

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

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.



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, NO_x, SO_x

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, NO_x, SO_x

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, NO_x, SO_x

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.