitive to air pollution, as their lungs are still developing, and they may have an unknown underlying health condition. Students with confirmed respiratory conditions such as asthma may be more affected by the smoke. Please ensure that your child has their necessary medications and inform the school if they require special accommodations.

How You Can Help:

- Stay Informed: Keep track of local air quality reports and follow any additional recommendations from health officials. Visit airquality.mt.gov for more health information.
- Prepare Your Child: Ensure your child understands the importance of staying indoors and following the school's guidelines during this period.
- Health Precautions: If your child experiences difficulty breathing, coughing, or other symptoms, please seek medical attention promptly.

We appreciate your cooperation and understanding as we navigate this challenging situation. Our goal is to maintain a safe and healthy learning environment for all students.

Thank you for your support.
Best regards,
[Your Name]
Principal
[School Name]

Email Template for Principals to Teachers

Subject: Wildfire Smoke Event
Dear Teachers,
As you may be aware, our region is currently experiencing significant wildfire smoke, which has led to deteriorating air quality. We will follow MT DPHHS recommendations for air quality and outdoor activity. If the Air Quality Index (AQI) score is over 150, students will have indoor recess. Additionally, students with chronic conditions will have access to indoor recess if the AQI is over 100. If you have questions about individual students, please contact the school nurse or myself. The health and safety of our students and staff are our top priorities, and I want to ensure we are all taking the necessary steps to maintain a safe environment.

Key Actions to Maintain Health and Safety

1. Keep Windows and Doors Closed: To prevent smoke from entering the building, please ensure that all windows always remain closed.
2. Use Air Cleaners: If available, use portable HEPA air cleaners in classrooms to help filter out harmful particles. Consider device operation settings and ask your building manager or administration if you are unsure how to use the air cleaner provided.
3. Limit Outdoor Activities: Recess, physical education, and any other outdoor activities should be moved indoors if the AQI is over 150. We will monitor air quality throughout the day and communicate any changes.
4. Avoid Additional Indoor Pollutants: Refrain from using candles, incense, harsh cleaning chemicals or any other items that could contribute to indoor air pollution.
5. Encourage students to drink water: Dehydration is a common health effect of wildfire smoke exposure.

Support for Sensitive Individuals:
Students and staff with respiratory conditions such as asthma may be more affected by the smoke. Please be vigilant and provide support as needed. If any student or staff member experiences difficulty breathing, coughing, or other symptoms, they should seek medical attention promptly.

Thank you for your cooperation and dedication to maintaining a safe and healthy learning environment.

Best regards,
[Your Name]
Principal
[School Name]

Outdoor Activity & Air Quality Guidelines for Schools and Child Care Facilities

Health Effect Category	Good	Moderate	Unhealthy for sensitive groups*	Unhealthy	Very Unhealthy/ Hazardous
Visibility (miles)	13+	9-13	5-9	2-5	Less than 2
Air Quality Index (AQI)	0-50	51 - 100	101 - 150	151 - 200	201 +
Recess or Other Outdoor Activity (15-30 minutes)	No limitations	No limitations	Keep students with chronic lung or heart conditions indoors. Make indoor space available for all children to be active, especially young children.	Keep all students indoors and limit students to light or moderate activities.	Keep all students indoors and limit students to light activities.
Physical Education Class (1 hour)	No limitations	Monitor sensitive groups and limit their vigorous activities.	Keep students with chronic lung or heart conditions indoors. Limit these students to light activities. Make indoor space available for all students to be active, especially young children. If outdoors, limit students to light or moderate activities.	Conduct P.E. classes in an indoor environment with good air quality and limit students to light or moderate activities.	Conduct P.E. classes in an indoor environment with good air quality and limit students to light activities.
Athletic Events and Practices (2-4 hours)	No limitations	Monitor sensitive groups and limit their vigorous activities.	Students with chronic lung or heart conditions should abstain from outdoor practices and events based on the severity of their condition and sensitivity to smoke. Consider moving practice and events indoors. If events are not cancelled, increase rest periods and substitutions to allow for lower breathing rates.	Reschedule events or relocate to an area with good air quality. Conduct practices in an indoor environment with good air quality and limit students to light activities.	Reschedule/cancel events. Conduct practices in an indoor environment with good air quality and limit students to light activities.
Visit todaysair.mtdeq.us for local air quality conditions and more information.					

Examples of Activities

Light Activities: Walking, stretching, playing board/card games, dancing slowly

Moderate Activities: Yoga, gymnastics, shooting basketballs, skateboarding, weight training, hiking, biking, golfing

Vigorous Activities: Running/jogging, basketball, football, soccer, swimming, cheerleading, and wheeling your wheelchair

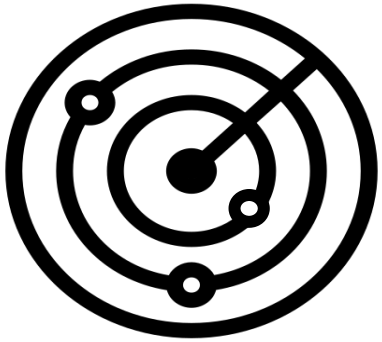
† *Please note that the intensity of an activity can vary by person and ability.*

*For the purpose of this document, sensitive groups include:

- **Children (ages 0-17 years)**. Children may be more sensitive to air pollution as their lungs are still developing and they may have an unknown underlying health condition.
- **People with chronic conditions.** People with chronic conditions, such as asthma or another respiratory disease, or cardiovascular disease, may be more sensitive to air pollution and should talk with their healthcare provider about managing their condition. People with chronic conditions should be medically managing their condition during air quality that is unhealthy for sensitive groups or worse. Students with asthma should be following their Asthma Action Plan in all conditions.
- **Pregnant people**. During pregnancy, changes to a person's body may increase vulnerability to environmental exposures. Additionally, during critical windows of human development, a pregnant person's prolonged exposure to wildfire smoke may harm the developing fetus.
- **Older adults**. Older adults are at increased risk of health effects from short-term exposures to wildfire smoke because of their higher prevalence of pre-existing lung and heart diseases.

How to Use This Table and the Today's Air Website

- Start planning early. Well before your event, start monitoring the air quality by visiting the **todaysair.mtdeq.us** website.
  - Review statewide smoke forecasts on the DEQ website: **deq.mt.gov/air/Programs/smokeforecasts**.
  - If your area is not near an air monitor, follow directions below for using the visibility guidelines.
  - Make adjustments to your plans depending on the forecast and the health effect category.
- Continue to monitor the air quality and the forecast in your area.
  - Be sure to leave adequate time for decisions to be made before teams/participants begin travel.
  - Air quality can change rapidly. Regularly review the PM2.5 concentration levels before and throughout lengthy events to assess for deteriorating conditions.



How to estimate air quality based on visibility:

1. Use pre-determined landmarks that were established on a clear day for distances (face away from the sun).
2. Determine the limit of your visible range by looking for targets at known distances (miles).
3. Use the visibility values in the table to determine the local wildfire smoke health effect category.

Items to Consider When Planning for Poor Air Quality During the School Year

- Is there an indoor/outdoor air quality section in the school or district wellness policy? If so, do you know where it is located?
- Which air quality monitor do you use or what geographic spot do you use for visibility guidelines? Does your school have it's own air quality monitors?
- Who makes the decisions to hold, cancel, or reschedule outdoor events? What is the procedure for rescheduling events? How do you communicate your decision with stakeholders? If participants are already traveling, how do you notify them?
- What do you do for recess and athletic practices on days with poor air quality?
- Has the school/district adopted a smoke readiness plan? What are the school/district plans to protect indoor air quality if poor outdoor air quality persists for a long period of time?
- Has the school inspected the air handling system and made necessary improvements to ensure ultimate efficiency?
- How do you document what happened during wildfire smoke or other air pollution events? What went well? What can be done better?

Protection from Particulate Matter

Wildfires, wood burning, and air stagnation increase the fine particulate matter (PM2.5/PM10) in the air we breathe. Fine particulate matter travels easily indoors, especially through doors, windows, and small openings. Over time, concentrations of fine particulate matter indoors can approach the level of concentration outdoors. Schools should use MERV 13 rated filters or great in their HVAC systems if the system is capable. Supplemental use of properly sized HEPA air purifiers have also been shown to improve indoor air quality by reducing particulate matter and chemicals found in smoke.

Cloth face coverings and dust masks offer little protection against harmful air pollutants in wildfire smoke because these coverings do not capture most small particles in smoke. Anyone thinking about wearing an N95 mask or respirator should consult their physician prior to doing so. Individuals experiencing symptoms such as wheezing, shortness of breath, chest pain, headache, and dizziness should be seen by a medical provider. Schools should be aware of students with asthma and other chronic conditions and consider accommodations for these students to minimize their exposure to wildfire smoke.

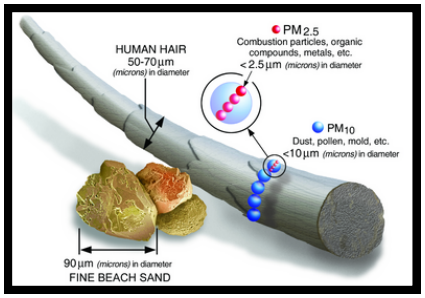
Visit airquality.mt.gov for more information on particulate matter and how to protect your health during poor air quality conditions.

Wildfire Smoke & Your Health

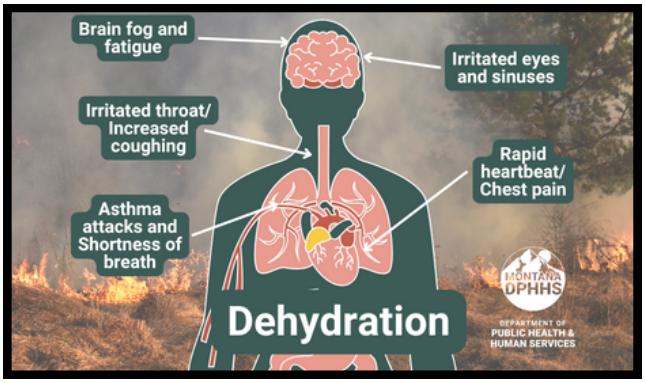
Protecting Yourself Indoors

Why do we worry about indoor air and wildfire smoke?

Wildfire smoke contains particulate matter that is four times smaller and up to ten times more toxic than other pollution. These tiny particles enter our homes and commercial buildings through open doors and windows, HVAC systems, and poorly sealed homes. They then travel into our lungs and in high quantities, can enter the bloodstream. This is harmful to all of us, but can be dangerous (and in some cases, deadly) to those with lung or heart conditions or those who are pregnant, children, or senior citizens.



Symptoms of Smoke Exposure



Wildfire smoke exposure may increase the risk of respiratory infections like bronchitis and pneumonia. Persons with lung or heart conditions should keep their rescue medication stocked and available. Closely monitor those who are more vulnerable and seek medical attention if symptoms become more noticeable.

Protecting Your Indoor Air

During a smoke event, the air inside can become as unhealthy as the air outside. These strategies protect the air in your home, community buildings, and businesses.

Keep doors and windows closed. Open at night to cool home if necessary

Avoid stovetop cooking, candle burning and smoking indoors

Use a HEPA air purifier or a DIY filter

Seal cracks in doors and windows

Change A/C setting to recirculate

For more information visit airquality.mt.gov

Resources for School Nurses

- Email template from school nurse to staff re: sensitive populations
- Most vulnerable populations information sheet
- Health Plan/504 Considerations with regard to wildfire smoke
- Wildfire Smoke and Your Health information sheet
- Outdoor Activity Guidelines Based on Air Quality information sheet

Email Template for School Nurses During Wildfire Smoke Event

Subject: Support for Students with Chronic Conditions During Wildfire Smoke Events
Dear Teachers,
As wildfire smoke events continue to affect our community, it's essential to take extra precautions to support our students with chronic health conditions, such as asthma and other respirator or heart conditions. Here are some guidelines to help ensure their well-being during these challenging times.

Indoor Air Quality:

- **Keep Windows and Doors Closed:** Ensure classrooms are sealed off from outdoor air.
- **HEPA Air Cleaners:** Use air cleaners in classrooms to reduce indoor pollutants.
- **Avoid Indoor Pollutants:** Please refrain from using strong cleaning chemicals or allowing activities that might compromise indoor air quality.

Monitoring Students:

- **Symptom Watch:** Be vigilant for symptoms of smoke exposure, such as coughing, wheezing, or shortness of breath. Immediately notify the school nurse if a student exhibits these symptoms.
- **Medication Access:** Ensure students with chronic conditions have quick access to their medications, such as inhalers.

Activity Adjustments:

- **Indoor Activities:** All outdoor activities, including recess and physical education, should be moved indoors.
- **Breaks and Hydration:** Allow students to take frequent breaks and ensure they stay hydrated.

Communication:

- **Parent Updates:** Keep parents informed about the school's measures to protect students and any significant changes in air quality.
- **Student Plans:** Familiarize yourself with the individual health plans of students with chronic conditions and follow the outlined procedures.

Thank you for your attention to this matter and your continued commitment to our students' health and safety. Should you have any questions or need further assistance, please do not hesitate to contact me.

Best regards,

STUDENT POPULATIONS MOST VULNBERABLE TO WILDFIRE SMOKE

MONTANA DPHHS
DEPARTMENT OF PUBLIC HEALTH & HUMAN SERVICES

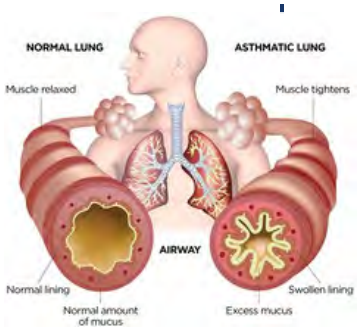
CHILDREN AGED 0-5

Wildfire is more dangerous to children because their lungs are still developing, they breathe more quickly and spend more time outdoors.

In addition, children may have a chronic disease that has not been identified yet.

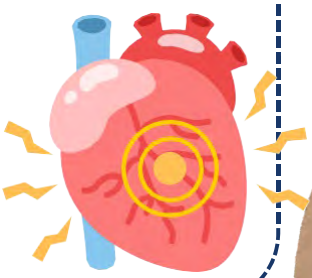
STUDENTS WITH ASTHMA

Wildfire smoke increases asthma symptoms like difficulty breathing, wheezing, and coughing. This may cause more reliance on rescue inhalers and possible emergency room visits.



STUDENTS WITH HEART CONDITIONS

Wildfire smoke exposure is linked to chest pain, heart palpitations and emergency room visits.



STUDENTS WITH OTHER LUNG ISSUES

Wildfire smoke exposure increases symptoms like shortness of breath, chest tightness, and fatigue or dizziness.

STUDENTS WITH DIABETES

Wildfire smoke exposure increases dehydration and has been associated with an increase in symptoms of diabetes.

STUDENT ATHLETES

Increased rate of breathing exposes lungs to increased levels of wildfire smoke, leading to inflammation, coughing, shortness of breath, and susceptibility to respiratory illness

Montana DPHHS suggested Section 504 Language
for students with chronic health conditions

Montana DPHHS recognizes that all children ages 0-17 are more sensitive to air pollution, as their lungs are still developing, and they may have an unknown underlying health condition. However, students with confirmed respiratory and heart conditions may be more affected by the smoke. Please consider the following accommodations when developing a 504 plan:

Section 504 Plan for Students with Chronic Conditions During Wildfire Smoke Events

Accommodations and Modifications:

1. **Indoor Air Quality Monitoring:**
    - Portable air purifiers with HEPA filters will be used in classrooms and common areas.
2. **Health and Safety Plan:**
    - The school nurse will have an updated health plan for the student, including medication administration and emergency contact information.
    - Staff will be trained on recognizing symptoms of smoke exposure and how to respond.
    - Staff will remind student to keep rescue medication in close proximity and will know where that medication is located.
3. **Access to Clean Air Spaces:**
    - The student will have access to designated clean air spaces, such as the library or a specific classroom, during wildfire smoke events.
4. **Educational Adjustments:**
    - The student may be excused from outdoor activities and physical education during wildfire smoke events.
    - Flexible deadlines and additional breaks may be provided to accommodate the student's health needs

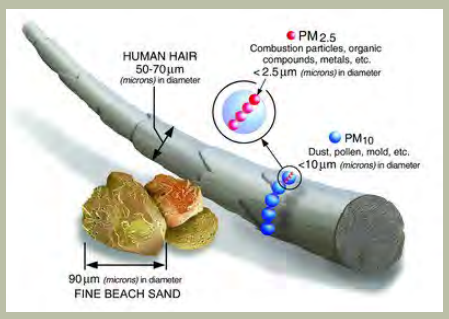
Resources for Coaches and Athletic Directors

- Training Considerations for Athletes During Wildfire Smoke Event information sheet
- Wildfire Smoke Practice Protocol template
- Outdoor Activity Guidelines Based on Air Quality information sheet
- PurpleAirs in Schools Project flyer for high schools
  (free indoor and outdoor air monitors)
- Social media posts about wildfire smoke

Training Considerations for Athletes During Wildfire Smoke Events

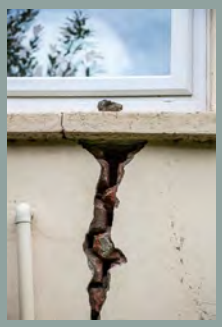
What makes wildfire smoke so unhealthy?

Wildfire smoke contains toxic chemicals that can cause long-term health effects with repeated exposure. The primary concern is the particle size—wildfire smoke particles are much smaller than dust particles and can reach deep into the lungs. In small amounts, the lungs can filter them out, but high concentrations (Air Quality Index over 150) can overwhelm the lungs and enter the bloodstream, causing adverse effects.



Short-term exposure to high levels of PM2.5 (fine particles) can inflame the respiratory system resulting in secondary effects on the cardiovascular system. This poses serious risks to those with pre-existing conditions. All individuals may experience breathing difficulties, irritation, and increased infections following these exposures.

When the Outdoor Air Quality Index (AQI) reaches levels of concern (100 for athletes with chronic conditions ie: asthma, 150 for others), activities should be moved inside and high intensity exercise should be avoided.



Indoor air is often times as unhealthy as outdoor air

In many buildings, the AQI inside quickly becomes as unhealthy as the air outside. Because the particles are so small, they quickly get through open doors, cracks and poorly sealed windows and doors, and ventilation systems. Larger areas, like gymnasiums, may be less affected but may still be in the unhealthy range during a significant smoke event.

If there's no difference, why can't we just stay outside?

Research indicates that being inside will normally decrease the intensity of activity, which will slow down breathing rates and the amount of particulate matter inhaled. In addition, you can improve air quality by running HEPA air purifiers and keeping doors and windows closed in workout areas.

How do I adapt indoor practices?

When developing practice plans, think about strategies that will improve team performance but will keep breathing rates lowered. A conditioning workout is ill-advised, but there are plenty of other options:

- Walkthroughs
- Strength Training
- Lower Intensity Drills
- Stretching/Mobility Work
- Other Sport Specific, Low Intensity Work

Important Precautions:

- *Be aware of athletes with chronic conditions and keep rescue medications close*
- *Keep athletes hydrated*
- *Watch for signs of nausea, dizziness, and coughing/wheezing*

What do I tell parents and athletes?

Frontload parent communication with comparisons they will understand. When an athlete suffers a knee injury, the inflammation from that injury is visible. Wildfire smoke induced inflammation is internal but is just as detrimental to athlete performance (and can also have long-term consequences). Unless the AQI is hazardous, avoid cancelling practices altogether. Team practices provide mental health benefits, as well as physical benefits, so even a mobility workout is productive. **Finally, encourage athletes to 1) rehydrate, 2) eat foods rich in antioxidants (berries, apples, black beans), 3) get extra sleep, and 4) sleep in a room with a HEPA air purifier (when possible).** Staying well-hydrated helps the liver and kidneys to remove toxins and additional recovery efforts will help reduce systemic inflammation caused by smoke exposure.

For more information about wildfire smoke, visit airquality.mt.gov

Wildfire Smoke Practice Protocol Template

*If you would like more information about obtaining a free indoor and outdoor air monitor for your school, read the **PurpleAirs in Schools Project** information attached to this document*

Purpose: To protect the health and well-being of athletes and staff during wildfire smoke events by providing clear guidelines for practice and games.

Monitoring Air Quality

1. **Check Air Quality Index (AQI)**: Before each practice or game, check the AQI using reliable sources such as AirNow.gov or your free registered high school PurpleAir monitor.
2. **AQI Levels and Recommended Actions**:
    - **0-50 (Good)**: Normal practice and games.
    - **51-100 (Moderate)**: Monitor sensitive individuals; reduce intensity if needed.
    - **101-150 (Unhealthy for Sensitive Groups)**: Modify practice to low-intensity activities; consider moving practice indoors.
    - **151-200 (Unhealthy)**: Move practice indoors or cancel outdoor activities.
    - **201-300 (Very Unhealthy)**: Cancel all outdoor activities; move indoors if possible.
    - **301+ (Hazardous)**: Cancel all activities.

Actions During High AQI Levels

1. **Communication**: Inform all coaches, staff, athletes, and parents about the AQI levels and any changes to practice schedules.
2. **Indoor Activities**: Plan indoor practice sessions, focusing on strategy, team meetings, mobility/stretching, and light exercises.
3. **Monitoring Athletes**: Closely monitor athletes with asthma or other lung or heart conditions. Ensure they have access to medications and are aware of the protocol.

General Guidelines

1. **Hydration**: Emphasize the importance of staying hydrated.
2. **Rest Periods**: Increase the frequency of rest periods and reduce the duration of intense activities.
3. **Medical Equipment**: Ensure the availability of medical equipment such as inhalers and first aid kits.
4. **Education**: Educate athletes on the symptoms of smoke exposure and encourage them to report any discomfort.

Signs of Smoke Exposure

1. **Common Symptoms**: Coughing, throat irritation, headaches, shortness of breath, fatigue, and chest pain.
2. **Immediate Actions**: Athletes experiencing these symptoms should stop activities immediately and seek medical attention if necessary.

Emergency Contact List

1. **Ensure Accessibility**: Maintain an updated list of emergency contacts for all athletes, especially those with pre-existing lung or heart conditions.
2. **Emergency Plan**: Have a clear plan for emergency situations, including transportation to medical facilities if needed.

Lesson Plans and Learning Activities

Stories and Activities:

- Why is Coco Orange? (Preschool-Grade 2)
- Why is Coco Red? (Preschool-Grade 2)
- Air Quality Flags in Schools Program (Preschool/Elementary)
- Sofia's Story (Grades 4-8)

Lesson Plans: Early Elementary

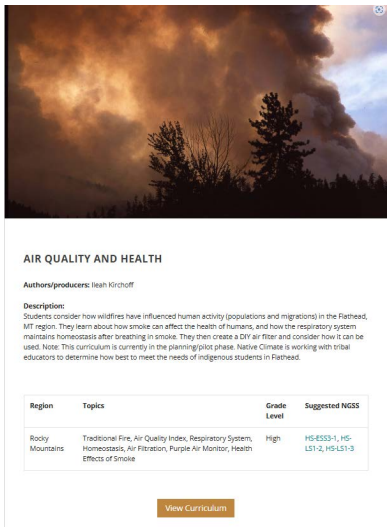
- Air Quality Coloring Page
- What Color is Your Air Today Worksheet
  - Preschool-Kindergarten
  - Grades 1-2
  - Grades 3-4

Lesson Plans: 5-8

- Birds Eye
- What's Up There Besides Air
- Indoor Air Quality Assessment
- *Particle Pollution Paper Wad Game
- *Air Strips Lesson Plan
- **(May be appropriate for high school as well)*

Lesson Plans: High School

- Whirling Swirling Air Pollution
- Field Testing for Ozone



AIR QUALITY AND HEALTH

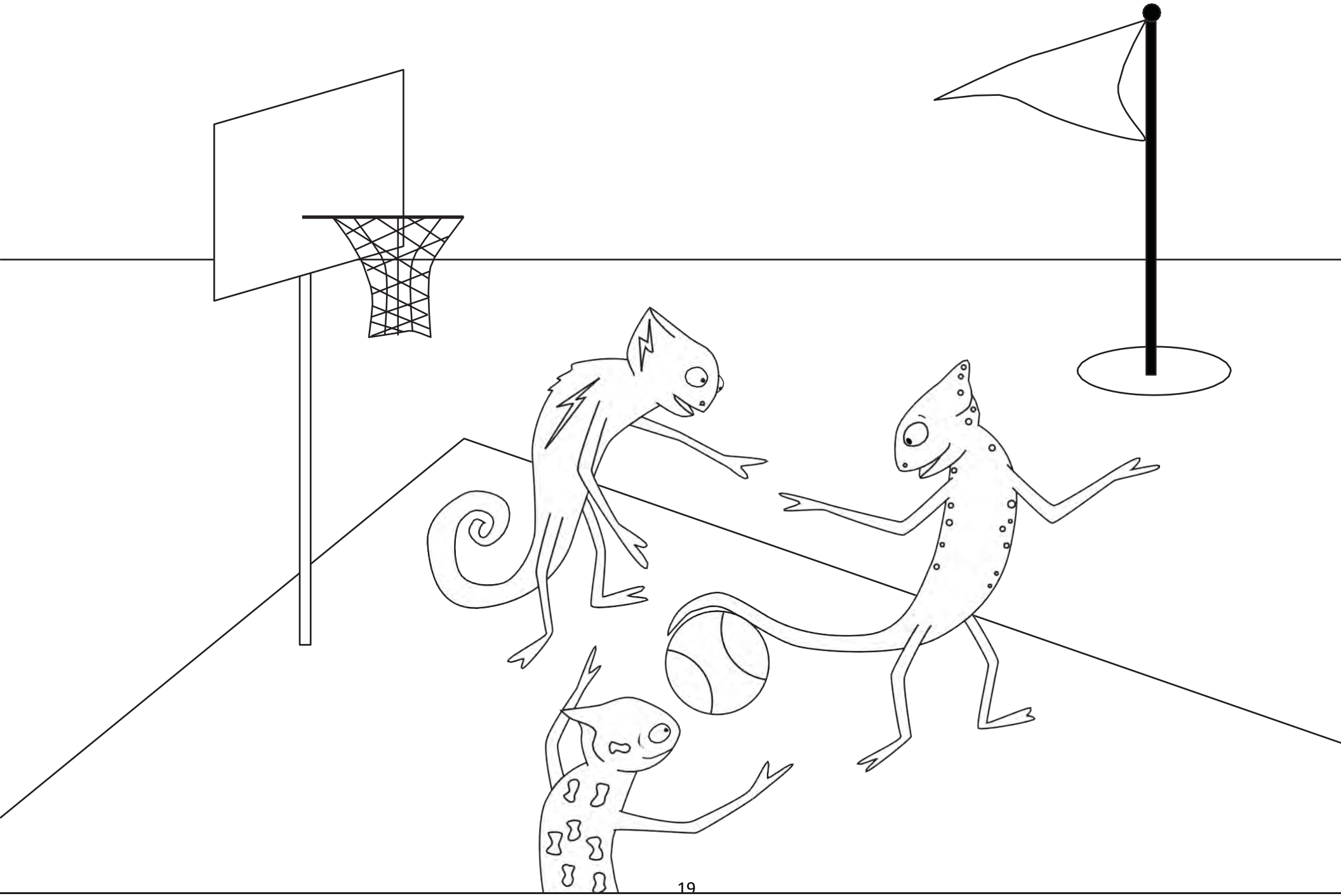
Authors/producers: Ileah Kirchoff

Description:
Students consider how wildfires have influenced human activity (populations and migrations) in the Flathead, MT region. They learn about how smoke can affect the health of humans, and how the respiratory system maintains homeostasis after breathing in smoke. They then create a DIY air filter and consider how it can be used. Note: This curriculum is currently in the planning/pilot phase. Native Climate is working with tribal educators to determine how best to meet the needs of indigenous students in Flathead.

Region	Topics	Grade Level	Suggested NGSS
Rocky Mountains	Traditional Fire, Air Quality Index, Respiratory System, Homeostasis, Air Filtration, Purple Air Monitor, Health Effects of Smoke	High	HS-ESS3-1, HS-LS1-2, HS-LS1-3

View Curriculum

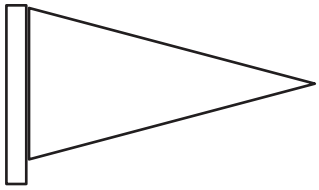
Native American Resiliency Project Lessons



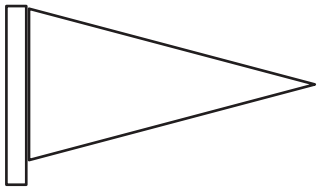
Exercise is good for you! Remember to take more breaks if the air outside is unhealthy.
Check the air quality color at airnow.gov

What Color is Your Air Today?

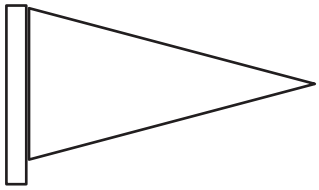
Color the flag to match each sentence.



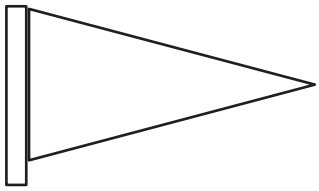
Green means it's a great day to be outside!



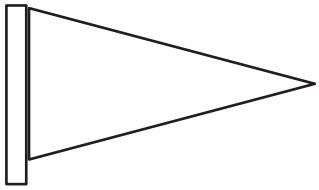
Yellow means it's a good day to be outside.



Orange means it's OK to be outside, but take breaks and rest if you're playing for a long time.



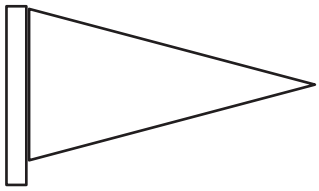
Red means take breaks and rest while playing outside.



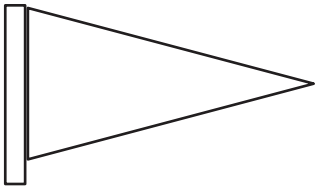
Purple means it's a good day to be inside.

What Color is Your Air Today?

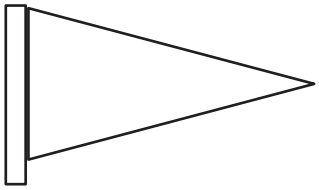
Complete each sentence with the correct word: green, yellow, orange, red, or purple.
Color the flag to match each sentence.



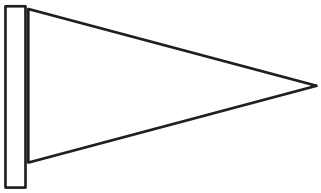
_____ means it's a great day to be outside!



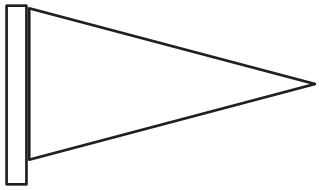
_____ means it's a good day to be outside.



_____ means it's OK to play outside, but take breaks and rest if you're playing outside for a long time.



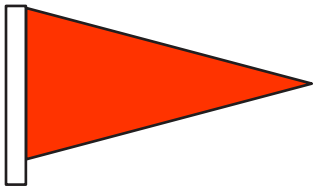
_____ means you should take breaks and rest while playing outside.



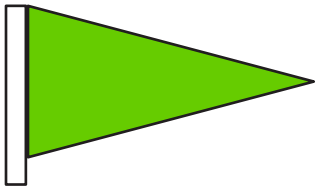
_____ means it's a good day to be inside.

What Color is Your Air Today?

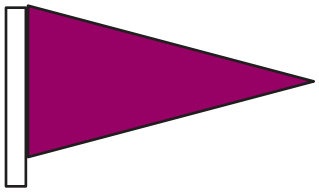
Complete each sentence with the correct color name.
Draw a line from each flag to the correct statement.
Please see the example below for the yellow flag.



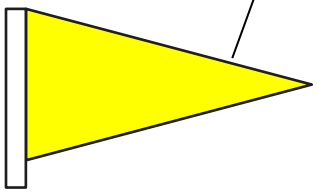
_____ means it's a great day to be outside!



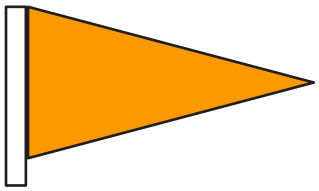
Yellow means it's a good day to be outside.



_____ means it's OK to be active outside, but take breaks and rest if you're playing outside for a long time.



_____ means take breaks and do easier activities if you're active outside.



_____ means it's a good day to stay indoors.

Bird's Eye View Lesson Plan

EPA
JUNE 2024

Grades: K-5
Subject: Science
NGSS (DCI) Connections: ESS3.C
Time: 2 Class Periods (1 Week Apart)

Student Objectives

- Name examples of natural and man-made air pollution.
- Describe some ways that people pollute the air.
- Observe and compare air samples.
- Explain how air pollution may affect us in our daily lives.

Materials

- Wire coat-hangers
- Stockings (tan or white)
- Scissors
- Stapler
- Petroleum jelly
- Cotton swabs
- Magnifying glass
- Tape or rubber bands
- Butcher paper

Background Information

People pollute or make the air dirty in many different ways. Perhaps the most obvious pollutants are those linked to burning fuel in factories, power plants, cars and trucks. People pollute the air simply by moving around. For example, particles and dust are stirred into the air when a person walks down the street or moves from room to room indoors. Vehicles traveling along dry dirt or gravel roads also stir up dirt and dust.

Particulate matter (PM) added to the air mixture in the form of dust might be made up of bacteria, microscopic organisms, pollen, animal dander or other substances. The extremely small size of these particles makes them a risk to humans because they are easily inhaled deep into the lungs where they can contribute to a variety of health problems.

The human respiratory tract has built-in, self-cleaning mechanisms designed to keep foreign particles out of the lungs. Some air pollutants can impair or halt these mechanisms, paving the way for pollutants to travel deeper into the lungs. Conditions ranging from sore, dry throats to asthma and bronchitis have been shown to have some connection with air pollution levels. Apart from health problems, air pollutants can create ugly blankets of smog or mists that spoil the natural beauty of our surroundings and affect vegetation. Plants need clean air, sunlight, and water for healthy growth and foreign substances in the air can hinder plants' ability to take in these essential nutrients.

Setting the Stage

Have the students construct the "flying bird." Kindergarten teachers may want an assistant to help the students make their birds. Teachers can prepare the coat hangers ahead of time for younger students.

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality
EPA- 456/F 24 006

Activity

Building the Birds

1. Have students cut out the bird parts.
2. Ask each student to write their name on the back of the tail feathers.
3. Students can color the head and tail feathers. They should not color the wings.
4. Grasp a wire hanger by the handle. In the center bottom, pull and stretch the hanger into a diamond shape.
5. Pull the knee high stocking onto the pointed part of the hanger and pull the stocking toward the handle until it fits snugly.
6. Secure the top of the hose with staples, tape or rubber bands.
7. Staple the head, wings, and tail feathers to the bird.
8. Using a cotton swab spread a small amount of petroleum jelly on the wings *(NOTE: Be sure the students apply the petroleum jelly to the wings only).*

Hanging the Birds

1. Help the students hang the birds at different locations inside and outside the classroom: playground, trees, breezeway, parking lot, school bus area, cafeteria, ball field, etc.
2. Make a chart listing the locations of the birds.
4. Collect the birds if there is a threat of rain. Place the birds back outside after the rain has passed.
5. After one week (or two) have the students collect their birds.

Collection and Comparison of the Birds

6. Have the students guess and chart their predictions as to which birds will be the dirtiest.
7. Collect the birds and place on a table or floor covered with butcher paper.
8. Students may visually select the bird showing the most and least signs of pollution. Help students identify the locations of the greatest and least pollution. Ask if they know the reason for the differences.
9. Give the students hand-held magnifying glasses to examine the bird's wings. Stress that the smallest particles can be the most dangerous and that there are particles present they cannot see, even with the magnifying glass.
10. Discuss with the students the implications that if the birds are "dirty" or polluted due to the air, then our lungs can be dirty too. Ask how they think this may affect their health, especially their breathing. Help them think of things we can do to protect our lungs. Examples: avoid burning trash or leaves; wear masks when working around saw dust; walk instead of driving; avoid playing near busy roadways, etc.

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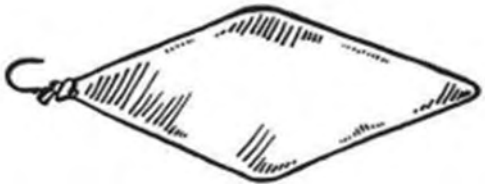
EPA- 456/F 24 006

Bird's Eye View Lesson Plan

Step 5

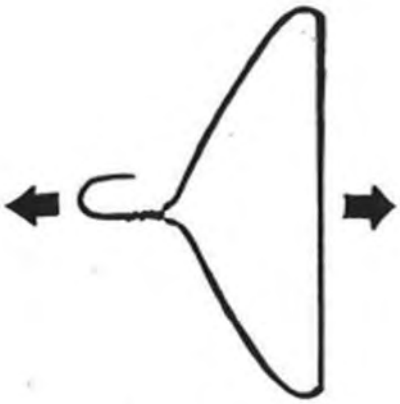
Step 4

Step 3



Step 2

Step 1



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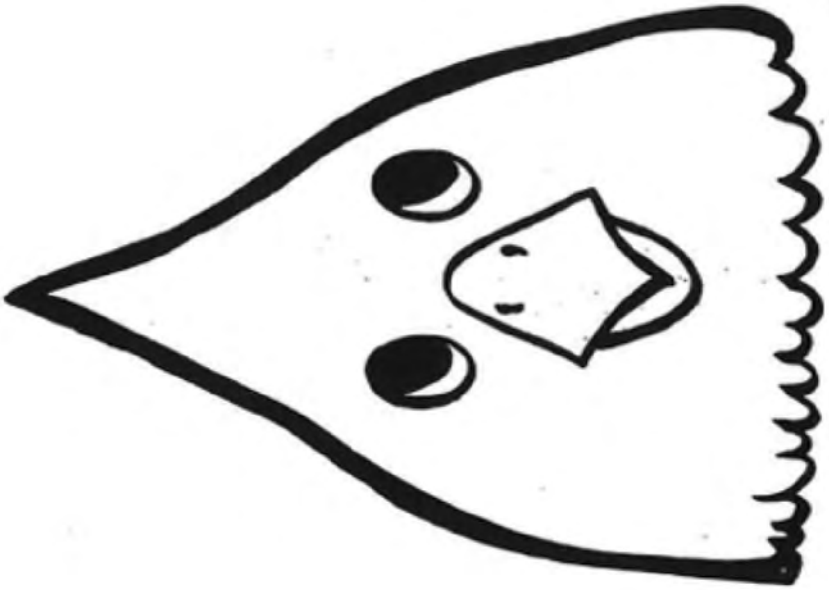
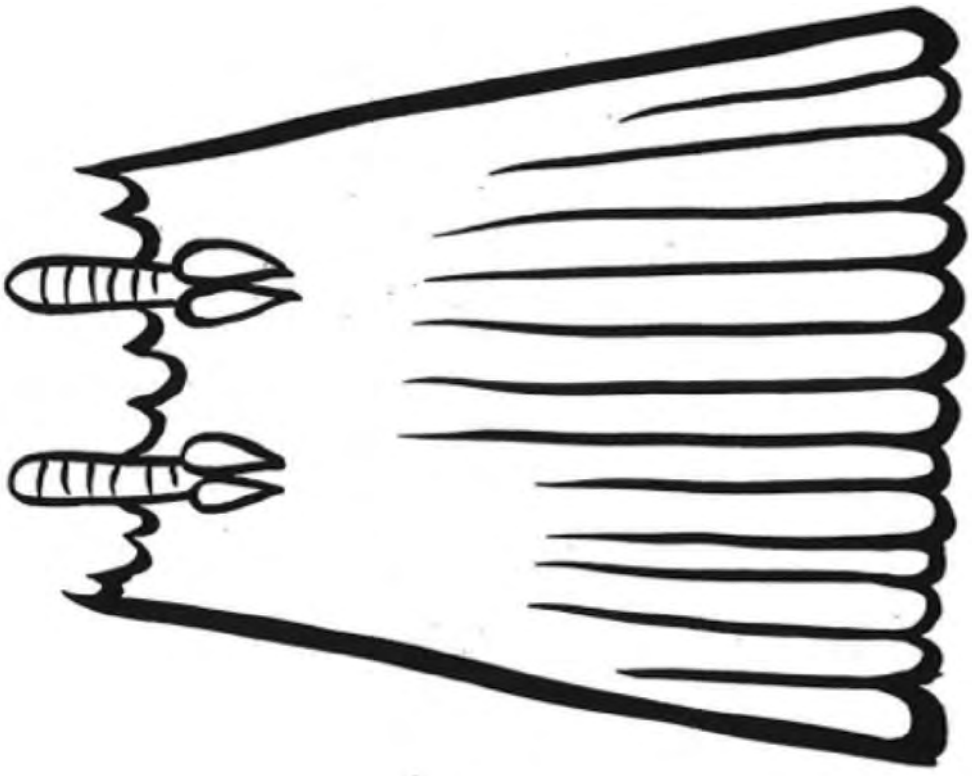
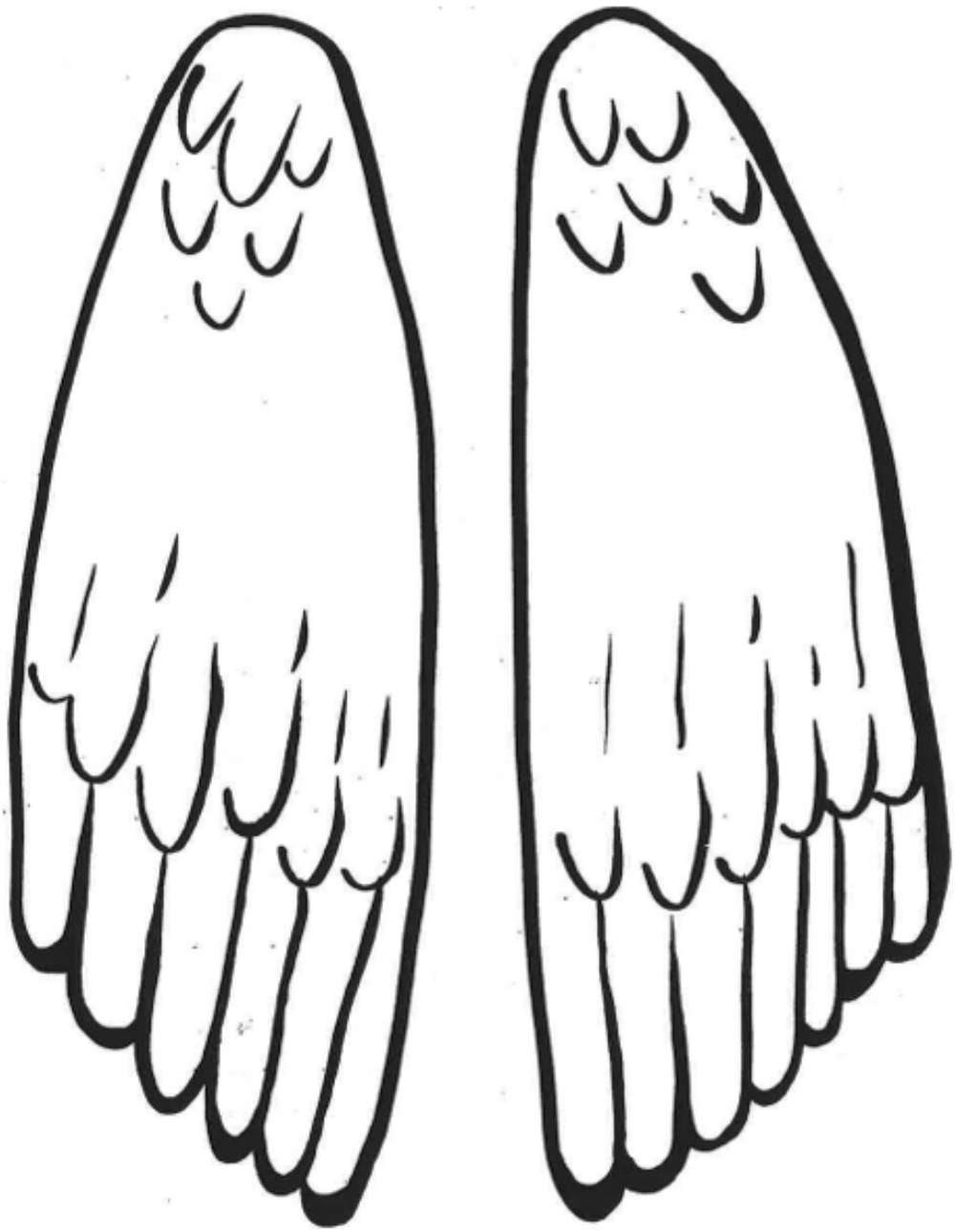
AirQuality Flag
PROGRAM

Bird's Eye View Lesson Plan





REMINDER – DO NOT COLOR WINGS!



What's Up There Besides Air?

EPA
JUNE 2024

Grade: 5
Subject: Science, Language Arts
NGSS (DCI) Connections: ESS3.C
Time: 1 to 2 Class Periods

Student Objectives

- Define air pollution.
- Demonstrate the presence of air pollution in the air around us.
- Hypothesize on the sources of air pollution in the air around us.

Materials

- Notebook and pencil for each student
- A milk carton for each student, team or group of students
- Double-sided carpet tape
- Waterproof marker
- Directional compass
- Magnifying glass
- Colored pencils, markers or crayons
- Flashlight (optional)
- Posters (optional)

Background Information

Clean air is healthy for us to breathe. However, air can become polluted - that is, made dirty with particles and gases - making the air unhealthy. In general, air pollution is any visible or invisible particle or gas found in the air that is not part of the standard composition of air.

Some air pollution is from natural sources, but much of it comes from human-related activities such as car exhaust, factory emissions, and products that we use. It is important to note that both indoor air and outdoor air can be polluted. This lesson is focused on outdoor air. Air pollutants can be in one of two forms: particulate or gaseous. Particle pollution is in the form of small solids or droplets. Dust, smoke, sand, ash, smog and pollen are examples of particle pollution. Particle pollution is often easy for us to notice because it can make the air look dirty or smell unusual. Sometimes we can see particle pollution when it settles out of the air and accumulates on surfaces - our cars can be covered with yellow pollen, outdoor surfaces can be covered with dust and statues can become dirty from deposited soot.

Gaseous air pollutants are in the form of a gas: carbon monoxide, radon, ozone, and sulfur dioxide are a few examples. Some gaseous pollutants are invisible and odorless, making them more difficult to detect than particle pollution. Two such invisible pollutants are carbon monoxide and radon.

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality
EPA-**456/F 24 006**

Background Info (Cont.)

Others are more obvious because we can smell them or immediately feel their effects. Gaseous pollutants can combine with water vapor and other elements to create other pollutants. For example, ozone is created by an interaction of volatile organic compounds (VOCs), nitrogen oxides, natural atmospheric gases, and sunlight.

How do we know when air pollutants are present? As mentioned previously, sometimes we can see them or smell them. Other times we might experience noticeable effects of the pollutants, such as difficulty breathing when there's a lot of ozone in the air or watery eyes when there is excessive pollen in the air.

We can also obtain air quality information from apps, websites, government agencies, the news media and social media to inform us of the air quality conditions or forecast. You can check your air at AirqualityNow.gov or download the AirNow app.

Setting the Stage

What is Air Pollution?

- Students will discover ways in which they can tell that the air is polluted, learn that there are both particulate and gaseous air pollutants, and define (in their own words) the term "air pollution".
- The class will take a "walking" field trip outside in the area around the school or learning environment. Each student should have a notebook and pencil or pen for recording their observations. (*NOTE: This does not work as well immediately after a rain, because the air and surfaces have been cleansed of most air pollution.*)
- Before going outside, students should respond to the following in their notebooks using the NASA Kids air pollution site (https://climatekids.nasa.gov/air-pollution/):
  - *What causes air pollution? (solid and liquid particles and gases suspended/floating in the air)*
  - *Why is it important to keep track of pollutants in the air? (because they can be harmful to people and the environment)*
- Now take the students outside. Have students "smell" the air. Ask them if it smells clean, the way it does right after it rains, or if they can detect any other smells. Ask students to record what they smell in their notebooks.
- Ask students to look at the air, both right around them and toward the horizon. Is it clear or hazy? Ask them to record their observations in their notebooks.

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EPA- **456/F 24 006**

Setting the Stage (Cont.)

- Have students inspect objects in the vicinity to see if they can find any physical evidence of air pollutants (*stationary objects that collect dust, dirt, etc.*) and record their descriptions in their notebooks.
- When they have finished the field trip, return to the classroom and ask the students to share their findings. Ask them the following questions:
    - *Do you think polluted air always contains the same pollutants? (No) What observations tell you this? (Deposited pollutants look different, sometimes I sneeze when I go outside and sometimes I don't, etc.)*
    - *Do you think air pollutants are particles or gases? Why? (They can be either. Some we can see; some we can smell.)*
    - *You mentioned several things that you smelled or saw that let you know the air contained pollutants. Which indicate the presence of particulate air pollutants and which indicate the presence of gaseous air pollutants? (Deposited particles indicate particle pollution; smells indicate gaseous or particulate pollutants.)*
- Ask students to write a definition of the term "air pollution" in their notebooks.

Activity

Catching Particle Pollutants
Students will collect particle pollutants to demonstrate the presence of particle pollution have the carton labeled in the correct orientations.

1. Label the catchers 1, 2, 3, etc.
2. Place the cartons in various spots around the school, using the compass to make sure that N is facing north, etc. (*NOTE: Write on the bottom of carton the location where it is placed.*) Make a list showing where each catcher was placed.
3. Have students write their predictions about which side will "collect" more pollutants and explain their rationale.
4. After a few days, collect the cartons and examine them. On a chart write the location where the carton was placed, how much particulate matter was stuck to the tape, what it looked like (use a magnifying glass), and the direction from which the majority of the pollutants came, etc.

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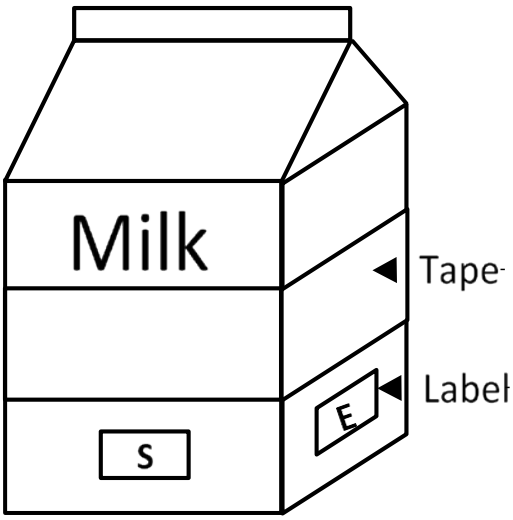
Extension



- Create and share a simple map that shows all the locations where the cartons were placed, with potential pollutant sources identified (*traffic, pollen sources, factories, etc.*)
- Use colored pencils, markers, or crayons, to indicate the relative amount of particulate matter "collected" at each of the locations. This can be done as a group or students can individually create these maps.
- Discuss possible reasons more particles were caught in some locations than in others (*proximity to road, exposure, wind direction, etc.*).
- Have students write a paragraph in their notebooks that lays out the observed air pollutants and hypothesizes on where they may have originated.
- Turn off the lights in the room. Ask the students if they think that the air in the classroom is clean. Shine a bright flashlight in the dark room and ask students to observe what they see around the beam of light. Have each student draw and describe in writing what they saw. Discuss their findings. Ask the students what senses were used and what senses were not used and why.
- Have the students make a collage using pictures cut from magazines. On one half of the paper, glue pictures of people or things polluting the air. On the other half, show pictures of people cleaning up and taking care of the earth.
- Have students write a cinquain (5-line stanza) on the topic of air pollution.
- Have students work in groups to create a "Don't Pollute" poster. They can make up their own catchy slogan. Display the posters around the school.
- Have the students create an opinion survey and ask older students or adults what they think are the biggest contributors to air pollution. Have the students record only what that individual thinks is the largest contributor. Have the students bring the results back to class and discuss their findings.

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality

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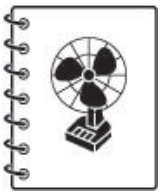
Student Indoor Air Quality Assessment



Most people know that outdoor air pollution can damage their health, but many do not know that indoor air pollution can also have harmful effects. Good indoor air reduces triggers for allergies and asthma, which contributes to a favorable learning environment. This section will help your school identify practices that impact indoor air quality and start you thinking about how you can modify these practices to improve it.

School Name: _____ **Date:** _____

Conducted By:
Please include adminstrators, teachers, school staff, students and parents involved in this assessment.

Name	**Title and/or Grade Level**

School Population:

Students: _____ Staff: _____

Most of the Student Indoor Air Quality Assessment sections are designed so students can do the majority of the investigations with some help from teachers and staff. Due to the technical nature of maintaining heating, ventilation and air conditioning systems (HVAC) and the location of building components, school building engineers or maintenance staff may have to do the bulk of this section.

A. General Indoor Air Quality Information

		YES	NO
1.	Does your school have an indoor air quality plan?		
2.	Does your school have a medical emergency plan that includes asthma/allergies?		
3.	Does your school/district have a policy addressing student self-medication?		
4.	Are students with asthma allowed to carry and use their rescue inhalers?		
5.	Does the school provide staff development for dealing with asthma/allergies?		
6.	Are your school vehicles, buildings and grounds "Smoke Free"?		
7.	Does your school have a regular cleaning schedule, and is it followed?		
8.	Is indoor air quality or information on asthma/allergies included in the curriculum?		
	If yes, at what grades, and in what subjects, is it included?		
9.	Have regularly occupied (45 minutes/day or more) spaces at or below ground level been tested for radon?		
	If a radon problem existed, have appropriate corrective measures been taken?		
10.	Have areas containing asbestos been identified and has asbestos been properly removed or contained?		

B. Indoor Air Quality Checklists

The following walk-through checklists (pages 3-5) are adapted from *EPA's Indoor Air Quality Tools for Schools*. They will give you a quick overview of conditions that affect the quality of air within your school. Use your senses of sight, smell, touch and hearing while doing your walk-through. You may want to refer to the *Indoor Air Quality Tools for Schools Kit* (http://www.epa.gov/iaq/schools/actionkit.html) for some helpful hints.

C. Action Plan

Based on the information you gathered from this assessment, what recommendations do you have for the school to improve its chemical management program? Use the chart on page 6 to brainstorm and organize ideas for action.

Indoor Inspection of Classrooms, Hallways, Offices, Staff Lounge, Auditorium and Gym

Indoor Air Quality Checklist

Make a copy and complete this checklist for each of the following rooms/areas: classrooms, offices, hallways, staff lounge, auditorium and gym.

Room #/Name: _____	Date of Assessment: _____		
	YES	NO	Observation
Is the temperature within acceptable ranges for the season (68°-78°F)?			
Is the relative humidity within acceptable ranges (33-55%)?			
Is the air exchange adequate?			
Are air supply and exhaust vents clear?			
Is area generally free from odors?			
Are there signs of ongoing water damage?			
Are there signs of mold or mildew?			
Is the area clean and relatively dust free?			
Is the area free of pests or any signs of them?			
Is there any sign of food or food waste lying around?			
Are trash cans emptied daily?			
Are chemicals and art supplies stored and handled in such way to reduce fumes?*			
If there are animals in the classroom: • Are cages cleaned regularly and waste disposed of regularly?			
• Is animal food stored in tightly sealed containers?			
Are teachers and staff aware of students' asthma/ allergies?			
Do occupants report health concerns?			
Is the paint peeling or flaking?**			
Do you have any other observations?			

* Under fume hood or tightly capped during storage.
**If your school was built before 1978, you may have a lead paint issue.

Indoor Inspection of Bathrooms, Locker Rooms, Plumbing/Utility Room, Janitorial Supply Closets, Kitchen and Furnace Room

Indoor Air Quality Checklist

Make a copy and complete this checklist for each of the following rooms/areas: bathrooms, locker rooms, plumbing or utility room, janitorial supply closets, kitchens and the furnace room.

Only Part 1 of the checklist has to be completed for bathrooms, locker rooms and plumbing/utility rooms. Both Parts 1 and 2 of the checklist should be completed for kitchens and the furnace room.

Room #/Name: _____	Date of Assessment: _____		
Part 1	**YES**	**NO**	**Observation**
Do rooms have operating exhaust fans?			
If yes, are the fans clean?			
Do all drains have traps?			
Are all drain traps filled with water?			
Are any of the water faucets or pipes leaking?*			
Are there any signs of ongoing water damage?			
Are there signs of mold or mildew?			
Are odorous or "hazardous" house cleaning chemicals used with adequate ventilation and/or only when school is unoccupied?			
Is the paint flaking or peeling?			
Part 2	**YES**	**NO**	**Observation**
Are combustion gas or fuel odors present?			
Do appliances have flues (furnaces, water heaters, etc.) or exhaust hoods (kitchen ranges, dishwashers, etc.)?			
Are all flue components free from leaks, disconnections and deterioration?			
Is soot or grease noticeable on outside of flue or vent?			
Are exhaust fans being used when appliances are in operation?			
Are exhaust vents and filters clean?			

Outdoor Inspection

Air Quality Checklist

Inspect outdoor areas of school grounds and complete checklist.

Date of Assessment: _____			
Air Intakes	**YES**	**NO**	**Observation**
Are ventilation units on?			
• If yes, is air flowing into the outdoor air intake?			
Are outdoor air intakes free from blockage or obstruction?			
Are bird or animal droppings near air intakes?			
Are sources of vehicle exhaust accumulation (parking, loading docks, bus loading, etc.) located near or upwind of air intakes?			
Does painting, roofing or maintenance of exterior building take place in the vicinity of air intakes when school is occupied?			
Are plumbing stacks at least 10 feet away from air intakes?			
Ground Level	**YES**	**NO**	**Observation**
Are vehicles adjacent to the building allowed to idle for longer than 3 minutes?			
Are garbage dumpsters located near air intakes or windows and doors that are frequently open?			
Are other potential sources of air contamination (chimneys, stacks, industry) located near the building?			
Does the area around the building have good site drainage?			
Do sprinklers over spray the building and air intakes or allow water to pool near the building?			
Do all entrances have clean "walk-off" mats to collect shoe dust and dirt?			
Is paint outside peeling or flaking?			
Roof	**YES**	**NO**	**Observation**
Is the roof in good repair?			
Is there evidence of water pooling on the roof?			
Are exhaust fans operating and air flowing out?			
Is there any evidence of bird or animal nests or droppings?			
Do you have any other observations?			

Indoor Air Quality Assessment: Ideas for Action

Based on the information you gathered from the Indoor Air Quality Assessment, what action ideas do you have to improve the air quality in and around your school? Use this sheet to record your ideas.

Section	General Ideas	Classroom Connections/ Lesson Plan Ideas	Community Involvement/ Activity Ideas	Outside Sources (organizations, community members, professionals)
A. General Indoor Air Quality Information				
A. General Indoor Air Quality Information				
B. Indoor Air Quality Checklists				
B. Indoor Air Quality Checklists				

Particle Pollution Activity – Paper Wad Game

EPA

JUNE 2024

Grades: 6-8
Subject: Science
NGSS Connections: ESS3.C, MS-LS1-3
Time: 15 minutes

Student Objectives

- Define particle pollution.
- Discuss potential sources of particle pollution.
- Identify health problems associated with particle pollution and how our bodies work to protect us.

Materials

- Swim noodle
- Golf ball
- Grain of sand
- Baseball-size paper wads (25 +/- paper wads depending on the number of participants) – these represent coarse particles in particle pollution.
- Marble-size paper wads (50 +/- paper wads depending on the number of participants) – these represent fine particles in particle pollution.

Background Information

In this activity, students pretend to be cilia, tiny hairs that protect and filter out particles in the lungs. As cilia, participants wave their arms and smack away particle pollution in the form of paper wads.

Particle pollution, also called particulate matter (PM), is a combination of tiny solid and liquid materials found in the air. Examples include dust, pollen, mold, and even metals. Potential sources include industries, power plants, automobiles, fires, construction sites, and unpaved roads.

Air monitoring stations throughout the US measure particle pollution of various ranges, but most monitor for $PM_{2.5}$ and PM_{10}.

- $PM_{2.5}$ - "fine particles" that are smaller than 2.5 microns in diameter.
- PM_{10} - "coarse particles" that are smaller than 10 microns in diameter.

The largest fine particle (measuring 2.5 microns in diameter) is almost 30 times smaller than the average human hair (averaging 70 microns in diameter).

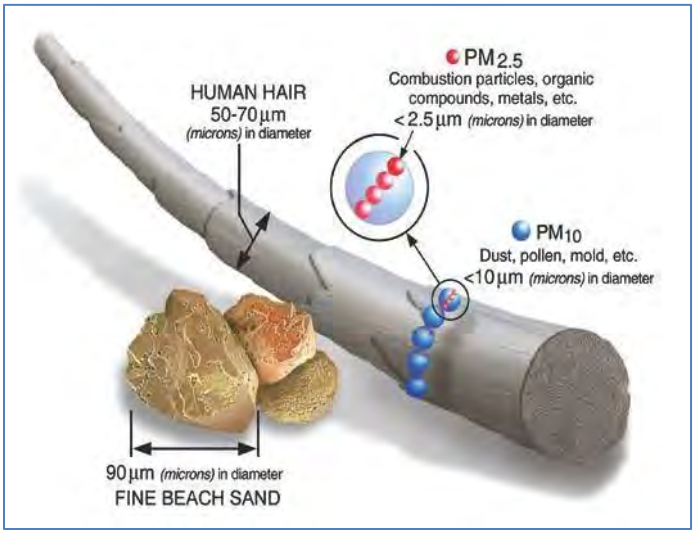


Image courtesy of the U.S. EPA

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality

EPA-**456/F 24 006**

Setting the Stage

- Tell students that they are going to play a game where each of them will pretend to be cilia - tiny hairs in the lungs that filter out dust and other particles we breathe in. have to block particles (paper balls) from going past them!
- Lead a discussion with students about how we know air pollution exists. Are air pollutants visible, can we use any of our senses to detect some or all of them?
- Have students give examples of visible air pollutants (e.g., smoke, dust, smog, etc.).
- Define PM for the students by sharing the "Background Information" above. This information can also be found on the EPA website; the link is listed in the additional resources section at the end of this document.
- Use the materials you collected as props to model the relative size of particulate matter for students. Tell them the swim noodle represents a strand of human hair, the golf ball represents PM_{10} and the grain of sand represents $PM_{2.5}$ "fine particles" in the image.

Activity

1. Have students stand in an open area (outside, gym, etc.) at least an arms-length distance from one another. Tell them they are the cilia in lungs.
2. As cilia, students are responsible for protecting the lungs from particle pollution (paper wads). Tell cilia (participants) to wave their arms and if a paper wad comes near them to smack it away. Depending on the size of the group, you may need another volunteer to help you throw particle pollution (paper wads) at the cilia (students).
3. After throwing particle pollution (paper wads) at the cilia (students), ask them if it was easy or difficult protecting the lungs from the coarse particle pollution (paper wads).
4. Tell the cilia (students) that they now will be protecting the lungs from fine particles ($PM_{2.5}$ in the image). *NOTE: you will only be using the marble-sized paper wads during this section of the activity.*
5. Tell the cilia (students) to again wave their arms and if a paper wad comes near them to smack it away. Again, depending on the size of the group, you may need another volunteer to help you throw particle pollution (paper wads) at the cilia (students)

Air Quality Flag PROGRAM

Activity (cont.)

6. After throwing particle pollution (paper wads) at the cilia (students) ask them if it was easy or difficult protecting the lungs from the fine particle pollution (paper wads). Ask students if it was easier or more difficult protecting the lungs from the coarse particles or fine particles.

7. Collect all the paper wads. Tell the cilia (students) that they now will be protecting the lungs from fine and coarse particles in particle pollution. *NOTE: you will be throwing both the baseball-sized paper wads and marble-sized paper wads in this section of the activity.*

8. Tell the cilia (students) to again wave their arms and if a paper wad comes near them to smack it away.

9. Discuss ways to reduce particle pollution. Examples include:
   - prohibiting smoking indoors,
   - reducing use of candles, woodstoves, and fireplaces,
   - only burning dry, seasoned wood in fireplaces and wood stoves,
   - ensuring woodstoves are EPA-certified (and replacing woodstoves that are not EPA-certified),
   - never burning garbage, and
   - using public transportation, carpooling, biking, or walking to reduce automobile emissions.

Additional Resources

Reference

U.S. EPA. *Particulate Matter: Basic Information*. https://www.epa.gov/pm-pollution

Teens Health. *Lungs and Respiratory System*. https://kidshealth.org/en/teens/lungs.html

Air Quality Flag PROGRAM

Air Strips Lesson Plan

EPA
JUNE 2024

Grades: 6-8
Subject: Science
NGSS Connections: ESS3.C
Time: 2 Class Periods (1 Week Apart)

Student Objectives

Define particulate matter.

- Collect particulate matter from the air in test areas around the school.
- Analyze the particles collected and draw conclusions about the airborne particulate pollutants.

Materials

- Poster board or cardboard
- Scissors
- Rulers
- Clear tape (e.g. packing tape)
- String
- Magnifying glasses
- Hole punch
- Permanent markers
- Optional: compasses, dissecting microscope, balance, quarter
- Student directions sheet (included)
- Air strips template (included)

Background Information

Our atmosphere is almost completely made up of invisible gases. Most major air pollutants are also invisible gases, although large amounts of them concentrated in areas such as cities can be seen as haze or smog.

The air we breathe indoors and outdoors always contains particulate matter (PM). Some particles, such as dust, dirt, soot, or smoke, are large enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope. Particulate matter can accumulate on surfaces such as buildings and other structures.

Particulate matter is made up of tiny particles of solid matter and/or droplets of liquid. Natural sources include volcanic ash, pollen, and dust blown about by the wind. Diesel fuel burned by vehicles on the road, as well as coal and oil burned by power plants and industries, are the chief sources of human-made particulate pollutants. However, not all sources are large-scale. The use of wood in fireplaces and wood- burning stoves can also produce significant amounts of particulate matter in localized areas. The U.S Environmental Protection Agency provides information on types of wood-burning appliances. If you choose to heat your home with wood, use the cleanest wood-burning appliance – these are marked with EPA-certified and EPA-qualified labels.

Particulate matter can be harmful to plant life and to animals and human life when the pollutants are inhaled. Smaller particles, (10 micrometers in diameter or smaller), pose the greatest health problems since these smaller particles generally pass through the nose and throat and enter the lungs. Because it can have harmful and serious effects, particulate matter is one of the six criteria pollutants – a pollutant for which the federal government has established laws and air quality standards.

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality
EPA- 456/F 24 006

Air Strips Lesson Plan

EPA
JUNE 2024

Setting the Stage

- Ask students to respond to the journal prompt: "Can we see air pollution? Explain your reasoning in 2-4 sentences."
- Define PM for students by sharing the "Background Information."
- Engage students in a classroom discussion about visible air pollution. Ask a few students who are comfortable doing so to share their journal responses. Encourage the class to give examples of visible air pollutants (e.g., smoke, dust, smog, etc.), drawing from facts in the background information and journal responses.

Activity

1. Make an air strip for yourself. Use this strip to show the students how their finished product should look, then use it as a control in step 4 for comparison with the test strips exposed to the air for 1 week.

2. Give each student a copy of the student directions sheet (included) and an air strip template (included). Provide the materials to make the strips and have the students follow the directions. *NOTE: Each student should make at least one air strip, more if there is time.*

3. Have the students hang the strips at different places around the school, both inside (e.g., hallways, cafeteria, bathrooms, classrooms, gym, kitchen, etc.) and outside (e.g., trees, walkways, entrances, etc.). Give each student tape to secure the air strip's string to a stable surface at the selected sites. The air strips should be able to move freely without bumping other surfaces. *NOTE: All air strips should be carefully labeled with date, location, and student's name.*

4. Have the students check the weather forecast to make sure that the air strips will not get wet in the rain. If the forecast calls for rain, bring the air strips in for that period of time before returning them outdoors.

5. After one week, have the students collect the strips. Tell them to be careful not to touch the sticky side of the tape.

6. Have the students visually compare the control air strip to the air strips used to collect particulate matter.

7. 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, pollen may also have been collected. *OPTIONAL: You may choose to have the students use dissecting microscopes instead of, or in addition to, magnifying glasses.*

8. Ask the students to draw conclusions about the particulate air pollutants in the test areas. Are there differences in the particles based on where the air strips were placed?

9. Have each student develop a chart or graph using the information gathered by the class and write a summary paragraph about the activity.

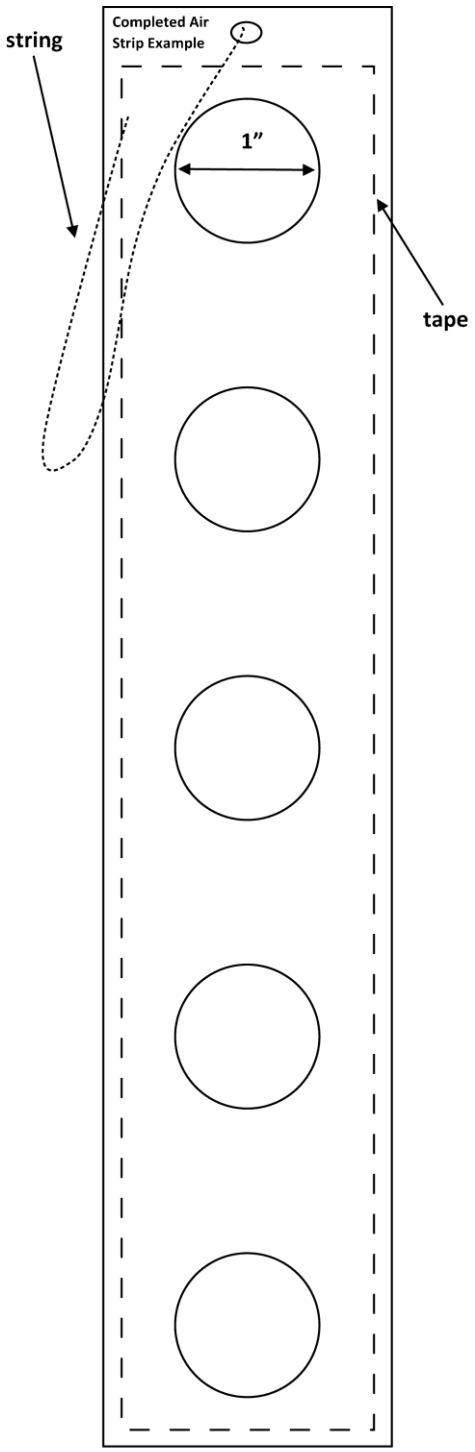
Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality
EPA- 456/F 24 006

Air Strips Lesson Plan

Student Directions

1. Cut out an air strip template (provided on page 5). Be sure to cut out the 5 circles in the center of the template strip.
2. Place the template on a piece of posterboard or cardboard. Trace around the outside of the template and each circle. Cut out the rectangular air strip. *Note*: *If you don't have a copy of the template, you can use a ruler to measure a rectangle that is 2 inches wide and 10 inches long on your posterboard or cardboard.*
3. Cut out the circles you traced on the posterboard or carboard. *Note: If you don't have a template, use a ruler to find a round object with a 1-inch diameter or use a compass to draw the circles*. *A quarter is about 1 inch in diameter.)*
4. 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 at a selected site.
5. 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.) 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 the date, location, and your name on the top edge of the strip.



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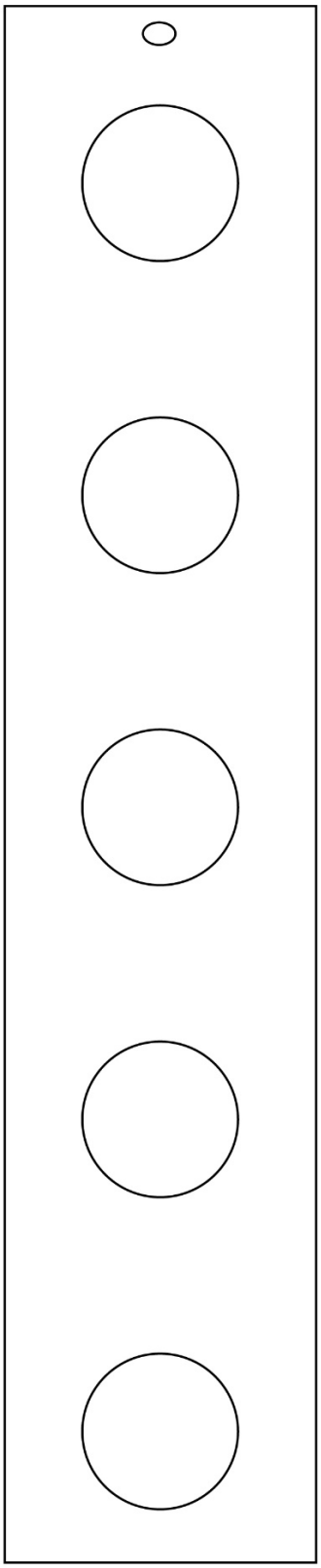
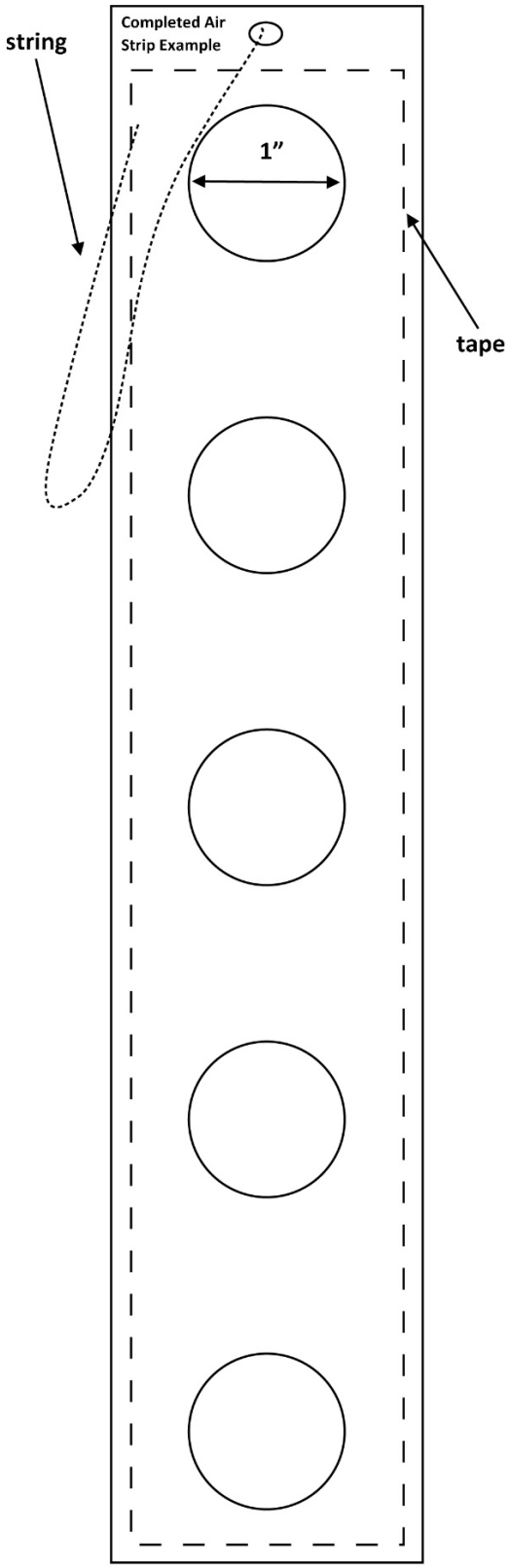
EPA- 456/F 24 006

Extension

- Place air strips in a variety of other places for a week. Have the students compare the PM collected from the different areas.
- Hang new air strips daily and compare them to determine if the day of the week makes a difference in the amount of PM collected. Have the students consider possible factors such as weather, industrial schedules, etc.

Air Strip Template





Whirling Swirling Air Pollution

EPA
JUNE 2024

Grades: 9-12 and Adult Subject: Science
Time: 1 hour

Student Objectives

- Bring awareness to the air pollutants that we contribute to the airshed each day.
- Commit to reducing activities that contribute to air pollution.

Materials

- Water
- Clear plastic cups
- Food coloring (green, yellow, blue, and red)
- Props can be used while narrating this activity. Use your imagination. Here are some suggestions:
    - Small plastic car
      Shower and hair products
    - Electric hair dryer
      Perfumes
    - Bug spray

Background Information

There are numerous ways that everyday human activities can contribute to air pollution. These activities may not be immediately apparent as a source of pollution when you consider them from an individual viewpoint. However, the cumulative effect can be profound. This activity attempts to simulate the cumulative effect of various air pollution sources upon the airshed.

An airshed is a geographic area with all parts of the area being subject to similar conditions of air pollution. The boundaries of an airshed may be defined by weather patterns or by topographic features, like mountain ranges or bodies of water. Identifying emissions that impact an airshed can help improve and maintain the confined air quality within it.

Potential emissions include the following:

- Particulate Matter (PM)
- Volatile Organic Compounds (VOCs)
- Nitrogen Oxides (NOx)
- Sulfur Oxides (SOx)
- Carbon Monoxide (CO)

In this activity, water is used to simulate pollutant mixing, which occurs in the air.

Setting the Stage

- RED food coloring represents car and truck pollution.
- GREEN food coloring represents lawn, boat, and construction engines.
- BLUE food coloring represents consumer products and paints.
- YELLOW food coloring represents industry and commercial activities.
- Small clear cups half full of water represent the airshed.
- Students should work in pairs

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality
EPA- **456/F 24 006**

Whirling Swirling Air Pollution

EPA
JUNE 2024

Activity

Narrate A Day in the life of… (anyone: adults, teenagers, a movie star in New York City, etc.). Be creative with your story and embellish as needed. This can be a humorous and exaggerated depiction of how someone might excessively contribute air pollutants during their daily activities. Tell the students the water represents their airshed. During the narration they are to add a drop of food coloring when they hear something that contributes to air pollution. Have fun with this!

Alarm goes off! Get ready for your day.

- VOC sources: perfumed soap, shampoo and shaving supplies; use an excessive amount of hot water.
- Use deodorant, an electric hair dryer, hair spray, and perfume.
- CO, NOX, PM2.5, SOX sources: Combustion to heat water.

Add one drop of BLUE food coloring to your airshed.

Jump into your car and drive to work! You don't carpool. You forget your dry cleaning and backtrack to home. Then you go to the drive-thru at your coffee shop.

- VOCs, CO, NOx, SOx, PM sources.
- Cold start in your automobile: High CO emissions.
- Add one drop of RED food coloring to your airshed.

- **Arrive at Work!** Choose any job that might contribute air pollutants.
- Industrial sources: PM, CO, VOCs, NOx, SOx from manufacturing, mills, construction, space heating.
- Commercial sources: PM, CO, VOCs, NOx, SOx from printing, painting, delivery, small manufacturing, or dry cleaning.

Add one drop of YELLOW food coloring to your airshed.

Time for your lunch break! Take four friends with you.
Two co-workers want a burger. You sit in a drive-thru line for 10 minutes on a high ozone day. Your other two co-workers want tacos – idling in another drive-thru line with the AC on.

- PM, CO, VOCs, NOx, SOx

Add one drop of RED food coloring to your airshed.

Eat your lunch (flame broiled burger with fries):

- PM, CO, VOCs, NOx, SOx

Add one drop of BLUE food coloring to your airshed.

Drive back to work!

- PM, CO, VOCs, NOx, SOx

Add one drop of RED food coloring to your airshed.

Back at work! You turn the AC up. Same sources mentioned above.

Add one drop of YELLOW food coloring to your airshed.

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality

EPA- **456/F 24 006**

Activity (Cont.)

Time to go home! Drive home in your car. You're almost home, but you had to turn around to go to the grocery store.

- PM, CO, VOCs, NOx, SOx

Add one drop of RED food coloring to your airshed.

Pick up the dry cleaning!

- VOCs

Add one drop of BLUE food coloring to your airshed.

Get ready for the barbeque! It's 4:30, just enough time to mow the yard before sundown.

- PM, CO, VOCs, NOx, SOx

Add one drop of GREEN food coloring to your airshed.

Cookout! The mosquitos are out - spray everyone with the repellant. Use lighter fluid to get the charcoal hot.
– Grill the hamburgers.

- PM, CO, VOCs, NOx, SOx

Add one drop of BLUE food coloring to your airshed.

Now look at the airshed in the glass. The original water was clear and pristine.

- What happened to the airshed?
- What contributed to the pollution?
- What actions were unnecessary?
- What would you do differently?

Discussion

Individuals should evaluate the environmental impacts that result from the choices we make in our everyday activities. When you make a choice that reduces or eliminates the amount of pollution you contribute to the air, you also reduce the need for technologies to remove or recycle the pollution.

Have the students design a sequence which describes their daily activities. Ask the students if they are willing to make one or two lifestyle changes for a semester.

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality

EPA- **456/F 24 006**

Field Testing for Ozone

EPA
JUNE 2024

Grades: 9-12
Subject: Earth Science, Chemistry
NGSS (DCI) Connections: HS-ESS3-4
Time: 2 Class Periods (1 Week Apart)

Student Objectives

- Distinguish between tropospheric and stratospheric ozone.
- Define smog.
- Discuss air quality and related health and welfare issues involving tropospheric and stratospheric ozone.
- Perform simple measurement of ozone concentration in the outdoor air.

Materials

- Potassium iodide
- Filter paper (can use coffee filters)
- Corn starch
- Glass stirring rod
- Small paint brush
- 250 mL beaker
- Heat source (preferably a hot plate)
- 9" microwaveable plate or paper plate
- Clear jar with lid or zipper lock plastic bag
- Distilled water
- Heat safe glass plate
- Full-splash safety goggles
- Aprons
- Scissors
- Schoenbein Color Scale (provided)
- Relative Humidity Schoenbein Number Chart (provided)
- Bulb psychrometer (optional)

Student Activity

This test is based on the oxidation capability of ozone. Ozone in the air will oxidize the potassium iodide on the Schoenbein paper to produce iodine. The iodine reacts with starch and produces a purple color. The exact shade of purple correlates to the amount of ozone present in the air. The two reactions involved are:

$$2KI + O_3 + H_2O \rightarrow 2KOH + O_2 + I_2$$

I_2 + starch → starch turns a shade of purple

Background Information

The issue of ozone in the earth's atmosphere can be confusing. On one hand, we know that high above the earth's surface in the stratosphere is a layer of ozone that surrounds the planet and helps block out some of the sun's harmful radiation. We hear reports of "holes" developing in this stratospheric ozone shield and of the harm that the increased ultraviolet radiation can cause on earth. On the other hand, we know that higher than normal concentrations of ozone in the air we breathe in the troposphere (ground-level) can be harmful to people, animals, plants, and various materials. The ozone gas in the stratosphere and troposphere is the same, the chemical O_3. In the upper atmosphere (stratosphere) it greatly benefits all life. Near the earth's surface (troposphere), it can cause problems.

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality
EPA- 456/F 24 006

Background Info (Cont.)

The Stratospheric Ozone Layer

High in the stratosphere, a layer of ozone gas forms an important and effective protective barrier against the harmful ultraviolet (UV) radiation from the sun. In the 1970s, scientists discovered that certain human-made chemicals containing chlorine and bromine were depleting stratospheric ozone. This led to the adoption in 1987 of the Montreal Protocol, a global environmental treaty to protect the ozone layer by phasing out the production and consumption of chemicals that destroy the ozone layer. All countries have signed on to the Montreal Protocol, and the ozone layer is now expected to recover to healthy levels by mid-century. Researchers across the globe continue to study the ozone layer, the causes of its depletion, and the effects of ozone layer depletion on humans and the environment. Visit EPA's website to learn more: https://www.epa.gov/ozone-layer-protection.

Increased UV radiation at the earth's surface can lead to a greater incidence of:

- Skin cancer, eye problems such as cataracts, and immune deficiencies in humans
- Decreased crop yields, and reduced populations of microscopic sea plants and animals that are vital to the food chain

Ozone Pollution in the Troposphere

High concentrations of ozone in the ambient air that we breathe in the troposphere can cause many problems. Because ozone molecules are highly reactive, they have an effect on practically every material they contact, whether it be lung tissue, crops or other vegetation, rubber, plastic, paints, etc.

What we often refer to as "smog" is mostly ground-level ozone. The recipe for the formation of ozone in the ambient air includes volatile organic compounds (VOCs), nitrogen oxides, and sunlight. Because sunlight is a key factor, ozone pollution is generally worse during the day (particularly the afternoon) and in the summertime. Vehicle exhaust provides most of the VOCs and nitrogen oxides that form ozone, so times of increased vehicle use (such as morning and afternoon rush hours) also increase the possibility of ozone problems.

Ozone can cause eye, nose, and throat irritation, and can damage the lungs. Visit EPA's website to learn more about ozone pollution in the troposphere: https://www.epa.gov/ozone-pollution.

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Field Testing for Ozone

EPA
JUNE 2024

Student Directions

1. Place 100 mL of water in a 250 mL beaker on your heat source, then add 5 grams of corn starch.

2. Heat and stir mixture until it gels. The mixture is gelled when it thickens and becomes somewhat translucent.

3. Remove the beaker from the heat and add 1 gram of potassium iodide and stir well. Allow the solution to cool.

4. Lay a piece of filter paper (you can use coffee filters) on a glass plate and carefully brush the paste onto the filter paper. Turn the filter paper over and do the same on the other side. Apply the paste as uniformly as possible. <u>The paper can be exposed for immediate testing at this point.</u>

5. If you plan to test at a later time, allow the paper to dry. To save time, place the paper on a microwave-safe plate and microwave for one minute.

6. Cut the paper into small strips. To store the strips, seal them in a clear jar or zipper lock plastic bag out of direct sunlight.

7. When you are ready to sample, dip a prepared strip of test paper in distilled water and hang it at a data collection site out of direct sunlight. Make sure the strip can hang freely.

8. Expose the paper for approximately eight hours. Seal it in an airtight container if the results will not be recorded immediately.

9. To observe and record test results, dip the paper in distilled water. Observe the color and determine the Schoenbein Number using the Schoenbein color scale.

10. Determine the relative humidity of the data collection site by using a bulb psychrometer or local weather data.

11. Round the relative humidity reading to the nearest 10 percent. (Higher relative humidity makes the paper more sensitive to ozone, and a higher Schoenbein Number is observed. To correct for this, the relative humidity must be determined and figured into the calculation of the ozone concentration.)

12. Refer to the Relative Humidity Schoenbein Number Chart. Along the bottom of the chart, find the point that corresponds to the Schoenbein Number that you recorded. From that point, draw a line upward until it intersects with the curve that corresponds to your relative humidity reading. To find the ozone concentration in parts per billion, draw a perpendicular line from the Schoenbein Number/relative humidity point of intersection to the left side of the chart (see example below). *NOTE: The color of the paper may not be uniform. Determine the Schoenbein Number by the color in the area with the most noticeable change.*

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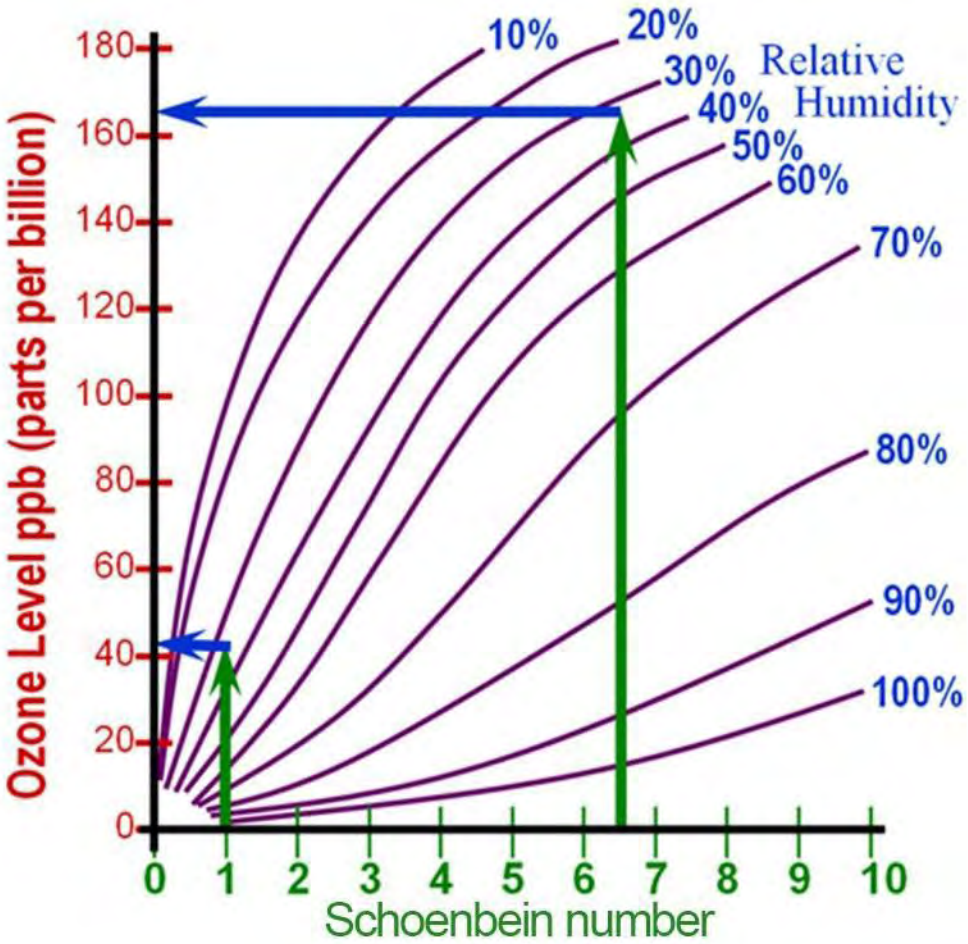
Field Testing for Ozone



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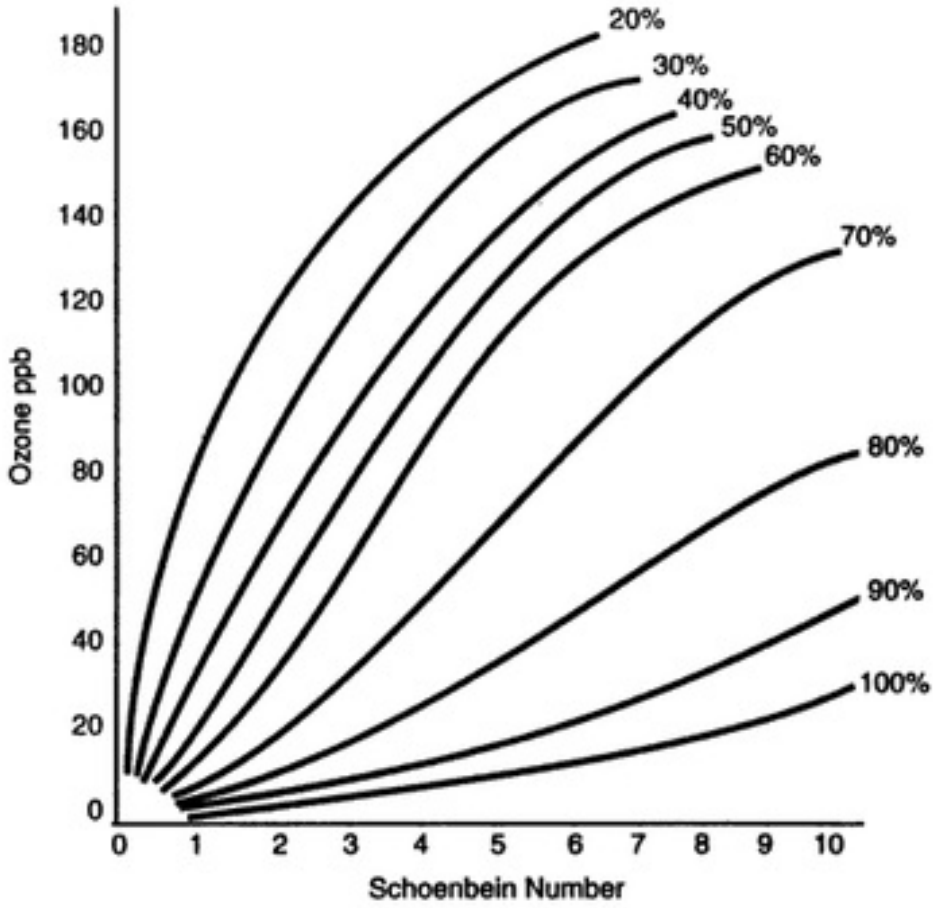
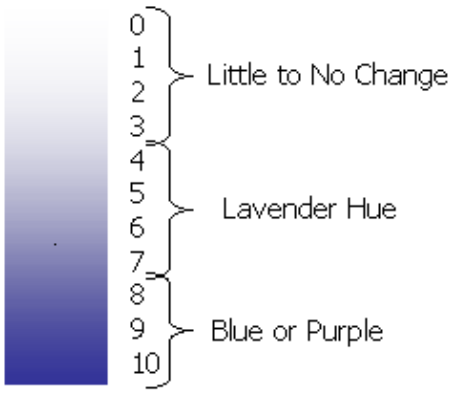
Field Testing for Ozone

Relative Humidity Schoenbein Number Chart





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Field Testing for Ozone

EPA
JUNE 2024

Student Directions

1. What change in the test paper, if any, did you observe?
2. Compare your test paper to those of other students. Do all the test papers appear the same? (Individual test papers will vary depending on the amount of oxidants at that site. Be aware that false positive results can occur from nitrous oxides in heavy traffic areas.)
3. Was the relative humidity for your test day high or low? (Individual results will vary depending on the specific relative humidity of the site.)
4. Why do you think the test papers did not all appear the same?
5. Would the ozone parts per billion (ppb) be the same for a Schoenbein Number of 4 at a relative humidity of 30 percent and 70 percent? (Hint: Refer to the Relative Humidity Schoenbein Number Chart.)
6. Based on the data you collected, do you think this method is a good way to measure tropospheric ozone? Why or why not?
7. Compare data with those from a local monitoring station*. Also, if possible, get information about the wind direction during your study and determine how it affected your measurements.

*https://gispub.epa.gov/airnow/?contours=ozone

What Can Be Done?

Both ozone problems, stratospheric depletion and tropospheric build-up, are created in large part by air pollution. The only practical approach to stopping the destruction of the ozone layer and to minimizing ozone pollution in our ambient air is reducing the human-generated pollutants that contribute to these problems. Ozone-depleting substances include classes of chemicals called chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) that are commonly used in refrigeration equipment, air conditioners, foam products, and fire suppression. Finding and using alternatives to ozone-depleting substances is an essential part of the solution. By 2020, the U.S. phased out the new production and import of most HCFCs and EPA's Significant New Alternatives Policy (SNAP) program has reviewed over 500 alternatives to ozone-depleting substances. As individuals, we can immediately repair any leaks in refrigerators, have our car and home air conditioners checked periodically, use alternatives to home air conditioning, and use alternatives to foam insulation and containers

Decreasing our use of vehicles burning fossil fuels and assuring our vehicle emission control systems are functioning properly is also critical to solving the problem of tropospheric ozone. We can use public transportation for long trips, walk or use bicycles for short trips, carpool to work, and combine several errands into one outing. Some areas have "ozone action days", which encourage citizens and industries to follow procedures to reduce their impact on the formation of harmful ozone. On these days, citizens are encouraged to postpone mowing their lawns and refilling their automobile's gas tanks until the evening hours, avoid using lighter fluid for charcoal, and carpool or use public transportation.

Air Quality Flag PROGRAM

Adapted from the Air and Waste Management Association Environmental Resource Guide for Air Quality
EPA- 456/F 24 006

Additional Resources

- Air Quality Flag Program (free flags for Montana Schools)
- Tribal Air Quality Flag Program
- PurpleAirs in Schools Program (free indoor and outdoor air monitors for all high schools)
- Social Media Posts

Air Quality Flag Program: Quick-Start

Would you like to have a visual way to tell everyone in your organization, school, or community what the air quality will be today? Just fly a flag! The Air Quality Flag Program uses brightly colored flags in the colors of the Air Quality Index to show each day's outdoor air quality forecast.

Step 1: Get the Flags

Purchase the air quality flags online or seek local support to help you get flags. If you don't have a flag pole, use a hanger or choose another way to show everyone the color for the day. **For free flags in Montana, visit https://www.montanahphc.org/air-quality-flags.html**

Step 2: Share with Your Community

Use newsletters, emails, flyers, and social media to announce your program to the community. Tell everyone about the health impacts of air pollution and about the Air Quality Index colors. Everything you need is at www.airnow.gov/flag.

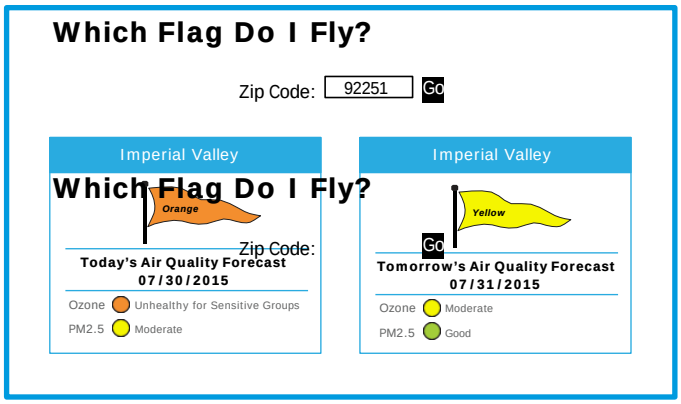
Step 3: Fly the Flag

Find your daily flag color www.airnow.gov/which-flag-do-i-fly/.

Put in your zip code, click GO, and the flag you should fly today will appear on the page.

Tomorrow's flag also appears, so you can prepare for the day ahead.

At www.airnow.gov, you can also find the daily air quality, a smartphone app, a website widget, and a sign-up for emails. All of these will tell you which flag to fly.

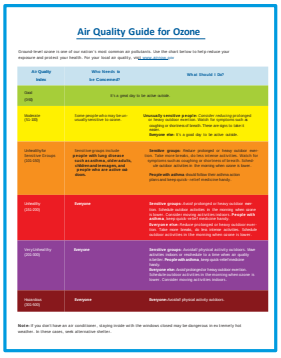


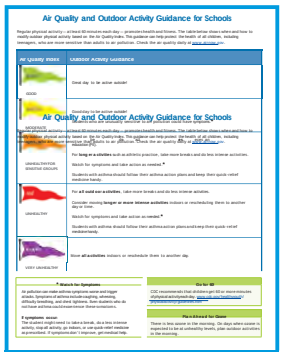
Step 4: Take Action

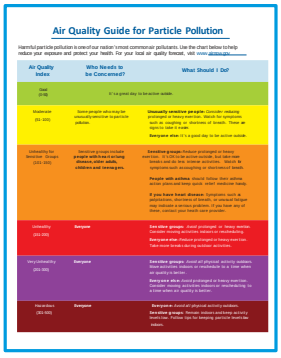
Everyone is affected when the air is unhealthy -- especially older adults, children and teens, people with asthma or heart conditions, and those who work or exercise outdoors.

Know when to do less intense activities, take more breaks, or go indoors.

These Activity Guidelines will help everyone know what to do. There's one about ozone pollution, one about particle pollution, and one for schools at www.airnow.gov/activity-guidance.







Learn More

This information and more can be found on the Air Quality Flag Program website: www.airnow.gov/flag.

Register your program on the website to get important updates and an official certificate.

EPA United States Environmental Protection Agency

EPA-456/F-15-011
September 2015

Outreach & Information Division's

Air Quality Flag Program!

How will air pollution affect my family's health and activity today?

Eskipakyaaki

MENWIKEKI

It's a great day to be active outside.

Othaawi

KWIENI

It's a good day to be active outside. Take it easier if you are unusually sensitive to air pollution.

Nsaanahaateeki

MIYAASIKEKI

Older adults, children and teens, people with certain health conditions, and people who are active outdoors should take it easier.

Meeskwaaki

MIYAASIPEMAATETHIENI

Everyone should take it easier.

Swaaminaateeki

NESI MIYAASIPEMAATETHIENI

Sensitive groups, avoid outdoor exertion. Everyone else, avoid long or intense outdoor exertion.

Go for 150!

The CDC recommends 150 minutes of moderate-intensity activity or 75 minutes of vigorous-intensity activity every week for adults.

Watch for symptoms.

Coughing or shortness of breath are signs to take it easier. Air pollution can also make asthma symptoms worse and trigger attacks.

Take it easier.

Take breaks. Be active for a shorter amount of time. Do less intense activities, like walking instead of running.

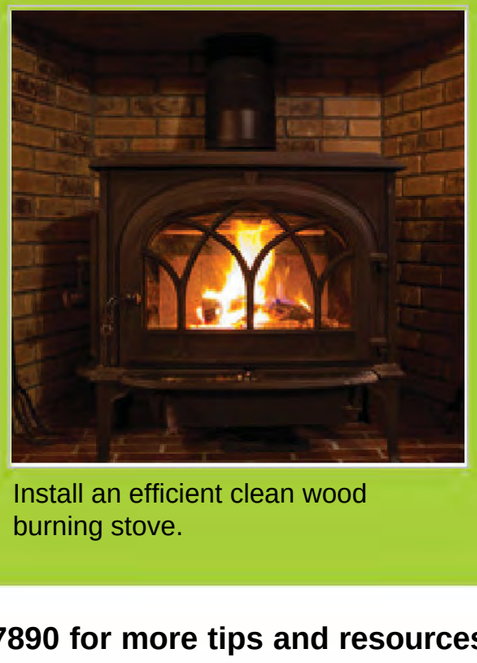
Plan ahead for ozone.

There is less ozone in the morning, so plan your intense outdoor activities early on high ozone days .

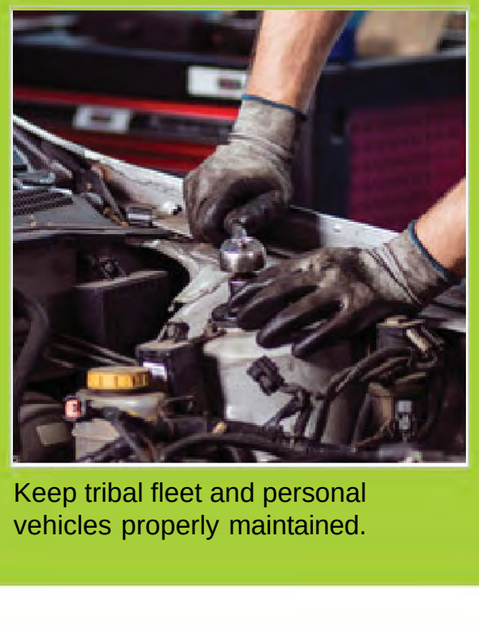
How the Outreach & Information Division Can Improve Air Quality

Take the tribal transportation, carpool, walk, or ride a bike.

Avoid idling at the Tribal Head Start and everywhere.



Install an efficient clean wood burning stove.



Keep tribal fleet and personal vehicles properly maintained.

Contact Partikulat Madder @ 123-456-7890 for more tips and resources

United States Environmental Protection Agency

www.airnow.gov/flag

Air Quality Flag PROGRAM

Graphics bounded by blue dashed lines, and text bounded by red solid lines, can be changed by clicking on them.

Banded Tribes of the Oid Reservation

Air Quality Flag Program!

How will air pollution affect my family's health and activity today?

Substitute in any language for the AQI colors and awareness levels.

Eskipakyaaki

MENWIKEKI

It's a great day to be active outside.

Othaawi

KWIENI

It's a good day to be active outside. Take it easier if you are unusually sensitive to air pollution.

Nsaanahaateeki

MIYAASIKEKI

Older adults, children and teens, people with certain health conditions, and people who are active outdoors should take it easier.

Meeskwaaki

MIYAASIPEMAATETHIENI

Everyone should take it easier.

Swaaminaateeki

NESI MIYAASIPEMAATETHIENI

Sensitive groups, avoid outdoor exertion. Everyone else, avoid long or intense outdoor exertion.

Use health messages that are appropriate for your community.

Go for 150!

The CDC recommends 150 minutes of moderate-intensity activity or 75 minutes of vigorous-intensity activity every week for adults.

Watch for symptoms.

Coughing or shortness of breath are signs to take it easier. Air pollution can also make asthma symptoms worse and trigger attacks.

Take it easier.

Take breaks. Be active for a shorter amount of time. Do less intense activities, like walking instead of running.

Plan ahead for ozone.

There is less ozone in the morning, so plan your intense outdoor activities early on high ozone days .

Use pictures in your community to correlate to action messages.

How the Banded Tribes of the Oid Reservation Can Improve Air Quality

Take the tribal transportation, carpool, walk, or ride a bike.

Avoid idling at the Tribal Head Start and everywhere.

Install an efficient clean wood burning stove.

Keep tribal fleet and personal vehicles properly maintained.

Create/select suitable action messages.

Contact Partikulat Madder @ 123-456-7890 for more tips and resources

You can include name, phone, email in the contact section.

EPA United States Environmental Protection Agency

www.airnow.gov/flag

Air Quality Flag PROGRAM

Additional health and action messages are available at airnow.gov on the "What You Can Do" link or by doing an internet search for clean air tips.

Tribal Air Quality Flag Program Flyer/Poster Template

Use the editable document titled *Tribal_AQFP_Flyer.pdf* to create a flyer and/or poster that you can customize for use in your own community. The example document titled *Tribal_AQFP_Example.pdf* will help you to easily identify the fields and areas that you can edit.

An important note: the text fields are preset font style and size. You can make small changes to the font size by right clicking on the text, then select Text Style, then selecting either superscript or subscript. Also, you may copy and paste text into a field, however, please note that this will also paste in the font, including the style and size. This may be considered an alternative if you need to enlarge/reduce text or want more customization. For those only wanting to create the messages, it will be easier to type (rather than paste) your messages.

This document is still being reviewed and revised, and may be considered draft. Its first release is at the National Tribal Forum on Air Quality, 2018. If you have any suggestions to improve it, please see the contact information at the end of this document to provide them.

Air Quality Flag Program Health and Action Messages

These health and action messages are provided as examples for the Tribal Air Quality Flag Program Template. However, you should use messages that relate to you and your community, keeping in mind the population and demographics, expected air quality issues, routine activities, etc. Ask yourself what messages will have the greatest impact. Remember that you can create as many Air Quality Flag Program posters/flyers as you want and may want to create different ones for different seasons too!

Conducting an internet search will provide you with detailed messages that will help you and your family and community take actions that will protect their health and help to clean the air we breathe. Type in “clean air tips” or “air related health messages”.

From the AirNow website at https://www.airnow.gov/index.cfm?action=resources.whatyoucando:

Air pollution can affect your health and the environment. There are actions every one of us can take to reduce air pollution and keep the air cleaner, and precautionary measures you can take to protect your health.

Transportation Tips

Choose a cleaner commute — car pool, use public transportation, bike or walk when possible.

Combine errands to reduce "cold starts" of your car and avoid extended idling.

Be sure your tires are properly inflated.

Keep car, boat and other engines properly tuned, and avoid engines that smoke.

Follow gasoline refueling instructions for efficient vapor recovery. Be careful not to spill fuel and always tighten your gas cap securely.

Household Tips

Use environmentally safe paints and cleaning products whenever possible.

Some products that you use at your home or office are made with smog-forming chemicals that can evaporate into the air when you use them. Follow manufacturers' recommendations for use and properly seal cleaners, paints, and other chemicals to prevent evaporation into the air.

Conserve electricity. Consider setting your thermostat a little higher in the summer and lower in winter. Participate in local energy conservation programs. Look for the ENERGY STAR label when buying home or office equipment.

Consider using gas logs instead of wood. If you use a wood-burning stove or fireplace insert, make sure it meets EPA design specifications. Burn only dry, seasoned wood.

Lawn and Garden Tips

Mulch or compost leaves and yard waste.

Action Day Tips

Days when ozone is expected to be high:

Conserve electricity and set your air conditioner at a higher temperature.

Choose a cleaner commute—share a ride to work or use public transportation. Bicycle or walk to errands when possible.

Refuel cars and trucks after dusk.

Combine errands and reduce trips.

Limit engine idling.

Use household, workshop, and garden chemicals in ways that keep evaporation to a minimum, or try to delay using them when poor air quality is forecast.

Days when particle pollution is expected to be high:

Reduce or eliminate fireplace and wood stove use.

Avoid using gas-powered lawn and garden equipment.

Avoid burning leaves, trash and other materials.

Excerpted from the Santa Barbara County Air Pollution Control District at https://www.ourair.org/tips-for-clean-air/

What One Person Can Do: Top 10 Tips for Cleaner Air and a Healthier Planet

Keep in mind that your choices in two areas – energy use and transportation – will determine your personal contribution to the problems of air pollution and global climate change. Changing these choices will help address these problems!

Drive less: Walk, bike, or take the bus or train instead of driving solo whenever you can.

When you do drive: combine car trips, carpool, keep your car tuned up, keep your tire pressures up, and don't top off your tank at the gas station. If you are looking to buy a new car, see the benefits of Clean-Air Cars.

Use less electricity through energy-efficient products and habits as well as thinking about installing solar panels or a passive solar water heater.

Use less toxic products, such as for household cleaning, painting, washing clothes, or dealing with pests or weeds.

Shop local to reduce energy use and pollution from transportation of products.

Shop sustainable to consider product lifecycle: production, use, and disposal.

Save your fireplace or wood stove for special occasions. Install and use a gas log if you can.

Reduce, Reuse, and Recycle.

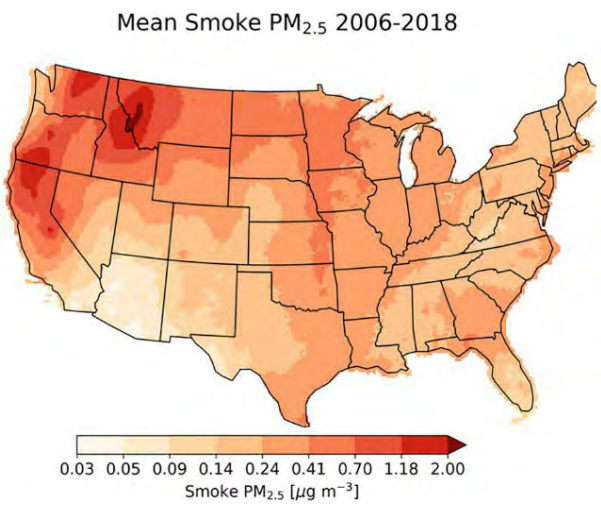
Use a broom instead of a leaf blower and if you use a landscaping service, try to make sure it follows green practices.

For additional help, please contact:

James Payne
United States Environmental Protection Agency
Office of Air Quality Planning and Standards
Outreach and Information Division
Community and Tribal Programs Group
109 TW Alexander Drive, Research Triangle Park, NC 27711
919-541-0961
Payne.JamesJ@epa.gov

PurpleAirs in Schools Project

Free Air Sensors for your school to monitor Montana's air pollutant of concern: Particulate Matter ($PM_{2.5}$)



Plot from O'Dell et al. 2021

Significance of Smoke Impacts in Montana

- Montanans are subjected to some of the highest concentrations of smoke-derived $PM_{2.5}$ in the United States.
- Montana represents a high outlier for percentage of annual mortalities attributed to smoke exposure.
- Wildfires and smoke-attributed $PM_{2.5}$ are expected to increase due to intensifying drought, warming due to climate change and forests heavily over-burdened with wildland fuels.
- Wildfire smoke can have negative health effects on students participating in back-to-school extracurricular activities such as outdoor sport practices and events.

We aim to empower all Montanans, including those living in our most rural and underserved communities, with knowledge and air quality data currently unavailable to them.

School and Student Benefits

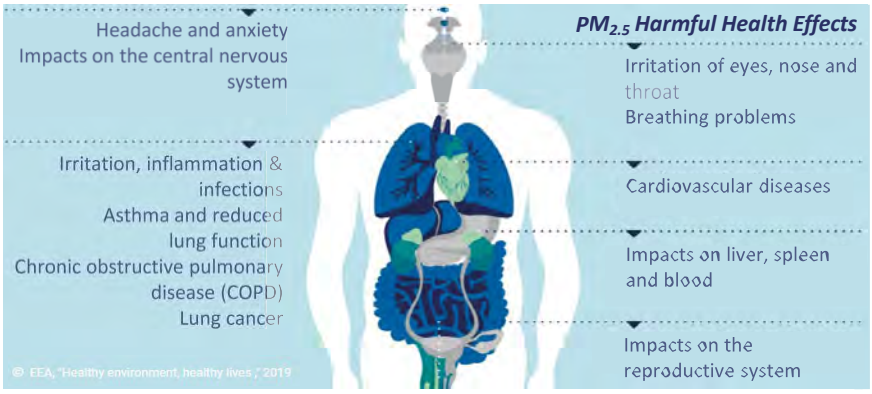
1. Inform decision-making regarding the health and safety of students and athletes during poor air quality events.
   - For example, it can be difficult to decide whether it is safe to practice sports outside especially if the closest air monitor is a few towns away!
2. Improve preparedness for your school and community ahead of poor air quality events especially during fire season.
3. Give teachers, students, and parents real-time and historical data to learn about local air quality issues.
   - Provides opportunities for students to interact with real-world data and investigate the existent threat of smoke.
   - Build student engagement in the fields of science, data and web-based technologies, and environmental health.
4. Ensure future generations have access to local air quality information and awareness of public health risks.

Armed with air quality data and knowledge about the risks of smoke, Montanans can reduce their exposure to, and health effects associated with, smoke and $PM_{2.5}$

Requirements

- Install indoor and outdoor air quality sensors and connect them to the school's wifi.
  - Indoor sensor installed in science teacher's classroom.
  - Outdoor sensor installed anywhere there is power and good wifi connection.
- PurpleAir $PM_{2.5}$ sensors are about the size of a grapefruit and simple to install.
  - The equipment along with guidance and continuous support will be provided.
- PurpleAir sensors are reliable enough to meet the needs of individuals, schools, and organizations for public health decision-making.

*There are **no** reporting requirements attached to this opportunity.



PurpleAirs in Schools Project

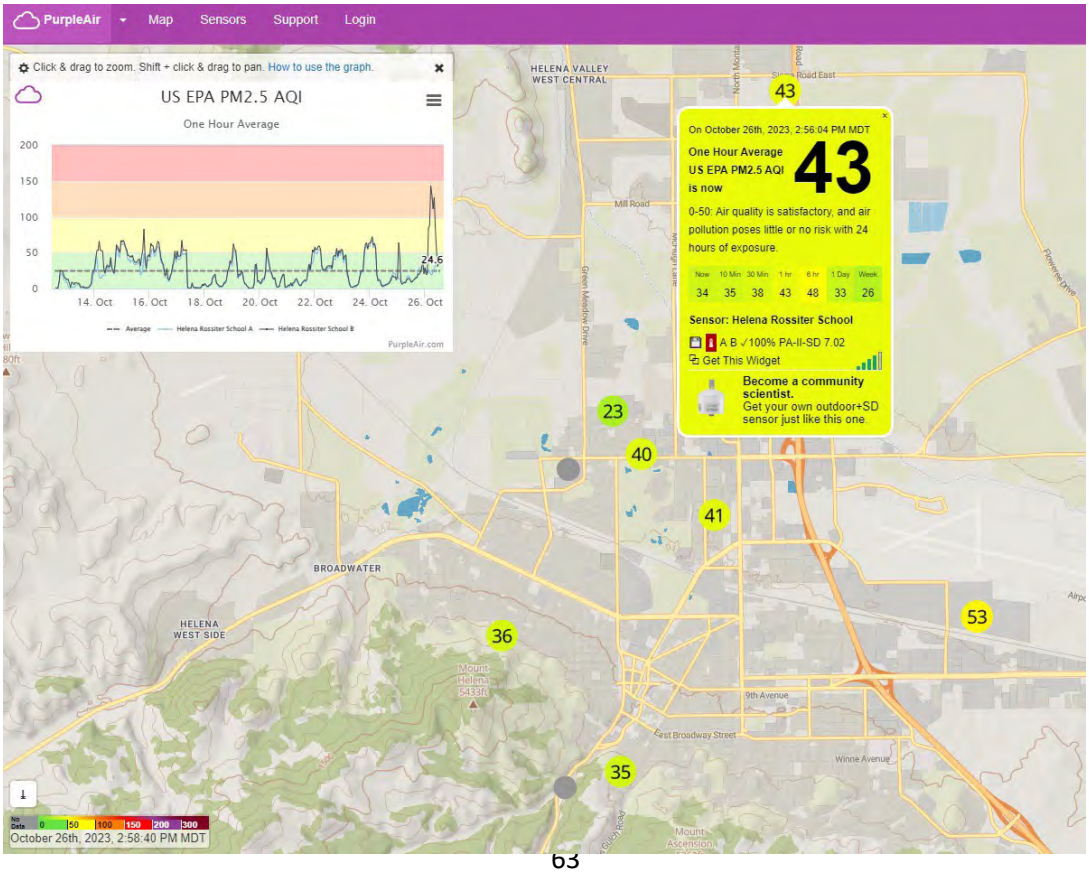
Free Air Sensors for your school to monitor Montana's air pollutant of concern: Particulate Matter ($PM_{2.5}$)

PurpleAir Sensors Report the Air Quality Index

- Air quality index (AQI) is calculated from the measured $PM_{2.5}$ concentration which is correlated to an AQI value.
- AQI value is on a scale of 0 to 500.
  - Lower the AQI value, the better the air quality.
- AQI index values reflect levels of health concern associated with exposure to $PM_{2.5}$.
- Ranges of health concern are communicated via color scale.

AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

The online PurpleAir Air Quality Map displays your sensors in addition to other sensors that have been installed in your community. The sensors provide the real-time AQI Level of Health Concern as well as a plot of the Health Concern trends.



DEQ MONTANA

UNIVERSITY OF MONTANA CENTER FOR POPULATION HEALTH RESEARCH

MONTANA HIGH SCHOOL MHSA ASSOCIATION

To get your **free air sensors** or more information contact Keri Nauman at MT DEQ (406-444-6698 & keri.nauman@mt.gov) or Dave Jones at UM (406-243-4861 & david.jones@mso.umt.edu).

Social Media Posts for Schools

Breathing wildfire smoke, even for short periods of time, can affect anyone and result in coughing, itchy eyes, runny nose, headache, and shortness of breath. AirNow.gov provides information about local air quality and contains a fire and smoke map to help you stay informed and healthy this wildfire season.

Wildfire smoke can irritate the eyes and breathing airways, causing cough, a scratchy throat, runny nose and trouble breathing. Drinking lots of water helps reduce inflammation and protects you from the effects of wildfire smoke

Wildfire smoke is particularly harmful for children with active bodies and developing lungs. If the air quality is unhealthy, limit their time outdoors.