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2010 San Joaquin Valley Air Pollution Control District Governing Board

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TEACHER’S MANUAL

Procedures for Grades K-2 and 3-5

Blue Sky, Brown Sky… It’s Up to You!

An Elementary School Curriculum Provided by

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™
www.healthyairliving.org
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Welcome to *Blue Sky, Brown Sky...It’s Up to You!* This curriculum is designed to introduce students to the causes and effects of air pollution in the San Joaquin Valley and to teach them behaviors that promote cleaner air.

Many of the habits that help protect our environment are easiest to establish in childhood. Through age-appropriate investigations and activities, students will understand the importance of clean air and learn that each person’s individual efforts can make a difference.

**ORGANIZATION**
The curriculum procedures in this Teacher’s Manual are divided into two sections:
- Procedures for Grades K-2
- Procedures for Grades 3-5

Each section contains three Lessons and a Follow-Up with Investigations and Activities that address the following objectives.

**STUDENT OBJECTIVES**

**Grades K-2: The Air We Breathe**

Students will be able to identify that:
- Air is invisible but all around us.
- All living things need air to survive.
- Air pollution comes from many sources.
- Air pollution harms living things.
- We can all help keep our air clean.

**Grades 3-5: Pollution Problems and Solutions**

Students will be able to identify:
- Sources of air pollution
- Effects of air pollution on both living and non-living things
- Solutions to air pollution problems

**MATERIALS**
Along with this Teacher’s Manual, the curriculum includes:
- Student Booklets for Grades K-2
- Student Booklets for Grades 3-5
- Home Leaflets
- Tracking the AQI Poster for Grades 3-5

Materials needed to conduct each Investigation are listed at the beginning of the procedures for that Investigation. Most all the required materials are common items; however, some Investigations do require a number of materials, so be sure to check the list before conducting that Investigation.

**TEACHING STRATEGIES**
Each Lesson begins with a Summary and Brief Background of the topics covered in that Lesson. For more detailed background, refer to the following section on *Pollution Problems in the Valley*.

Each Lesson contains two or three Investigations that involve students in demonstrations, experiments, explorations, surveys, and/or reading and writing activities. Most all make use of Activities within the Student Booklets, as noted by a ★ in the Materials list. The Investigations are organized sequentially; however, not all Investigations must be completed. Choose those Investigations that are appropriate for your students, timeframe, and curriculum plan.

To extend students’ learning and to reinforce the Healthy Air Living message, Follow-Up activities are provided for each section (K-2 and 3-5), including extra Activity pages in the Student Booklet.

To help Spanish-speaking students who are English-language learners, a few of the student Activities, along with teacher procedures, have been translated. The translated Activities are noted in the lessons and appear at the end of each curriculum section in this manual.

Though the Investigations have been developed to be appropriate for the indicated grade levels (K-2 or 3-5), several can be easily adapted to accommodate students at varying grade levels.

**GLOSSARY AND RESOURCES**
A glossary of all the air quality terms is provided at the back of this manual. You might use the words to conduct spelling or vocabulary bees as appropriate for your grade level.

Also provided are websites and phone numbers for various organizations that serve as resources for air quality information.

**CORRELATIONS WITH CONTENT STANDARDS**
Many of the Investigations and Activities can be used to support some of the California Content Standards. The introduction to each Investigation lists the standards addressed by that Investigation. A complete chart at the back of this manual shows correlations with standards in Science, Math, Language Arts, and History for kindergarten through grade 5.
We breathe in and out thousands of times every day, usually without thinking about it. We depend on the air in our atmosphere, and it seems like there is an endless supply for us to breathe. In reality, our breathing space stretches only 10 miles above the Earth, in the troposphere. The layer of air we breathe is no deeper proportionally than the skin of an apple is to the total apple itself. This thin layer of air sustains all life on Earth. Yet, we routinely dump hundreds of tons of pollution into our air each day.

What is air pollution?
Air is polluted when it contains a large enough amount of unhealthy particles and gases to harm people, animals, and plants and to deteriorate objects such as statues, buildings, bridges, and other structures. In all urban areas across the United States, five major air pollutants are measured: carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, and particulate matter. For each pollutant, the United States Environmental Protection Agency (EPA) has established standards. When the amount of the pollutant in the air during a specified time is over that standard level, the air is declared unhealthful.

What causes air pollution?
Some pollutants enter our air naturally from forest fires, volcanoes, and decomposition. But most pollutants are created by the activities of people. Familiar sources of unhealthy particles and gases are:

- exhaust from gasoline-powered vehicles and equipment
- emissions from factories and industrial processes
- smoke and ash from burning wood in fireplaces and stoves
- vapors from products such as lighter fluid, paint, solvents, gasoline, and aerosol sprays

Why does the San Joaquin Valley have an air pollution problem?
Because of our location, weather conditions, and increasing population, the Valley has a serious air pollution problem that is affecting both our health and our economy.

Topography
The Valley is shaped like a big pot, with the Valley floor being the bottom of the pot and the surrounding mountains forming the sides. This configuration promotes the creation of temperature inversions, which work like the lid to the pot. Hot air rises and traps the air pollutants near the Valley floor where we live and breathe.

Climate
The Valley’s hot summer temperatures promote the formation of ground-level ozone, the main ingredient in smog. Ozone is created when other pollutants in the air react and combine in a photochemical process that takes place in the bright, hot sun.

During the fall and winter months, particulate matter is the primary concern because strong inversion layers prevent the particles, including increased emissions from burning wood, from dispersing.

Growing Population
The number of people living in the Valley increases year after year. And more people means more polluting activities, such as driving cars, mowing lawns, burning fires, and using products with polluting chemicals.
What are the major pollutants affecting the Valley?
In the Valley, the pollutants that significantly affect the air that we breathe are:

- ozone (created from nitrogen oxides and volatile organic compounds)
- particulate matter

Presently, our air quality does not meet federal nor state health standards for ozone or for particulate matter that is 2.5 micrometers or smaller (PM2.5).

Ozone (O₃)
An invisible gas, ozone appears in two places in our atmosphere. Ozone occurs naturally in the stratosphere at 45,000 feet above the surface of the Earth. This ozone layer protects and shields the Earth from harmful ultraviolet rays. But ozone in the troposphere—that is, ground-level ozone—is harmful to living beings and non-living materials. It is the same gas, but it is good for us up high and bad for us down low where we can breathe it.

Unlike other pollutants, ozone is not directly emitted by any one source. It is created when two pollutants “cook” in the hot sun. Ozone is formed from:

- nitrogen oxides (NOx), which come from emissions from vehicles and other equipment or sources that burn fossil fuels
- volatile organic compounds (VOCs), which evaporate into the air from paints, charcoal lighter fluid, gasoline, aerosol sprays, and other products, as well as from dairies

In the hot sun, these two pollutants react and combine to form ozone, which can reach dangerously high levels during the summer months.

Particulate Matter (PM2.5, PM10)
Particulate matter is made up of a mixture of solid particles and liquid droplets found in the air. Very fine particles 2.5 micrometers or smaller (called PM2.5) are so tiny that several thousand of them could fit on the period at the end of this sentence. Particles 10 micrometers or smaller—about one-seventh the width of a strand of human hair—are called PM10.

Some sources of particulate matter include:

- soot and smoke from chimneys
- ash and gases from burning wood
- dust from construction and mining sites
- dirt from roads
- rubber from tires
- exhaust from vehicles
- emissions from factories

Particulate matter is particularly a problem during cold fall and winter months. Wood smoke from fireplaces and wood stoves contains tiny airborne particles of ash combined with carbon monoxide gas, formaldehyde, and nitrogen oxides, creating a toxic mix. Stagnant weather conditions often trap these particles close to the Valley floor where we continually breathe them. And since the Valley often experiences fog in the winter, the toxic particles in wood smoke can hover in the air, posing a health risk to people and animals long after the fires go out.

Wood smoke is a problem indoors as well as outdoors, even in buildings that don’t burn wood. Because the particles are so tiny, they can easily seep past closed doors and windows.
What are the effects of air pollution?

Air pollution can literally make us sick. It aggravates chronic respiratory diseases, such as asthma and bronchitis, and lowers our resistance to infection.

When ozone levels are high, we might experience:
- chest pain or tightness
- shortness of breath
- coughing and wheezing
- dry throat
- headache
- dizziness
- nausea
- watery and burning eyes

Particulate matter poses a health threat especially to the respiratory tract. Because the particles are so small, they bypass the body’s natural filtering system—mucous membranes in the nose, mouth, and throat—and are able to penetrate to the deepest part of the lungs. Studies have linked fine particle matter to numerous respiratory problems, including asthma, bronchitis, emphysema, pneumonia. Besides reducing lung function, particulate matter can also cause:
- eye irritation
- headaches
- throat irritation
- aggravated sinuses
- allergies

Although air pollution can cause health problems for everyone, especially at risk are children, elderly people, and people in fragile health, especially those with heart and lung diseases. Air pollution is particularly harmful to children because children:
- are exposed to more air pollution per pound than adults
- take more breaths per minute
- have less mature immune systems
- have more skin area for their body size through which toxins can be absorbed
- spend more time playing outdoors, therefore are exposed to pollutants longer and more frequently
- are still developing so their lungs are susceptible to long-term damage

Air pollution also deteriorates the health of our pets and other animals, as well as plants and trees. And it affects non-living parts of our environment too. Particulate matter literally makes our air dirty, reducing visibility and discoloring buildings, statues, and other structures. And ozone can:
- fade and peel paint
- corrode plaster
- damage fabrics
- crack rubber
- rust iron or steel

How is air pollution monitored?

In the San Joaquin Valley, air pollution control was initiated in 1970 with the formation of air pollution control districts in Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties. In 1992, all eight county agencies, except the southeast portion of Kern County, were consolidated to form the San Joaquin Valley Air Pollution Control District, which is divided into three regions:

- **Northern Region** - San Joaquin, Stanislaus, Merced
- **Central Region** - Madera, Fresno, Kings
- **Southern Region** - Tulare, Kern (the Valley air basin portions only)

Geographically, the Valley Air District is the largest air pollution control district in the nation, stretching 270 miles from north to south with three regional offices located in Modesto, Fresno, and Bakersfield.
The Valley Air District monitors the air daily and reports the results using the Air Quality Index, a scale established by the United States Environmental Protection Agency (EPA) to convey pollution levels to the public. As you can see on the scale, any measurement over 100 means the air is considered unhealthful.

Because the Valley Air District is so large, the AQI is reported by county. Daily air quality information can be found in the major daily newspapers, on local television channels, by calling 1-800 SMOG INFO (1-800-766-4463), or by checking the Valley Air District’s website at www.valleyair.org or www.healthyairliving.org.

When air pollution levels pose a risk to public health, cautions are issued. These health notices usually occur on hot days during peak ozone periods in the mid to late afternoon or on cold days in the winter when people are burning more wood. During these episodes, residents are advised to curtail strenuous exercise and activities. School officials are notified so that student activities can be modified accordingly.

To indicate the air quality each day at your school, you can participate in the Air Quality Flag Program. Your school will be provided with four air quality flags (green, yellow, orange, and red) and will receive daily notification of the air quality forecast by e-mail. When students see the color of the flag flying, they will know if it is a good day to be active outdoors or if they should limit outdoor exertion. Through posters, brochures, and educational workshops, students, parents, teachers, and administrators will also become aware of what they can do to help reduce air pollution and live a Healthy Air life. Contact the District at 559-230-6000 or public.education@valleyair.org for more information.
What’s being done about air pollution?
Since its formation, the Valley Air District has been responsible for developing and implementing air pollution control programs in the San Joaquin Valley region. This includes developing plans, adopting and enforcing rules, issuing permits to reduce air pollution, and conducting public education and information campaigns.

One program, introduced in 2008 throughout the San Joaquin Valley, is called Healthy Air Living. This year-round program seeks to improve the health and quality of life of all Valley residents through individual and collective actions that clean up our air. The goal is to give people—in homes, at businesses, and in schools—the tools to make clean-air choices and commit to Healthy Air Living.

In the summer when ozone levels are high, Valley residents are asked to cut back on pollution-causing activities such as charcoal barbecuing, gardening with gasoline-powered equipment, driving to work alone, excessive use of motor vehicles, painting, and motor boating.

From November through February, residents are asked to Check Before You Burn. On the www.valleyair.org website or by calling 1-800-766-4463, residents can find out if they can use their wood-burning fireplace or wood stove in their county. There are just two wood-burning forecasts:

- **Prohibits Wood Burning**
  The rule prohibits burning any solid fuel—including wood, manufactured firelogs, and pellets. Violations can result in fines.

- **Urges Clean Wood Burning**
  Residents are urged to burn as cleanly as possible if they must burn. For example:
  - use manufactured firelogs or pellets;
  - use only clean, dry, seasoned wood;
  - use denser woods, such as oak;
  - make sure that the fire has plenty of air;
  - keep wood-burning devices well-maintained and clean;
  - when possible, upgrade to an efficient gas insert or an EPA-Phase II wood or pellet stove.

Although mandatory curtailments affect most residents and businesses, they do not apply to:
- devices that use natural gas or propane exclusively
- homes that do not have connections to natural gas service
- homes in which burning wood is the sole source of heat
- cooking devices
What can we do about air pollution?
A significant amount of the air pollution in the San Joaquin Valley is created by residents. It comes from the choices we make every day—about how we get around our communities, how we take care of our yards, how we heat our homes, and what products we use.

Cars and other vehicles produce the majority of the Valley’s air pollution. To reduce that amount, we need to reduce the amount we drive—by carpooling, walking, taking public transportation, and combining errands when we do drive. Keeping our cars in good running condition—tuned up with properly inflated tires—can also help reduce air pollution.

Gasoline powers not only cars but also yard equipment. But for every yard-care tool that burns gasoline, an electric or manual option is available that usually works just as well and certainly pollutes much less—or not at all. You can recycle that gas-powered lawnmower and use a push mower or electric mower. And instead of that leaf blower, people-powered rakes and brooms work just as well and produce much less dust.

When possible, we should avoid burning wood, keeping those fires for special occasions. When we do burn wood, we should do so cleanly, following the suggestions under the Check Before You Burn program. And by keeping heater thermostats low, we can also reduce air pollution from power plants.

We need to be aware of the products that we use. We should try to limit those that release VOCs into the air, such as lighter fluids, cleaners, solvents, polishes, drain openers, oil-based paints, aerosol sprays, insecticides, and other products labeled “Hazardous” or “Toxic” or “Danger.”

We can all make one change for cleaner air. If we all alter our daily habits throughout the year, we can help prevent air pollution, keep our sky blue, and live a Healthy Air life.
Lesson 1: What’s Air and Why Do We Need It?
Summary and Brief Background
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Investigation 2 – Take a Nature Walk
★ Activity 1: Who Needs Air?
Investigation 3 – Demonstrate that Plants Need Air

Lesson 2: What Pollutes the Air?
Summary and Brief Background
Investigation 4 – Determine Where Air Pollution Comes From
★ Activity 2: Pollution in the Valley
Investigation 5 – Identify Pollutants That We Can and Can’t See
★ Activity 3: What Pollutes the Air?

Lesson 3: How Can We Keep Our Air Clean?
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Actividades En Español (Spanish-Language Activities)
Resumen y Procedimiento (Summary and Procedures)
★ Actividad: La Contaminación en el Valle
(Activity: Pollution in the Valley)
★ Actividad: Sopa de Letras (Activity: Word Scramble)
Lesson 1: What’s Air and Why Do We Need It?

SUMMARY AND BRIEF BACKGROUND

The air we breathe, a mixture of colorless and odorless gases—primarily nitrogen (78%) and oxygen (21%)—stretches only about 10 miles above the Earth. But this thin layer of air sustains all life on Earth.

Air, by volume

- Oxygen (21%)
- Nitrogen (78%)

In the first Investigation, students discover that although they can’t always see it, air is all around us, in the atmosphere, filling up space.

On a nature walk in Investigation 2, students learn that of all things needed to live, air is the most important. We can live without food for about five weeks and without water for about five days; however, without air, a person can live only about five minutes.

In an experiment with plants in Investigation 3, students experience first-hand the importance of air to the survival of living things.
Procedures:

A. Display the empty plastic liter bottle and ask students what is in the bottle.
(Answers may vary, but a common response is “nothing is in the bottle.”)

B. Tell students that you are going to show them what is in the bottle. Conduct the demonstration as follows:
• Place the balloon over the mouth of the bottle.
• Have students squeeze the bottle to inflate the balloon.

C. Ask children the following questions to guide them in making certain observations about the air around them:

1. What caused the balloon to get bigger?
(Air from the bottle was forced into the balloon, causing it to inflate.)

2. What is air?
(Air is made up of odorless and colorless gases.)

3. Can you see air?
(No. Pure air is invisible. You cannot see it or smell it.)

4. Where is air?
(Air is all around us, filling up all the space around us.)

5. How do you know that air is there around us?
(Sometimes we can feel the air when it moves. It creates breezes and winds.)
Investigation 2 – TAKE A NATURE WALK

Procedures:

A. Take students on a nature walk, either in a nearby park or just around the schoolyard. Ask students to point out some things that are natural parts of the environment—sun, soil, water, air, plants, rocks, animals, people.

B. Help children learn the importance of elements in the environment by asking:

1. Why do we need the sun?
   *(The sun gives us light and warmth. Without it, we would always be in the dark, and it would be too cold to live. The sun is also needed by plants. Without sunlight, plants could not grow.)*

2. Why do we need water to live?
   *(We need water to drink so that our bodies can function.)*

3. What other things need water to live?
   *(Animals need water to live. Plants—such as grass, trees, and flowers—also need water to live.)*

4. Why is soil important?
   *(We use soil to grow plants for food.)*

5. Why do we need plants?
   *(Plants provide food for animals and for people. We make cloth from some plants, such as cotton. Plants also help clean our air.)*

6. Why are animals important?
   *(Some animals provide food—such as milk from cows, eggs from chickens, and meat from chickens, turkeys, pigs, cows, lambs, and fish. Some animals are important to the health of an ecosystem—such as worms that break down elements in the soil. Other animals—dogs and cats—provide companionship, and some—horses and mules—help us with our work.)*

7. Why is air important?
   *(We need air to breathe to stay alive. Plants and animals also need air to live.)*

Objective:
To show that living things need air to survive

Materials:
- Pencil or crayons for each student
- Pad of paper for each student or student group
- Student Booklets – Activity 1: Who Needs Air?

Time:
- 15 minutes

Standards:
- Kindergarten
  Science: 1e, 3c
  Math: A1.1; S1.1
  English: LS1.1, 1.2
- Grade 1
  Science: 2b, 2c, 3c, 4a, 4b
  Math: S1.1
  English: LC1.1
- Grade 2
  Science: 3e
C. Ask students to hold their breath for as long as they can. Point out that their bodies force them to breathe because they need air to survive.

D. Ask students to jump up and down for about 30 seconds. Have them describe what has happened to their breathing. Point out that when they exercise they breathe faster so that their bodies can get more air.

E. Divide the class into two groups. Tell one group to look for and record (either by writing or drawing) examples of living things that need air. Tell the other group to look for examples of non-living things.

F. Ask students to share what they have recorded. For example:

- Living things that need air: grass, trees, plants, ants, cats, dogs, people.
- Non-living things that do not need air: rocks, sidewalks, signs, buildings, balls, swings, benches.

G. Remind students that even though the non-living things do not need air to live, many are made from things that do need air to live—such as wooden benches made from trees or clothes made from wool from sheep.

H. Give each student a copy of the student booklet, *Blue Sky, Brown Sky...It's Up to You!* Have students open their books to page 2 and complete Activity 1: *Who Needs Air?*

I. Review the correct answers with students, emphasizing that all living things need air to survive.

---

**Activity 1: Who Needs Air?**

Directions: Circle the pictures of those things that need air to live.

1.  
2.  
3.  
4.  
5.  
6.  
7.  
8.  
9.  
10.  
11.  
12.
Investigation 3 – DEMONSTRATE THAT PLANTS NEED AIR

Procedures:

A. Label each of several small potted plants with a number. On poster board or butcher paper, set up a chart as follows:

<table>
<thead>
<tr>
<th>Plant #</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>4</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Ask students to describe how the plants look (e.g., color, texture) and record on the chart. (Note: You may want to have students draw pictures of the plants as well.)

C. Divide the plants into two groups. Cover each plant in group 1 with a plastic bag, securing the bag around the pot with a rubber band. Place all the plants in the same location. Ask students:

1. What happens when the plants are covered by the plastic bags? (The plants cannot get any air.)

2. What do you think will happen to the plants that are covered?

D. Each day for the next week, have students observe the plants. Compare the covered plants to the ones that are not covered. Discuss what is happening to the plants and record students’ observations on the chart (e.g., limp stems, wilting leaves, brown edges).

E. At the end of the week, have students compare the plants in groups 1 and 2. Point out that all the plants had the same amount of water and sunlight. Emphasize that the plants in group 1 are deteriorating or dying because of the lack of air the plants received.

Objective:
To show that plants need air to survive

Materials:
- A few small, healthy potted plants, freshly watered
- Clear plastic bags that fit over the plants
- Rubber bands
- Poster board or butcher paper
- Marking pens

Time:
- 15 minutes to set up demonstration
- 1 week for observation

Standards:
- Kindergarten
  Science: 2a, 4a, 4e
  Math: S1.1
  English: LS1.1, 1.2, 2.1
- Grade 1
  Science: 2b, 4a, 4b
  Math: S1.2
  English: W1.2; LS1.5, 2.4
- Grade 2
  Science: 2e, 4a, 4g
Lesson 2: What Pollutes the Air?

SUMMARY AND BRIEF BACKGROUND

The air we breathe, the air we depend on every day, is polluted on too many days. That means that the air contains a large enough amount of unhealthy particles and gases to harm people, animals, and plants, as well as damage non-living objects like buildings and fabrics. Currently, in the San Joaquin Valley, our air quality does not meet federal nor state health standards for ground-level ozone and particulate matter that is 2.5 microns or less (PM2.5).

In a read-along story in Investigation 4, students learn that air pollution comes from many familiar sources, especially:

- exhaust from gasoline-powered vehicles and equipment, and
- emissions from chimneys and smokestacks on houses and factories.

And they learn that air pollution, which is making people sick, cannot just be blown away because the shape of the Valley traps the pollutants inside.

In Investigation 5, students realize that although they can see some pollutants—spewing from smokestacks and tailpipes, drifting up from campfires and barbecues—other pollutants are invisible, and these pollutants are contained in household products that get used every day.
Procedures:

A. Ask students if the air around them ever looks or smells dirty. Have them describe what they see or smell in dirty air (e.g., smoke from burning wood, exhaust from cars, garbage from trash cans).

B. Have students open their booklets to page 3, Activity 2: Pollution in the Valley. Depending on the level of your class, either read the story aloud, having students follow along and identify the picture words, or have students read the story aloud.

Activity 2: Pollution in the Valley

Sparkle the Sun and Windy the Breeze loved the San Joaquin Valley. Sparkle’s warm sun rays and Windy’s cool breezes helped grow the grapes, oranges, almonds, and cotton so important in the Valley.

But some days, and could barely see the Valley floor where the crops grew because the air was so brown and dirty. And the people who usually smiled at them would cough and sneeze and rub their watery eyes and sometimes have trouble breathing.

“What’s making the air so dirty?” asked.

“Look down in the Valley,” answered.

When they looked down, they saw smoke and gases coming out of the tailpipes of many many cars and trucks, coming out of smokestacks and chimneys on houses and factories, coming from lawn mowers and leaf blowers powered by gasoline, and coming from barbeques and wood stoves.

“The air is being polluted,” said.

“The smoke and gases are making smog.”

“And smog hurts the people, the plants, and the animals in the Valley,” said.

“So let’s get rid of it.”

puffed up and blew and blew, but the smog didn’t go away. The Valley is shaped like a big pot with mountains all around the sides. The pollution was trapped in the Valley by the mountains.

“I’ll just burn it away,” said. But as he shined brighter and brighter and got hotter and hotter, the smog got worse!

“Well,” said , “we can’t blow the dirty air away or burn it away.”

“So,” replied , “we’ve just got to keep the air from getting dirty in the first place so that people can LIVE A HEALTHY AIR LIFE.”

Objective:
To identify sources of air pollution

Materials:
- Student Booklets – Activity 2: Pollution in the Valley
- Paper
- Crayons

Time:
- 30 minutes

Standards:
- Kindergarten
  Science: 3a, 3b
  English: R1.2, 1.3, 1.15, 2.5; LS1.2
- Grade 1
  Science: 3c, 4a
  English: R1.1, 1.11, 1.13, 1.16, 2.2, 2.6, 2.7; LS1.1, 1.5, 2.4
- Grade 2
  English: R1.1, 1.2, 1.6, 2.3, 2.5, 2.6; LS1.3

Note:
Activity 2 is in Spanish on page 34.
C. To discuss the story, ask the following questions:

1. **What made the air dirty?**
   (Smoke and gases were coming out of the tailpipes of cars and trucks, out of smokestacks and chimneys on houses and factories, from gasoline-powered lawn mowers and leaf-blowers, and from barbeques and wood stoves.)

2. **Why is air pollution bad?**
   (Air pollution harms people, making them cough and sneeze, making their eyes water, and sometimes making it hard for them to breathe. Air pollution also harms plants and animals.)

3. **What is another name for air pollution?**
   (Smog is another name for air pollution.)

4. **Why couldn’t Windy blow the smog away?**
   (The San Joaquin Valley is shaped like a big pot. All around the sides of the Valley are mountains. When Windy blew, the smog was just blown up against the mountains. It was trapped inside the Valley.)

5. **What happened when Sparkle tried to burn the smog away?**
   (As Sparkle got brighter and hotter, the smog just got worse.)

6. **What can we do about air pollution?**
   (Since we can’t blow it away or burn it away, we have to try not to create the air pollution in the first place.)

D. Have each student draw a picture based on the story.
**Procedures for Grades K-2**

Lesson 2: What Pollutes the Air?

**Objective:**
To demonstrate that some air pollutants are visible and that some are invisible

**Materials:**
- Film projector, overhead projector, flashlight, or other strong light source
- Two chalk erasers with built-up chalk residue
- Several slides or white index cards
- Petroleum jelly
- Items with strong odors (e.g., onion, garlic, perfume, coffee beans, hard-boiled egg, vinegar, orange)
- Pictures of items and/or actual items that create invisible air pollution (e.g., glue, oil-based paint, nail polish, charcoal lighter fluid, window cleaner, aerosol spray)

★ Student Booklets – Activity 3: What Pollutes the Air?

**Time:**
- 30 minutes on day one
- 15 minutes two days later

**Standards:**
- Kindergarten
  - Math: S1.1; MR1.2
  - English: LS1.1, 1.2, 2.1
- Grade 1
  - Math: S1.1, 1.2, MR1.2, 3.0
  - English: LS1.5, 2.4
  - History: 1.2.4
- Grade 2
  - Math: MR1.2, 3.0

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**Procedures:**

**Part I: Pollution You Can See**

A. Have students look around the room for dust that has settled. When students have identified areas of dust, ask:

1. **Where do you think the dust came from?**
   (Answers will vary. Students may suggest the playground, the chalkboard, the street, nearby fields.)

2. **What happens when you blow on the dust?**
   (Some of the dust goes into the air.)

3. **What happens if you breathe the air that contains the dust?**
   (The dust can get into our eyes, our noses, and perhaps into our lungs.)

B. Tell students that they are going to see how some dust is created and how long it takes to settle. Follow the procedures below.

**CAUTION:** Move any students with respiratory sensitivity away from this demonstration.

1. Darken the room and create a bright beam of light with a film projector, overhead projector, or flashlight.

2. Have students examine the air in the beam for floating dust particles. Ask them to describe what they see.
3. Within the beam of light, clap together two chalk erasers. Ask students to describe what they see. Tell students that the air is often full of particles like the chalk dust we see in the beam of light. Explain that the hairs in our noses and the mucus membranes in our noses and mouths catch many of these particles—especially the big ones—before they get into our lungs, but that tiny particles can get past our nose and mouth filters.

4. Clap the erasers together again, time how long it takes the particulates to settle, and have the students count the number of breaths they take within that time frame.

C. Have students collect particulate matter outside. Number several slides or white index cards, and then coat them with petroleum jelly and hang or place them in various locations outside. Create a chart identifying where each was placed. After two days, collect the slides or cards and examine them. Have students describe and record what they see. Which ones collected the most particulate matter? Why? Do the particles differ from one specimen to the other? Why?

Part II: Pollution You Can’t See

A. Choose two or three students to be scientists. Tell the other students that they are pollution monitors.

B. Tell the pollution monitors to close their eyes tightly and to keep them closed. Take the scientists to one end of the room and give each a strong smelling item (e.g., onion, perfume; see Materials list).

C. Have the scientists—one at a time—walk among the pollution monitors. Instruct the monitors to raise their hands as soon as they are aware of a scent or odor. Ask the monitors to try to identify what they smell without opening their eyes. Repeat the process with additional items.

D. Explain that the smells are created when particles—solid, liquid, or gas—from the item enter the air.

E. Tell students that sometimes what goes into the air can be harmful—that is, pollute the air. Show students the items or pictures of items that can release harmful chemicals into our air (e.g., glue, nail polish; see Materials list). Discuss how some of the items smell, pointing out that good smells and bad smells do not always indicate whether an item is a pollutant or not.

F. Have students open their booklets to page 4 and complete Activity 3: What Pollutes the Air? Review correct answers with the class.
Summary and Brief Background

Since a significant amount of the air pollution in the San Joaquin Valley is created by residents, we can all do our part to help reduce air pollution so that we can all live a Healthy Air life.

In Investigation 6 through a read-along story, students are exposed to various “good ideas” about what people in the Valley can do to keep pollutants from getting into the air. Though students are not old enough to make decisions about many of these behaviors, they can encourage their parents to:

• drive their cars less
• use “people-powered” lawn equipment instead of gasoline-powered lawn mowers and leaf blowers
• burn wood less often
• buy fewer products that release air pollutants, such as charcoal lighter fluid and aerosol sprays.

On a pollution patrol in Investigation 7, students look for sources of air pollution and discuss what alternatives exist. Then students draw a picture of something everyone can do to live a Healthy Air life and keep the Valley’s sky blue.
Procedures:

A. Ask students how they think we could keep our air cleaner. Make a list of their suggestions on the chalkboard.

B. Have students open their booklets to page 5, Activity 4: Healthy Air Living. Depending on the level of your class, either read the story aloud, having students follow along and identify the picture words, or have students read the story aloud.

Activity 4: Healthy Air Living

Sparkle the Sun and Windy the Breeze discovered that they couldn’t blow or burn away the unhealthful smog in the Valley, so they knew it was important to try to keep the pollutants from getting into the air. But how?

As they looked down into the Valley one morning, they saw the roads crowded with cars and trucks, and their tailpipes were spitting pollution into the air. When they looked closer, they saw that most cars had only one person inside.

had an idea. “What if people shared rides—carpooled,” he said. Then there would be fewer cars on the roads.”

“Good idea!” responded. “And what if sometimes they didn’t use their cars at all? Instead, they could walk or bike or skate to get where they need to go.”

“Good idea!” said. “They could use ‘people power!’”

As and continued to look around the Valley, they found more ways to reduce pollution by using people power.

“Look,” said , pointing to people working in their yards. “Like cars, many leaf blowers and lawn mowers run on gasoline, which pollutes the air. But , rakes and brooms are people powered, which means no air pollution.”

“And what about spray bottles,” suggested. “People can use their own power to pump the spray instead of using aerosol sprays, which usually contain a polluting gas.”

“Good idea!” said. “People can try to keep as many harmful chemicals as possible out of the air—such as chemicals in some paints, glue, and cleaners, as well as in charcoal lighter fluid that is used in barbeques.”

“And to keep smoke and soot and ashes out of the air,” continued, “people could burn wood less often in their fireplaces and stoves.”

“All these activities,” said, “will keep the air from getting dirty and keep people healthier.”

“And everyone,” said, “can Live A Healthy Air Life every day.”

“Good idea!” said.
C. To discuss the story, ask the following questions:

1. Many people have to drive to work or to school or drive to run errands, so what can we do to reduce the pollution that comes from cars and trucks? (When possible, we can carpool—that is, share rides with other people so that fewer cars are on the roads. And we can try to combine errands so that we are not driving the car so often.)

2. What can we do instead of driving our cars sometimes? (Sometimes we can walk or ride a bike or skate or take public transportation.)

3. How can we use “people power” at home to create less air pollution? (We can use rakes and brooms instead of gasoline-powered leaf blowers, and we can use push lawn mowers—or maybe electric ones—instead of ones powered by gasoline.)

4. What is the difference between aerosol sprays and pump sprays? Why should we try to use pump sprays when possible? (Aerosol sprays often contain a gas that makes the product continually spray out when we press down on the button. Pump sprays just use air to spray the product out of the bottle each time we press the pump. The gas used in aerosols can contribute to air pollution.)

5. What is the best way to light a barbeque—and keep the air clean? (We should use electric starters or chimney briquette starters instead of using charcoal lighter fluid, which contributes to air pollution.)

6. What does it mean to “live a Healthy Air life”? (It means doing activities and using products that help keep our air clean and keep us healthier.)

D. Explain to students that sometimes in the summer when there is too much pollution in the air, the Valley Air District asks people to cut back on pollution-causing activities. Tell students that on those days we need to be especially careful about doing such activities as barbequing with charcoal and driving a lot and about using products that might pollute the air.

E. Explain that in the winter when people use their fireplaces and wood stoves, too much pollution can get into the air from burning wood. Tell students that in the fall and winter, the Valley Air District asks residents to Check Before You Burn, meaning check the air quality forecast to see if it is okay to burn wood that day.

F. Have students open their booklets to page 6 and complete Activity 5: Who Lives a Healthy Air Life? Review correct answers with the class.

Activity 5: Who Lives a Healthy Air Life?
Directions: Circle the people who are doing activities to keep the air clean.

1. Riding a bike
2. Walking
3. Skating
4. Using rakes and brooms
5. Using push lawn mowers
6. Using electric启动器
7. Using charcoal lighter fluid
8. Using chimney briquette starters
9. Using charcoal lighter fluid
10. Using electric启动器
Investigation 7 – GO ON A POLLUTION PATROL

**Procedures:**

A. Lead students on a walk around the school—indoors and out—and/or around the nearby neighborhood, asking them to look for and record (either by writing or drawing) signs of air pollution.

B. Have students share what they recorded. For example:
   - Cars, buses, and trucks driving on the street, emitting air pollutants through tailpipes
   - Chimneys on houses or other buildings with smoke coming out
   - Dust from fields and roads
   - Gas-powered leaf blower or lawn mower
   - Paint
   - Charcoal lighter fluid
   - Aerosol spray cans
   - Glue
   - Cleaners

C. For each pollutant source they found, discuss what could be done instead.

D. Have students open their booklets to page 7, **Activity 6: How I Can Live a Healthy Air Life**. Ask students to draw a picture of something that they can do to live a Healthy Air life and to write a sentence about their picture. Be sure to have students turn their booklets sideways to draw their pictures.

**Objective:**
To have students find potential air pollution sources

**Materials:**
- Pencil or crayon for each student
- Paper for each student
- Student Booklets – Activity 6: How I Can Live a Healthy Air Life
- Crayons

**Time:**
- 20 minutes for pollution patrol
- 20 minutes for Activity 6

**Standards:**
- Kindergarten
  - Math: A1.1; S1.1
  - English: W1.1; LS1.1, 1.2, 2.1
- Grade 1
  - English: W1.3; LC1.1
- Grade 2
  - English: LC1.2
Follow-Up

Summary

These follow-up activities will help extend students’ learning and practice of Healthy Air Living.

- Procedure A contains four more Activities in the Student Booklet.
- Procedure B has students take home a leaflet that overviews the Valley’s air quality problems, tells about the *Blue Sky, Brown Sky...It’s Up to You* program, and provides suggestions to help prevent air pollution so that we can all live a Healthy Air life.
- Procedure C explains Healthy Air Living contests in which students can participate.
- Procedure D tells how your students can take the Healthy Air Living School Pledge.
- Procedure E explains the Air Quality Flag Program for schools.

And for even more follow-up, visit the Healthy Air Living website (www.healthyairliving.com).
**THE AIR WE BREATHE**

**Objective:**
To reinforce the Healthy Air Living message

**Materials:**
- Student Booklets – Activity 7: Word Scramble
- Activity 8: Secret Message
- Activity 9: Word Search
- Activity 10: Connect the Dots
- Home Leaflets
- Computer with Internet connection (www.healthyairliving.com)

**Standards:**
- Content standards addressed by these Follow-Up Activities in the Student Booklet are shown on the Correlations Chart at the end of this manual.

**Note:**
Activity 7 is in Spanish on page 36.

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**FOLLOW-UP**

**Procedures:**

A. **Do some Extra Activities in the Student Booklet**
   Activities 7, 8, 9, and 10 in the student booklet (pages 8-11) can help reinforce the Healthy Air Living message while providing some skill practice and fun for students. Answer keys are shown on the following page.

B. **Distribute the Home Leaflets**
   Hand out a copy of the Home Leaflet to each student and ask them to:
   - give the leaflet to their parents or other caregiver
   - talk about what they’ve learned about Healthy Air Living
   - discuss ways that their family can help keep the air clean and the sky blue

C. **Participate in a Healthy Air Living Contest**
   The Healthy Air Living website lists several contests for students. Most appropriate for K-2 students are:

   **Healthy Air Living Kids Calendar Contest**
   Each year, the Valley Air District conducts a contest in which student drawings are chosen to produce a Healthy Air Living Kids calendar. If students would like to participate in the contest, remove their drawings from page 7 in their booklets, or have students draw on other paper. Follow these guidelines:

   1. On a piece of 8½ by 11 inch white paper, turned lengthwise so that it measures 11 inches across the top, write a clean air message and draw a picture that shows something we can all do to help clean up our air so that we can all live a Healthy Air life.

   2. On the back of the picture, write the student’s name and home address, age, grade, name of school, and teacher’s name.

   3. Send the picture unfolded in a large envelope by October 10 to:
      Valley Air District
      Attention: Calendar Contest
      1990 E. Gettysburg Avenue
      Fresno, CA 93726
ANSWER KEYS FOR ACTIVITIES 7, 8, 9, AND 10

Activity 7: Word Scramble
Directions: Unscramble the words below to fill in the blanks in each sentence.

1. Sparkle and Windy want you to LIVE A HEALTHY _____air_____ LIFE.
2. Another word for air pollution is _____smog_____.
3. You prevent air pollution when you _____walk_____ instead of drive a car.
4. Pollution goes into the air when we burn _____wood_____.
5. When possible, use a _____pump_____ spray instead of an aerosol spray.
6. People can _____carpool_____ to work and school to reduce pollution.
7. Everyone can help keep the air _____clean_____.

Activity 8: Secret Message
Directions: Using the key, decode the secret message and write it at the bottom of the page.

Key
A E I O U

Code
T’S ⭐ P ⭐ T⭐

LL ⭐ F ⭐ S ⭐ T⭐

L⭐️ V⭐️ ⭐️ H⭐️ O⭐️L⭐️T⭐️HY ⭐️ R⭐️

L⭐️ ⭐️ O⭐️ V⭐️ E⭐️ R ⭐️ Y ⭐️ D⭐️ Y ⭐️!

IT’S UP TO ALL OF US TO LIVE A HEALTHY AIR LIFE EVERY DAY!

Activity 9: Word Search
Directions: Find the following pollution solutions in the puzzle below.

carpool  push mower  pump spray
walk        broom        bicycle

A T B I L M P R W T U
E I S M B I J S B B P
U R O P R M W F I V Q
L B P F O D A C C N M
CARPOOLPYFD
I U G Q M P K B C T G
J H V M O U A C L W O
K P U S H M O W E R I
L B P F R M A C I N M
U P U M P S P R A Y Q

Activity 10: Connect the Dots
Directions: Connect the dots and then fill in the blanks in the sentences.

1. The picture shows a _____sailboat_____.
2. It is powered by _____wind_____.
3. It does not _____pollute_____ the air.
Commute Green – Kids Edition
For one week each year, the Valley Air District conducts the Commute Green in the San Joaquin Challenge. You can register your school to compete against other Valley schools in using alternative commute methods to live a Healthy Air life. For more information and to register your school, visit the Healthy Air Living website.

For Reel Video Contest
Students can show us in 30 seconds how they live a Healthy Air life by making their own video. By creatively showing how they reduce emissions in their daily lives, they may win prizes and have their video showcased on the Healthy Air Living website! Visit the Healthy Air Living website for details about this annual contest.

D. Take the Healthy Air Living School Pledge
The Valley Air District offers Healthy Air Living Pledge cards, created for students to give to their family and friends—and for them to fill out themselves—that formalize their commitment to clean-air behaviors. Check the Healthy Air Living website for pledge cards and for incentives and contests to encourage pledge submissions.

E. Join the Air Quality Flag Program
By flying a specific colored flag (green, yellow, orange, or red) each day to indicate the air quality, your school can show that it cares about clean air and Healthy Air Living. For more information about the program and to sign up to receive your flags and other materials, visit the Healthy Air Living website.
Las actividades en esta sección pueden emplearse para introducir el concepto de Aire Limpio, Vida Sana a los estudiantes de habla hispana que están aprendiendo inglés.

Cada actividad cuenta con el procedimiento para el maestro, seguido de un original que se puede fotocopiar para el uso en clase.

- La primera Actividad corresponde a la Actividad 2 en la página 3 del Cuadernillo para el Estudiante. La actividad es una historia para leerse en grupo, que introduce las fuentes de contaminación del aire a los estudiantes.

- La segunda Actividad corresponde a la Actividad 7 en la página 8 del Cuadernillo para el Estudiante. Los estudiantes ordenarán letras para formar palabras que completen oraciones respecto al Aire Limpio, Vida Sana.

You can use the Activities in this section to help introduce Healthy Air Living to Spanish-speaking students who are English-language learners.

A master for each Activity page, from which you can make copies, follows the teacher procedures for using that Activity.

- In the first Activity, which matches Activity 2 on page 3 in the Student Booklet, a read-along story introduces students to the sources of air pollution.

- In the second Activity, which matches Activity 7 on page 8 in the Student Booklet, students unscramble words to complete statements about Healthy Air Living.
Procedimiento:
A. Pregúntele a los estudiantes si alguna vez han olído o visto el aire sucio (por ejemplo, que huela a humo de leña quemándose, o a los escapes de los automóviles, o a basura).
B. Distribuya la Actividad titulada La Contaminación en el Valle. Dependiendo del nivel de sus estudiantes, elija entre leerles la historia en voz alta mientras ellos la siguen e identifican las ilustraciones, o pedirles que la lean ellos en voz alta.
C. Hágales las siguientes preguntas para dialogar acerca de la historia:
   1. ¿Qué fue lo que ensució el aire?
      (Humo y gases salían de los escapes de los carros y camionetas, de chimeneas en fábricas y casas, de máquinas podadoras que usan gasolina, de asadores y de estufones que queman leña).
   2. ¿Por qué es dañina la contaminación del aire?
      (La contaminación del aire le hace daño a las personas: provoca que tosan y estornuden, que les lloren los ojos y a veces que les cueste trabajo respirar. La contaminación del aire también le hace daño a las plantas y a los animales.)
   3. ¿Qué otro nombre se le da a la contaminación del aire?
      (Smog es otro nombre para la contaminación del aire.)
   4. ¿Por qué no pudo Windy lograr que el smog se fuera con soplidos?
      (El Valle de San Joaquín tiene la forma de una olla gigante. Todo alrededor del Valle hay montañas. Cuando Windy sopló, el smog chocó contra las montañas, estaba atrapado dentro del Valle.)
   5. ¿Qué pasó cuando Sparkle trató de quemar el smog?
      (El smog empeoró cuando Sparkle se hizo más grande y más caliente.)
   6. ¿Qué podemos hacer acerca de la contaminación del aire?
      (Ya que no podemos sacarlo a soplidos, ni quemarlo; tenemos que tratar de no hacer cosas que produzcan contaminación en el aire.)
D. Pídale a los estudiantes que hagan un dibujo basado en la historia.

Procedures:
A. Ask students if the air around them ever looks or smells dirty. Have them describe what they see or smell in dirty air (e.g., smoke from burning wood, exhaust from cars, garbage from trash cans).
B. Distribute the Activity sheet, Pollution in the Valley. Depending on the level of your class, either read the story aloud, having students follow along and identify the picture words, or have students read the story aloud.
C. To discuss the story, ask the following questions:
   1. What made the air dirty?
      (Smoke and gases were coming out of the tailpipes of cars and trucks, out of smokestacks and chimneys on houses and factories, from gasoline-powered lawn mowers and leaf-blowers, and from barbeques and wood stoves.)
   2. Why is air pollution bad?
      (Air pollution harms people, making them cough and sneeze, making their eyes water, and sometimes making it hard for them to breathe. Air pollution also harms plants and animals.)
   3. What is another name for air pollution?
      (Smog is another name for air pollution.)
   4. Why couldn’t Windy blow the smog away?
      (The San Joaquin Valley is shaped like a big pot. All around the sides of the Valley are mountains. When Windy blew, the smog was just blown up against the mountains. It was trapped inside the Valley.)
   5. What happened when Sparkle tried to burn the smog away?
      (As Sparkle got brighter and hotter, the smog just got worse.)
   6. What can we do about air pollution?
      (Since we can’t blow it away or burn it away, we have to try not to create the air pollution in the first place.)
D. Have each student draw a picture based on the story.
Actividad: La Contaminación en el Valle

“Sparkle” el Sol 🌞 y “Windy” la Brisa querían mucho al Valle de San Joaquín. Los tibios rayos solares de Sparkle y la fresca brisa que soplaba Windy ayudaban a que crecieran las uvas, las naranjas, las almendras y el algodón que son tan importantes para el Valle.

Sin embargo, algunos días casi no podían ver los sembradíos porque el aire estaba sucio y café. En esos días también las personas, que normalmente les sonreían, andaban tosiendo y estornudando, se tallaban los ojos llorosos y a veces hasta les costaba trabajo respirar bien.

“¿Qué está ensuciando tanto el aire?” preguntó 🌞.

“Mira allá abajo en el Valle,” respondió 🌞.

Cuando miraron hacia abajo, vieron humo y gases que salían de los escapes de muchos, muchos carros y camionetas; de chimeneas en fábricas y casas; de máquinas podadoras que usan gasolina; y hasta de asadores y estufones que queman leña.

“El aire se está contaminando,” dijo 🌞.

“El humo y los gases están haciendo smog.”

“Y el smog le hace daño a la gente, a las plantas y a los animales del Valle,” dijo 🌞.

“Entonces hay que deshacernos de él.”

 llenó sus cachetes de aire y sopló y sopló, pero el smog no se fue. El Valle tiene la forma de una olla gigantesca hecha de las montañas que lo rodean, así que la contaminación se queda atrapada.

“Pues yo lo voy a quemar,” dijo 🌞. Pero aunque brilló más y más fuerte y se calentó más y más, lo único que pasó fue que el smog empeoró.

“Bueno,” dijo 🌞, “parece que no podemos hacer que el aire sucio se vaya con soplidos, ni tampoco podemos quemarlo.”

“Así que…” respondió 🌞, “lo que tenemos que hacer es lograr que el aire no se ensucie y así la gente tendrá Aire Limpio, Vida Sana.”
Actividad: Sopa de Letras
Activity: Word Scramble

Procedimiento:
A. Distribuya la Actividad, Sopa de Letras.
B. Dependiendo del nivel de sus estudiantes elija entre:
   - leerles cada punto en voz alta, pidiéndoles que indiquen la palabra que falta, y luego que la encuentren en la lista y ordenen las letras, o
   - dejarlos trabajar independientemente, ordenando las letras para formar las palabras que van en los espacios vacíos de las oraciones.
C. Platique con sus estudiantes respecto a las respuestas, enfocándose en lo que cada estudiante puede hacer para mantener el Aire Limpio, Vida Sana.

Procedures:
A. Distribute the Activity sheet, Word Scramble.
B. Depending on the level of your class, either:
   - read each item aloud, having students indicate the missing word and then find and unscramble the word in the list, or
   - have students work on their own to unscramble the words and fill in the blanks in each sentence.
C. Discuss the answers, focusing on what students can do to help keep the air clean and live a Healthy Air life.

Actividad: Sopa de Letras
Instrucciones: Ordena las letras para armar la palabra que debe ir en el espacio en blanco.

1. Sparkle y Windy quieren que tengas __ Aire __ Limpio.
2. Otra palabra que significa contaminación del aire es __ smog __.
3. Evitas contaminar el aire si __ caminas __ en lugar de usar el carro.
4. El aire se contamina cuando quemamos __ leña __.
5. Siempre que sea posible, usa productos en __ rociador __ en lugar de en aerosol.
6. Para reducir la contaminación del aire se puede __ compartir __ el carro con otros pasajeros.
7. Todos pueden ayudar a mantener el aire __ limpio __.
Actividad: Sopa de Letras
Instrucciones: Ordena las letras para armar la palabra que debe ir en el espacio en blanco.

1 Sparkle y Windy quieren que tengas __________ Limpio.
2 Otra palabra que significa contaminación del aire es ____________.
3 Evitas contaminar el aire si ___________ en lugar de usar el carro.
4 El aire se contamina cuando quemamos ___________.
5 Siempre que sea posible, usa productos en ___________ en lugar de en aerosol.
6 Para reducir la contaminación del aire se puede ___________ el carro con otros pasajeros.
7 Todos pueden ayudar a mantener el aire ____________.
Lesson 1: Valley Air
Summary and Brief Background
Investigation 1 – Determine What Pollutes Valley Air
 ★ Activity 1: Read About Causes of Air Pollution
 ★ Activity 2: Air Pollution Log
Investigation 2 – Identify the Valley’s Major Pollutants
 ★ Activity 3: Read About Major Pollutants
 ★ Activity 4: Pie in the Sky

Lesson 2: Pollution Problems
Summary and Brief Background
Investigation 3 – Identify Effects of Air Pollution
 ★ Activity 5: Read About Effects of Air Pollution
 ★ Activity 6: Pollution Problems
Investigation 4 – Track Air Pollution Levels
 ★ Activity 7: Levels of Air Pollution

Lesson 3: Pollution Solutions
Summary and Brief Background
Investigation 5 – Determine What We Can Do
 ★ Activity 8: Read About Pollution Solutions
 ★ Activity 9: Air Pollution Home Survey
 ★ Activity 10: What Can You Do?
Investigation 6 – Keep a Trip Log
 ★ Activity 11: Five-Day Transportation Journal
Investigation 7 – Design a Clean Air Environment

Follow-Up
Summary
 ★ Activity 12: Clean Air Crossword
 ★ Activity 13: Math Message

Actividades En Español (Spanish-Language Activities)
Resumen y Procedimiento (Summary and Procedures)
 ★ Actividad: Las Causas y Efectos de la Contaminación del Aire (Activity: Causes and Effects of Air Pollution)
 ★ Actividad: Encuesta para el Hogar Sobre la Contaminación del Aire (Activity: Air Pollution Home Survey)
Lesson 1: Valley Air

SUMMARY AND BRIEF BACKGROUND

Because of our location, climate, and growing population, we have a serious air pollution problem in the San Joaquin Valley. In the first Investigation, students read about the causes of air pollution and look around their communities for signs, sources, and possible effects of air pollution in the Valley.

In Investigation 2, students discover that the major pollutants affecting the Valley are ozone and particulate matter. In the summertime, the problem is ozone—the “bad ozone” at ground level not the “good ozone” that forms a protective layer above the Earth in the stratosphere. The harmful ground-level ozone continually forms when the hot sun “cooks” the emissions from vehicles and gas-powered yard equipment as well as from products such as charcoal lighter fluid and paint.

In the wintertime, our air pollution problem is usually particulate matter. Though particles come from many sources—vehicles, factories, fires, dust—one of the main sources is burning wood. And when it’s cold, people burn more wood in their fireplaces and wood stoves, causing more particulate matter to enter the air.
Procedures:

A. Ask students if the air around them ever looks or smells dirty. Have them describe what they see or smell in dirty air (e.g., smoke from burning wood, exhaust from cars, dust from fields, garbage from trash cans).

B. Hand out copies of the student booklet, *Blue Sky, Brown Sky...It’s Up to You!* Have students turn to page 2, Activity 1: Causes of Air Pollution, and read the information. Use the questions below to discuss what they read.

1. What does it mean when the air is polluted? (Polluted air contains enough gases and particles to harm people, plants, and animals.)
2. Where do the gases and particles come from that pollute our air?
(They come from exhaust from vehicles and from gas-powered equipment such as lawn mowers and leaf blowers. They come out of the smokestacks at factories and power plants that burn fossil fuels—oil, coal, and natural gas. They come from fires, from dust and dirt blown from construction sites, roads, and fields. They come from vapors that escape from products such as paint, lighter fluid, and cleaners.)

3. What is the largest source of air pollution in the Valley?
(Exhaust from cars, trucks, and other vehicles is the largest source of air pollution in the Valley.)

4. How many regions are there in the San Joaquin Valley Air District and how many counties?
(There are three regions in the District—Northern, Central, and Southern—and eight counties, covering 270 miles from north to south.)

5. What county and region are you in?
(NOTE: Have students locate where their city is on the map and write it in.)

6. Why does the Valley have high levels of air pollution?
(There are three reasons. The geography of the Valley—a basin surrounded by mountains—traps the pollution in the Valley. The hot summer climate causes pollutants to combine to form smog. And in the winter, not much air movement keeps particulate matter in the air. Also, the growing population creates more cars, equipment, products, and activities that produce pollutants that go into our air.)

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**Activity 2: Air Pollution Log**

In your community, what **SIGNS** of air pollution do you see and smell?
What **SOURCES** of that air pollution can you find?
What are some **EFFECTS** of air pollution that you notice?

**SIGNS of Air Pollution**
Example: Smoke in the air
_________________
_________________
_________________

**SOURCES of Air Pollution**
Example: Exhaust from car’s tailpipe
_________________
_________________
_________________

**EFFECTS of Air Pollution**
Example: People’s eyes watering
_________________
_________________
_________________

---

C. Have students turn to page 3 in their booklets, **Activity 2: Air Pollution Log**. Divide the class into three teams and assign each team the responsibility of looking outside for examples to list in one specific section on the activity sheet. To help students get started, discuss the example for each section:
- signs of pollution – *e.g.*, *smoke in the air*
- sources of pollution – *e.g.*, *exhaust from a car’s tailpipe*
- effects of pollution – *e.g.*, *people’s eyes watering*

(NOTE: Students will learn more about the effects of air pollution in Lesson 2.)

D. Have each team make a short presentation on what signs, sources, and effects of air pollution they discovered.
Investigation 2 – IDENTIFY THE VALLEY’S MAJOR POLLUTANTS

Procedures:

A. Have students turn to page 4 in their booklets, Activity 3: Major Pollutants. Have students read the information and then use the questions below to discuss what they read.

1. What are the major air pollutants in the San Joaquin Valley?
(Particulate matter and ozone are the Valley’s major air pollutants.)

2. What is particulate matter?
(Particulate matter is composed of tiny particles of solid and liquid matter carried in the air.)

Objective:
To determine the Valley’s air pollution problems in summer and in winter

Materials:
★ Student Booklets – Activity 3: Major Pollutants
★ Student Booklets – Activity 4: Pie in the Sky
• Old magazines
• Scissors
• Glue
• Poster board or butcher paper

Time:
• 30-60 minutes

Standards:
• Grade 3
  Science: 1a, 1g
  English: R 1.3, 2.2, 2.3, 2.6
• Grade 4
  Math: S 1.3
  English: R 2.2; LS 1.1
• Grade 5
  Science: 1a, 4c
  English: R 2.3

Note:
Information in Spanish about the causes and effects of air pollution is on page 64.
3. Where does particulate matter come from?
(Particulate matter comes from chimneys and smokestacks when wood or other fuel is burned in houses, factories, and power plants; it comes from vehicle exhaust, especially from diesel engines; it comes from outdoor fires; and it comes from dust and dirt blown from construction sites, roads, and other outdoor areas.)

4. What is ozone?
(Ozone is a colorless and odorless gas.)

5. Where does ozone come from?
(Ozone is formed in the air when nitrogen oxides—NOx—and volatile organic compounds—VOCs—combine. Nitrogen oxides are emitted from vehicles and other gasoline-powered equipment such as lawn mowers. Volatile organic compounds evaporate from gasoline, paint, lighter fluid, and other chemicals. When the two pollutants are both present in hot sunlight, they combine to form ozone, which is the main ingredient in smog.)

6. Which pollutant is more of a problem in the winter and which in the summer and why?
(Particulate matter is worse in the winter months because people burn more wood and fuel. Ozone is worse in the summer because the hot sun is needed for the chemicals to combine to form ozone.)

B. Have students turn to page 5 in their booklets and complete Activity 4: Pie in the Sky. Review answers with students, emphasizing that pollution sources can change depending on the location in the Valley and the time of the year.

C. Create large Valley air pollution pie charts on a bulletin board. Divide the class into groups according to the categories on the “Pie in the Sky” charts. Have each group look through magazines to find specific examples of pollution sources in their category and then paste the pictures onto the pie chart. (NOTE: Have students draw any pictures that they cannot find.)
SUMMARY AND BRIEF BACKGROUND

Air pollution is harmful to everyone, but especially to children, elderly people, pregnant women, and anyone in fragile health.

In Investigation 3, students learn about the health effects of both ozone and particulate matter, realizing that our bodies tolerate small amounts of air pollution but can become overwhelmed by too much, resulting in anything from watery eyes to permanent lung damage. Students also discover that air pollution affects other living beings as well as non-living objects.

Then in Investigation 4, students track air pollution levels using the daily Air Quality Index. At the end of a month, they analyze their data, looking for air quality trends.
Procedures:

A. Have students turn to pages 6 and 7 in their booklets, Activity 5: Effects of Air Pollution, and read the information. Use the questions below to discuss what they read.

1. How might you feel if you are playing outdoors on a day when the ozone level is high?
(We might have a headache. Our eyes might sting and water. Our throats and chests might hurt. We might have trouble breathing. We might feel nauseous.)

2. Why does air pollution sometimes make us cough or sneeze?
(Large particles, such as dirt and dust, might get trapped in our noses, throats, or bronchial tubes. We cough or sneeze to dislodge the particles and expel them from our bodies.)
3. **What part of our bodies is most affected by particulate matter? Why?**

   (Our lungs are most affected by particulate matter. Tiny particles, less than 10 microns wide, get into our lungs. They can make respiratory diseases worse and can cause our lungs not to function as well.)

4. **What are some serious health problems that air pollution can cause?**

   (Air pollution can trigger heart attacks, make asthma and bronchitis worse, and damage our lungs.)

5. **Why do you think children are especially affected by air pollution?**

   (Children often spend more time playing outdoors; therefore, they are often exposed longer to air pollution. Children are smaller so they are exposed to more pollution per pound of body weight. Children breathe faster so they take in more pollutants. And children’s bodies are more likely to be harmed by pollutants because they are still growing and developing.)

6. **What are some specific examples of how air pollution affects non-living things?**

   (Answers will vary. Examples include: Paint on buildings fades and peels. Statues get eaten away. Fabric on outdoor furniture, such as chairs or umbrellas, deteriorates. Rubber on windshield wipers crumbles. Iron and steel on lawn equipment rusts.)

B. Have students turn to page 8 in their booklets and complete **Activity 6: Pollution Problems**. Discuss answers with students, emphasizing the health problems that air pollution can cause.
Investigation 4 – TRACK AIR POLLUTION LEVELS

Procedures for Grades 3-5

Lesson 2: Pollution Problems

Objective:
To demonstrate trends in air pollution levels

Materials:
★ Student Booklets – Activity 7: Levels of Air Pollution
• Class Poster of Tracking the AQI
• Daily weather section from local newspaper showing Air Quality Index, or Internet access

Time:
• 20 minutes
• 5-10 minutes daily for a month

Standards:
• Grade 3
  Math: N 1.1; S 1.4
• Grade 4
  Math: S 1.1, 1.3; MR 1.1
• Grade 5
  Science: 4d, 6g, 6h
  Math: S 1.4; MR 1.1

B. Explain that the Air Quality Index is a scale established by the Environmental Protection Agency (EPA) to convey air pollution levels to the public. Have students indicate the ranges for each of the air quality categories.

- 0 - 50 – GOOD air quality
- 51 - 100 – MODERATE air quality
- 101 - 150 – UNHEALTHY for sensitive groups
- 151 - 200 – UNHEALTHY
- 201 - 300 – VERY UNHEALTHY

Point out that any number over 100 indicates that health problems are a possibility, especially for people sensitive to air pollution, such as people with existing heart or lung disease.
C. Tell students that they are going to track the Air Quality Index for the next month. On their worksheets and on the poster, have students write in the month they will be doing the tracking and the county in which they are located. Explain to students that because the Valley air basin is so large, the AQI for one county is not necessarily the AQI in another county.

D. Show students the AQI report in the local newspaper or on the Valley Air District website at www.valleyair.org. Have students indicate the AQI on their worksheets by putting a dot in the box across from the AQI number and above the date for that month. (NOTE: If you are not starting at the first of a month, you may want to have students change the dates at the bottom of the chart so that the date you are starting is shown under the first column of boxes.)

E. Have students turn to page 10 in their booklets, a continuation of Activity 7: Levels of Air Pollution. On this page, have students write in the AQI for that date and also indicate the temperature, weather conditions (such as foggy, cloudy, windy, etc.), and any health recommendations.

F. Determine how you want students to find the AQI and other information each day; they can either:
   1. Look at the weather page of the local newspaper—on their own or from one posted in the classroom.
   2. Watch the local evening news.
   3. Call the Valley Air District’s toll-free, recorded hotline at 1-800-SMOG INFO (1-800-766-4463).

G. At the end of the month, have students connect the dots on the AQI chart to create a graph. Have students use the AQI graph along with the detail they indicated about the weather conditions each day to look for trends in air quality. For example: How is the temperature related to the AQI? Did the wind have any effect on the air quality? What was the air quality during rainy weather?

H. Have students continue to track air quality over several months. Ask them to compare the various months and seasons to determine why there are certain trends in air quality in the San Joaquin Valley.
Lesson 3: Pollution Solutions

**Summary and Brief Background**

*Healthy Air Living* is the Valley Air District’s outreach program that seeks to improve the health and quality of life of all Valley residents through individual and collective actions that clean up our air. The goal is to give people the tools to make clean-air choices and commit to Healthy Air Living.

In the summer when the ozone level is high, Valley residents are asked to reduce or avoid activities that cause air pollution, such as driving unnecessarily, especially alone; using aerosol sprays; starting barbeque briquettes with lighter fluid; and using gasoline-powered yard equipment.

From November through February, the *Check Before You Burn* program prohibits the use of wood and pellet fireplaces, inserts, and stoves when air quality is deteriorating. Even when air quality is okay, residents are asked to voluntarily reduce fireplace use—or to burn as cleanly as possible.

If you think individual efforts won’t make a difference, consider these facts:

- A squirt or two of charcoal lighter fluid or a few sprays of window cleaner may not seem like much. But more than three million people live in the San Joaquin Valley, almost all using products that contribute to air pollution. Household products create 22 tons of air pollution every day in the Valley alone. That’s 8,030 tons of air pollution a year!

- A gasoline-powered lawn mower operated for just one hour creates as much air pollution as driving 100 miles in a newer-model vehicle. Gasoline-powered lawn equipment creates 5% of our nation’s air pollution.

- Cars and other vehicles are responsible for the majority of the Valley’s ozone problem. Although today’s automobiles are less polluting than older models, there are more of them on the road now than ever before. About three-quarters of the residents in the San Joaquin Valley drive alone to work, and the average car releases about 500 pounds of pollution each year into the Valley’s air.

- Old wood stoves can produce up to 50 grams of particulate matter per hour whereas newer fireplace inserts and wood stoves produce only about 6 grams per hour.

In **Investigation 5**, students brainstorm pollution solutions and then survey their homes and families to see what changes could be made to help prevent air pollution. Students look especially at choices they make related to doing yard work, heating their homes, buying and using products, and driving cars.

Since cars create much of the pollution in the Valley, students keep 5-day trip logs in **Investigation 6**, which can be analyzed and graphed to identify how we can reduce our use of cars.

Students look to the future in **Investigation 7**, not only deciding on air-friendly behaviors but also designing communities that can help reduce air pollution and promote Healthy Air Living.
Investigation 5 – DETERMINE WHAT WE CAN DO

Procedures:

A. Ask students to brainstorm ways in which they think people can help reduce air pollution so that we can all live a Healthy Air life. Make a list on the chalkboard.

B. Have students turn to page 11 in their booklets, Activity 8: Pollution Solutions. Have students read the information on pages 11 and 12 and then discuss the various behaviors, emphasizing how each behavior helps to reduce air pollution. Ask students:

1. How many of the behaviors are already listed on the chalkboard?
2. Which behaviors do you and/or your families do now?
3. How will many of the behaviors not only reduce air pollution but also save money?
4. What other air-friendly behaviors can you think of?

Objective:
To identify the actions we can take to reduce air pollution

Materials:
★ Student Booklets – Activity 8: Pollution Solutions
★ Student Booklets – Activity 9: Air Pollution Home Survey
★ Student Booklets – Activity 10: What Can You Do?
• Markers, poster boards, and other materials for students to create presentations

Time:
• 2 class sessions

Standards:
• Grade 3
  English: R 1.3, 2.2, 2.6; LS 1.5, 1.8
  History: 3.4.2
• Grade 4
  Math: S 1.1, 1.3
  English: R 1.1, 2.2, 2.4; LS 1.7, 1.8, 2.2a, 2.2b
• Grade 5
  Math: S 1.2
  English: R 1.1, 2.3;
  LS 1.4, 1.5, 1.6, 2.2a, 2.2b, 2.2c

Note:
Activity 9 is in Spanish on page 66.
C. Divide students into groups and assign each group one of the Pollution Solution categories: Transportation, Yard Work, Heating, Products. Have each group prepare a presentation on “Ways to Prevent Air Pollution.” Tell groups that they can create posters, videotapes, plays, poems, commercials, billboards, PowerPoint presentations, or other means to get across their message. Encourage groups to be creative.

D. Have students turn to pages 13 and 14 in their booklets, Activity 9: Air Pollution Home Survey. Explain to students that they are to work with their families to complete this questionnaire. Let students know when they should have the questionnaire completed so that they can discuss the results in class.

E. When students have completed their surveys, analyze the results, tallying the answers for each question. Have students graph some of the results, for example:

- What potential polluting products did students find?
- How many families use public transportation?
- How many families carpool?
- What is the most common heating source?
- What is the average thermostat setting during the winter?
- What is the most common way to barbeque?
- How many families use each kind of mower?

YARD WORK

Even gasoline-powered yard equipment can contribute to air pollution. We can clean up our yards and keep the air clean if we:

- Use push mowers or electric lawn mowers.
- Clean up with a broom and rake instead of a leaf blower.
- Avoid pesticides, especially in sprayers.

PRODUCTS

A square or two of charcoal lighter fluid may not seem like much. But more than three million people live in the San Joaquin Valley, and almost all use products that contribute to air pollution. Household products—such as lighter fluid, paint, cleaners, polishes, drain openers, and insecticides—create tons of air pollution every day in the Valley. To help reduce that amount:

- Light barbeque briquettes without lighter fluid; use an electric or a chimney briquette starter; or use a propane or natural gas barbeque instead.
- Paint with water-based paint, and use brushes and rollers, not sprayers.
- Choose pump sprays, gels, or solids instead of aerosol sprays.
- Avoid products with labels that have words such as "Hazardous," "Toxic," or "Danger."

HEALTHY AIR LIVING

We should make air-friendly choices every day. But when air pollution is forecast to reach unhealthy levels, we must be particularly careful. On those days, residents are asked to reduce or avoid as many activities as possible that cause air pollution.

In the summer when the ozone level is high, the Valley Air District asks residents to cut back on pollution-causing activities such as charcoal barbequing, gardening with gasoline-powered equipment, driving to work alone, excessive use of motor vehicles, painting, and motor boating.

In the winter, when particulate matter is high, residents are asked to Check Before You Burn. On those days, depending on the level of air pollution, either wood burning is prohibited or residents are asked to burn cleanly.

Solutions to pollution are up to all of us. We can all help prevent air pollution and keep our sky blue if we LIVE A HEALTHY AIR LIFE.

Activity 9: Air Pollution Home Survey

Take this questionnaire home and fill it out with your family.

<table>
<thead>
<tr>
<th>POTENTIAL POLLUTERS</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray Paint</td>
<td>a. no</td>
</tr>
<tr>
<td>Paint Remover</td>
<td>a. no</td>
</tr>
<tr>
<td>Lighter Fluid</td>
<td>a. no</td>
</tr>
<tr>
<td>Bug Spray</td>
<td>a. no</td>
</tr>
<tr>
<td>Window Cleaner</td>
<td>a. no</td>
</tr>
<tr>
<td>Furniture Polish</td>
<td>a. no</td>
</tr>
<tr>
<td>Drain Opener</td>
<td>a. no</td>
</tr>
<tr>
<td>Disinfectant</td>
<td>a. no</td>
</tr>
<tr>
<td>Cleaner</td>
<td>a. no</td>
</tr>
<tr>
<td>Aerosol Hair Spray</td>
<td>a. no</td>
</tr>
<tr>
<td>Aerosol Deodorant</td>
<td>a. no</td>
</tr>
<tr>
<td>Nail Polish</td>
<td>a. no</td>
</tr>
<tr>
<td>Nail Polish Remover</td>
<td>a. no</td>
</tr>
<tr>
<td>Air Freshener</td>
<td>a. no</td>
</tr>
<tr>
<td>Fabric Softener Sheets</td>
<td>a. no</td>
</tr>
<tr>
<td>Other:</td>
<td>a. no</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DRIVING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does anyone in your family regularly take public transportation?</td>
</tr>
<tr>
<td>a. no</td>
</tr>
<tr>
<td>2. Does anyone in your family regularly carpool?</td>
</tr>
<tr>
<td>a. no</td>
</tr>
<tr>
<td>3. Does anyone in your family regularly drive alone?</td>
</tr>
<tr>
<td>a. no</td>
</tr>
<tr>
<td>4. Does anyone in your family regularly go on a road trip?</td>
</tr>
<tr>
<td>a. no</td>
</tr>
<tr>
<td>5. Does your family try to run several errands at one time when taking the car?</td>
</tr>
<tr>
<td>a. no</td>
</tr>
<tr>
<td>6. Is your car well-maintained?</td>
</tr>
<tr>
<td>a. no</td>
</tr>
<tr>
<td>7. Do you avoid “topping off” your gas tank?</td>
</tr>
<tr>
<td>a. no</td>
</tr>
<tr>
<td>8. Does your family often shop by phone, mail, or Internet?</td>
</tr>
<tr>
<td>a. no</td>
</tr>
</tbody>
</table>
F. Discuss what changes students think they and their families could make. Point out to students that any question that they have circled “a” for their answer is a potential area for making a change to help prevent air pollution and live a Healthy Air life.

G. Have students turn to page 15 in their booklets, Activity 10: What Can You Do? Ask students to use their Air Pollution Home Surveys to determine first what specific changes their families could make to help reduce air pollution and then what changes they will make personally. Ask students to share what they write.
Lesson 3: Pollution Solutions

**Procedures:**

A. Have students turn to pages 16 and 17 in their booklets, *Activity 11: Five-Day Transportation Journal*. Explain the journal to students, pointing out that they should fill in each column except the last one—Alternative—each time any person in their family, including themselves, leaves the house to go somewhere.

**Objective:**
To identify how often cars are used and determine alternatives

**Materials:**
- Student Booklets – *Activity 11: Five-Day Transportation Journal*

**Time:**
- One 10-minute session
- One 20 minute session five days later

**Standards:**
- Grade 3
  - Math: MR 1.1, 2.3
  - History: 3.4.2
- Grade 4
  - Math: S 1.1, 1.2, 1.3; MR 1.1, 2.3
- Grade 5
  - Math: S 1.1, 1.2; MR 1.1, 2.3

![Activity 11: Five-Day Transportation Journal](image)
B. When students have completed their Five-Day Transportation Journals, analyze the results:
   - How many trips were made each day on average?
   - What is the average distance traveled per trip? per day?
   - What were the most common destinations?
   - How many of the trips were by car?
   - How many of the car trips had only one person in the car?
   - What other methods of transportation were used?
   - What was the most common form of transportation?

C. Create charts or graphs indicating some of the results of the transportation journals. If appropriate, have students determine the mode and median of some of the results.

D. On their journals, have students put an “X” next to any car trip that could have been eliminated, combined with another trip, or otherwise changed to produce less air pollution (e.g., use public transportation, walk, or carpool). In the last column, ask students to write the alternative to that car trip.

E. Ask students why it is difficult for people to use their cars less (e.g., habit, convenience, time, effort). Discuss ways to get people more committed to using their cars less, especially for trips with only one person in the car.
**Objective:**
To demonstrate that communities can be designed to help reduce air pollution

**Materials:**
- Poster boards
- Markers
- Construction paper
- Glue

**Time:**
- 2 class sessions

**Standards:**
- **Grade 3**
  - English: LS 1.2, 1.3, 1.7, 1.8
- **Grade 4**
  - English: LS 1.1, 1.7, 1.8, 2.2a, 2.2b
- **Grade 5**
  - English: LS 1.1, 1.3, 1.4, 1.5, 2.2a, 2.2b, 2.2c

**Procedures:**

A. Ask students:
   1. How much time does your family spend driving in a car?
   2. How far do members of your family work or go to school from where you live?
   3. What would allow people in your family to drive less?
   4. Do you think the layout of the city contributes to air pollution?

B. Divide the class into small groups. Explain that the students are going to be urban planners—professionals who determine the arrangement of roads, buildings, parks, and other elements that make up a city. Tell students that each group is to design a city deciding on the placement of the necessary elements with their primary goal to minimize air pollution, creating a Healthy Air Living community.

C. Brainstorm with students various parts of the city that they will want to include. For example:
   - single family homes
   - apartments and condominiums
   - office buildings
   - factories
   - grocery stores
   - shopping malls
   - schools
   - restaurants
   - gas stations
   - roads and highways
   - rapid transit
   - bike paths
   - walking/jogging trails
   - playgrounds and fields
   - trees and greenbelts
   - parks
D. After students have designed their cities, have each group share its design, explaining why their arrangement will help minimize air pollution. Discuss and debate what designs are best. Ask the following questions, and others, to generate a discussion:

1. What are some reasons you would want offices, factories, and schools near homes?
2. What are some reasons you would want them far away from homes?
3. What are the advantages of densely populated urban areas?
4. What are the disadvantages?
5. What are the advantages of suburban areas with lower population density?
6. What are the disadvantages?
7. How can trees help lower energy use and thus reduce air pollution?
8. How will you encourage people to use public transportation and bike paths?
Follow-Up

**SUMMARY**

These follow-up activities will help extend students’ learning and practice of Healthy Air Living.

- Procedure A contains two more Activities in the Student Booklet.

- Procedure B has students take home a leaflet that overviews the Valley’s air quality problems, tells about the *Blue Sky, Brown Sky...It’s Up to You* program, and provides suggestions to help prevent air pollution so that we can all live a Healthy Air life.

- Procedure C explains Healthy Air Living contests in which students can participate.

- Procedure D tells how your students can take the Healthy Air Living School Pledge.

- Procedure E explains the Air Quality Flag Program for schools.

And for even more follow-up, visit the Healthy Air Living website (www.healthyairliving.com).
**Follow-Up Procedures for Grades 3-5**

**POLLUTION PROBLEMS AND SOLUTIONS**

**Objective:**
To reinforce the Healthy Air Living message

**Materials:**
- Student Booklets – Activity 12: Clean Air Crossword
- Activity 13: Math Message
- Home Leaflets
- Computer with Internet connection (www.healthyairliving.com)

**Standards:**
- Content standards addressed by these Follow-Up Activities in the Student Booklet are shown on the Correlations Chart at the end of this manual.

---

**Procedures:**

A. Do some Extra Activities in the Student Booklet
   Activities 12 and 13 in the student booklet (pages 18 and 19) can help reinforce the Healthy Air Living message while providing some skill practice and fun for students. Answer keys are shown on the following pages.

B. Distribute the Home Leaflets
   Hand out a copy of the Home Leaflet to each student and ask them to:
   - give the leaflet to their parents or other caregiver
   - talk about what they’ve learned about Healthy Air Living
   - discuss ways that their family can help keep the air clean and the sky blue

C. Participate in a Healthy Air Living Contest
   The Healthy Air Living website lists several contests for students. For example:

   **Healthy Air Living Kids Calendar Contest**
   Each year, the Valley Air District conducts a contest in which student drawings are chosen to produce a Healthy Air Living Kids calendar. If students would like to participate in the contest, have them follow these guidelines:

   1. On a piece of 8½ by 11 inch white paper, turned lengthwise so that it measures 11 inches across the top, write a clean air message and draw a picture that shows something we can all do to help clean up our air so that we can all live a Healthy Air life.

   2. On the back of the picture, write the student’s name and home address, age, grade, name of school, and teacher’s name.

   3. Send the picture unfolded in a large envelope by October 10 to:
      Valley Air District
      Attention: Calendar Contest
      1990 E. Gettysburg Avenue
      Fresno, CA 93726
Activity 12: Clean Air Crossword

Across
1. A camp____ is a source of air pollution.
6. Particles are released into the air when we _____ wood.
8. Gas-powered lawn _____ contribute to air pollution.
9. _____ refer to volatile organic compounds.
11. Gas-powered ____ blowers contribute to air pollution.
14. _____ makes up 21% of our air.
15. ____ mowers help reduce air pollution.
16. Avoid ______ sprays when possible.
18. Use a _____ instead of a leaf blower.
20. We ______ the air in many ways.
21. ______ matter is more of a problem in the winter.
25. The surroundings in which we live is our ______.
28. ____ means particulate matter.
31. Gases or particles released into the air are called ______.
32. You should _____ Before You Burn.
34. Air pollution can make our ____ sting and water.
36. ___ means Air Quality Index.
37. Air pollution decreases the function of our ____.

Down
1. Harmful emissions come from burning fossil ____.
2. Avoid using ____ spray.
3. Ozone is the main ingredient in ____.
4. Choose a solid or a ____ instead of an aerosol spray.
5. Ozone is an odorless, colorless ____.
7. _____ refers to nitrogen oxides.
9. Most of the emissions that create ozone come from motor ______.
10. One reason that the Valley has high levels of air pollution is our ______.
12. ____ refers to the Environmental Protection Agency.
13. Never burn trash in your ______.
14. The Valley’s air quality does not meet federal or state standards for ____.
15. If possible, choose a ____ spray instead of an aerosol.
17. _____ means combining errands to make only one car trip.
22. To reduce air pollution from cars, we should ______.
23. Ozone is more of a problem in the ______.
24. Wood____ are a source of air pollution.
26. Use an ______ starter to light barbeque briquettes without lighter fluid.
27. _____ in the air is a sign of air pollution.
29. We can all LIVE A HEALTHY ____
30. Burning wood puts ____ into the air.
33. Air pollution harms not only people but also their ____.
35. NOx + VOCs + Hot ____ = Ozone.
Activity 13: Math Message

Solve the math problems below. Then fill in the bubbles with the letter that matches each number to read the message.

\[
\begin{align*}
\frac{1}{4} &= A & 3\div21 & 3 & 303 \div 296 & 7 & 7 & +12 & 2 \\
\frac{1}{2} &= B & 7 \times 6 & 7 & 17 & 19 & 14 \\
1 &= C & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
2 &= D & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
3 &= E & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
4 &= F & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
5 &= G & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
6 &= H & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
7 &= I & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
8 &= J & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
9 &= K & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
10 &= L & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
11 &= M & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
12 &= N & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
13 &= O & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
14 &= P & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
15 &= Q & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
16 &= R & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
17 &= S & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
18 &= T & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
19 &= U & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
20 &= V & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
21 &= W & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
22 &= X & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
23 &= Y & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
24 &= Z & \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
\end{align*}
\]

\[
\begin{align*}
& 6,985 - 6,972 & 7,161 + 7 & -59 \\
& 18 & 13 & 23 & 13 & 19 \\
& 533 & -515 & 3 \times 3 & 1,130 & 9,001 & 8,122 \\
& 18 & 13 & 9 & 3 & 3 & 14 \\
& 2 & 9 & 2 & 3 & 5314 & -5297 & 9,81 + 8 \\
& 18 & 6 & 3 & 17 & 9 & 23 \\
& \_ & \_ & \_ & \_ & \_ & \_ & \_ \\
& 1/8 & +3/8 & 2 & 852 & -833 & 9,27 \\
& 4/8 & 10 & 19 & 3 & \_ & \_ & \_ \\
\end{align*}
\]

IT IS UP
TO YOU
TO KEEP
THE SKY
BLUE

IT IS U P
TO K E E P
T H E S K Y
B L U E

ANSWER KEY FOR ACTIVITY 13
Healthy Air Living For Reel Video Contest
The For Reel video contest is an annual contest in which 30-second video entries compete to show Healthy Air Living. To see last year’s winners, visit the Healthy Air Living website. Contact the Valley Air District for more information.

Commute Green – Kids Edition
For one week each year, the Valley Air District conducts the Commute Green in the San Joaquin Challenge. You can register your school to compete against other Valley schools in using alternative commute methods to live a Healthy Air life. For more information and to register your school, visit the Healthy Air Living website.

D. Take the Healthy Air Living School Pledge
The Valley Air District offers Healthy Air Living Pledge cards, created for students to give to their family and friends—and for them to fill out themselves—that formalize their commitment to clean-air behaviors. Check the Healthy Air Living website for pledge cards and for incentives and contests to encourage pledge submissions.

E. Join the Air Quality Flag Program
By flying a specific colored flag (green, yellow, orange, or red) each day to indicate the air quality, your school can show that it cares about clean air and Healthy Air Living. For more information about the program and to sign up to receive your flags and other materials, visit the Healthy Air Living website.
RESUMEN

Las actividades en esta sección pueden emplearse para introducir el concepto de Aire Limpio, Vida Sana a los estudiantes de habla hispana que están aprendiendo inglés.

Cada actividad cuenta con el procedimiento para el maestro, seguido de un original que se puede fotocopiar para el uso en clase.

• La primera Actividad—Las Causas y Efectos de la Contaminación del Aire—presenta información para las Actividades 1, 3 y 5 en el Cuadernillo para el Estudiante.

• La segunda Actividad—Encuesta para el Hogar sobre la Contaminación del Aire—corresponde a la Actividad 9 en las páginas 13 y 14 del Cuadernillo para el Estudiante. Esta actividad consiste en que los estudiantes apliquen una encuesta en su casa para determinar qué cambios pueden hacer para ayudar a prevenir la contaminación y tener Aire Limpio, Vida Sana.

SUMMARY

You can use the Activities in this section to help introduce Healthy Air Living to Spanish-speaking students who are English-language learners.

A master for each Activity page, from which you can make copies, follows the teacher procedures for using that Activity.

• The first Activity—Causes and Effects of Air Pollution—presents information from Activities 1, 3, and 5 in the Student Booklet.

• The second Activity—Air Pollution Home Survey—matches Activity 9 on pages 13-14 in the Student Booklet, in which students survey their homes and families to see what changes could be made to help prevent air pollution so that we can all live a Healthy Air life.
Procedimiento:
A. Pregúntele a los estudiantes si alguna vez han visto el aire sucio o percibido olores desagradables. Pídales que lo describan (por ejemplo, que huele a humo de leña quemándose, o a humo de los escapes de los carros, a polvo, o a basura).

B. Distribuya la Actividad Las Causas y Efectos de la Contaminación del Aire. Pídale a los estudiantes que lean la información, ya sea que usted elija a varios estudiantes que lean uno por uno en voz alta, o que los divida en grupos y en cada grupo tomen turnos para leer en voz alta.

C. Hágales las siguientes preguntas para dialogar acerca de la información:

1. ¿Qué significa que el aire esté contaminado?
   (El aire contaminado contiene suficientes gases y partículas para hacerles daño a las personas, las plantas y los animales.)

2. ¿De dónde provienen los gases y las partículas que contaminan el aire?
   (Provienen de fuentes comunes como los carros y camionetas, las sopladoras de hojas, las fábricas, los asadores, las chimeneas, las pinturas para casas, los artículos de limpieza y los repelentes contra insectos.)

3. ¿Cuál es la fuente principal de contaminación del aire en el Valle?
   (El humo que proviene de carros, camionetas y otros vehículos es la fuente principal de contaminación del aire en el Valle.)

4. ¿Por qué son tan altos los niveles de contaminación del aire en el Valle?
   (Hay tres razones: La geografía del Valle—una cuenca rodeada de montañas—atrae la contaminación dentro del Valle. El clima caliente del verano provoca que los contaminantes se combinen y se conviertan en smog. En el invierno, la falta de viento mantiene las partículas suspendidas en el aire. El crecimiento de la población crea más carros, equipo, productos y actividades que producen contaminantes del aire.)

5. ¿Qué contaminantes son los principales en el Valle de San Joaquín?
   (Los mayores contaminantes en el Valle de San Joaquín son las partículas y el ozono.)

Procedimientos:
A. Ask students if the air around them ever looks or smells dirty. Have them describe what they see or smell in dirty air (e.g., smoke from burning wood, exhaust from cars, garbage from trash cans).

B. Distribute the Activity sheet, Causes and Effects of Air Pollution. Have students read the information, either by calling on students to read aloud, by asking students to read to themselves, or by having students take turns reading aloud in groups.

C. Use the following questions to discuss the information:

1. What does it mean when the air is polluted?
   (Polluted air contains enough gases and particles to harm people, plants, and animals.)

2. Where do the gases and particles come from that pollute our air?
   (They come from familiar sources such as cars, trucks, leaf blowers, factories, barbeques, fireplaces, and household paints, cleaners, and bug sprays.)

3. What is the largest source of air pollution in the Valley?
   (Exhaust from cars, trucks, and other vehicles is the largest source of air pollution in the Valley.)

4. Why does the Valley have high levels of air pollution?
   (There are three reasons. The geography of the Valley—a basin surrounded by mountains—traps the pollution in the Valley. The hot summer climate causes pollutants to combine to form smog. And in the winter, not much air movement keeps particulate matter in the air. Also, the growing population creates more cars, equipment, products, and activities that produce pollutants that go into our air.)

5. What are the major air pollutants in the San Joaquin Valley?
   (The major air pollutants in the Valley are particulate matter and ozone.)
6. What is particulate matter and where does it come from?
(Particulate matter is composed of tiny particles of solid and liquid matter. It comes from chimneys and smokestacks when wood or other fuel is burned in houses, factories, and power plants; it comes from vehicle exhaust, especially from diesel engines; and it comes from dust and dirt blown from construction sites, roads, and other outdoor areas.)

7. What is ozone and where does it come from?
(Ozone is a colorless and odorless gas. It is created when pollutants combine in the air and are cooked by the sun. Ozone is the main ingredient in smog.)

8. Which pollutant is more of a problem in the winter and which in the summer and why?
(Particulate matter is worse in the winter months because people burn more wood and fuel. Ozone is worse in the summer because the hot sun is needed for the chemicals to combine to form ozone.)

9. Why does air pollution sometimes make us cough or sneeze?
(Particles, such as dirt and dust, might get trapped in our noses, throats, or bronchial tubes. We cough or sneeze to dislodge the particles and expel them from our bodies.)

10. What are some serious health problems that air pollution can cause?
(Air pollution can trigger heart attacks, make asthma and bronchitis worse, and damage our lungs.)

11. Why do you think children are especially affected by air pollution?
(Children often spend more time playing outdoors; therefore, they are often exposed longer to air pollution. Children are smaller so they are exposed to more pollution per pound of body weight. Children breathe faster so they take in more pollutants. And children's bodies are more likely to be harmed by pollutants because they are still growing and developing.)

12. What are some specific examples of how air pollution affects non-living things?
(Answers will vary. Examples include: Paint on buildings fades and peels; statues get eaten away; fabric on outdoor furniture, such as chairs or umbrellas, deteriorates; rubber on windshield wipers crumbles; iron and steel on lawn equipment rusts.)
¿Qué Causa la Contaminación del Aire?

El aire está contaminado cuando la cantidad de gases y partículas que contiene pueden dañar todo lo que está vivo: las personas, las plantas y los animales. Los contaminantes provienen de fuentes comunes como los carros y camionetas, las máquinas sopladoras de hojas, las fábricas, los asadores, las chimeneas, las pinturas para casas, los artículos de limpieza y los repelentes contra insectos. En el Valle de San Joaquín, el humo que proviene de carros, camionetas y otros vehículos es la fuente principal de contaminación.

Tenemos un grave problema de contaminación del aire en el Valle, por tres razones: 

La Geografía. El Valle tiene la forma de una olla gigante o de una tina de baño con montañas delineando los costados. La contaminación del aire se asienta en el Valle y se queda atrapada.

El Clima. Durante el verano, las altas temperaturas provocan que los contaminantes se combinen y se conviertan en smog. En el invierno, la falta de viento mantiene las partículas suspendidas en el aire.

El Crecimiento de la Población. Mientras más personas viven en el Valle hay más vehículos en las calles y equipos, productos y actividades que producen contaminantes del aire.

En el Valle de San Joaquín nos preocupan dos contaminantes: las partículas y el ozono.

Las partículas (PM, por sus siglas en inglés) son diminutas partículas sólidas o líquidas, algunas tan pequeñas que no se ven a simple vista. Las partículas se generan de:
- Chimeneas y estufones en casas, fábricas y plantas generadoras de energía
- Vehículos, especialmente los que operan con motores de diesel
- Áreas en construcción, minas, calles, campos

Las partículas presentan más problemas durante el invierno porque la gente usa sus chimeneas y estufones.

El ozono es un gas incoloro e inodoro que se produce cuando varios contaminantes se combinan en el aire y se calientan bajo el sol. El ozono es el ingrediente principal del smog. Puede ser peligroso en el verano, cuando el sol calienta y alumbrá más.

¿Cuáles son los Efectos de la Contaminación del Aire?

La contaminación del aire no daña solamente a las personas, afecta también a nuestras mascotas y a los animales de granja.

La contaminación del aire provoca otros problemas. Demasiada contaminación en el aire reduce la visibilidad. Además, ciertos tipos de contaminantes afectan también a los objetos que no requieren oxígeno, por ejemplo:
- decoloran y pelan la pintura
- se carcomen el yeso en las paredes
- dañan telas
- rajan el hule
- oxidan el hierro y el acero

Cuando se pronostica que la contaminación del aire alcanzará ciertos niveles altos, se da aviso a la población. En esos días se aconseja limitar las actividades y el ejercicio al aire libre.
Procedimiento:
A. Distribuya la Actividad Encuesta para el Hogar sobre la Contaminación del Aire.
B. Explíquele a los estudiantes que van a responder este cuestionario en casa con sus familias. Dígales la fecha en que deberán traer el cuestionario respondido para comentar los resultados en clase.
C. Cuando los estudiantes hayan respondido el cuestionario, analice con ellos los resultados, llevando la cuenta de las respuestas para cada pregunta.
D. Dialogue con los estudiantes respecto a los cambios que pueden hacer con sus familias. Hágales notar que todas las preguntas cuya respuesta fue la letra “a”, son áreas potenciales para hacer un cambio que ayude a prevenir la contaminación y lograr tener un Aire Limpio, Vida Sana.

Procedures:
A. Distribute the Activity sheet, Air Pollution Home Survey.
B. Explain to students that they are to work with their families to complete this questionnaire. Let students know when they should have the questionnaire completed so that they can discuss the results in class.
C. When students have completed their surveys, analyze the results, tallying the answers for each question.
D. Discuss the changes students think they and their families could make. Point out to students that any question that they have circled “a” for their answer is a potential area for making a change to help prevent air pollution and live a Healthy Air life.
CONTAMINANTES POTENCIALES

1. Con la ayuda de un adulto, marca con una “X” los productos que encuentres en tu casa que tengan en el empaque palabras como “Hazardous” (Peligroso), “Toxic” (Tóxico), “Danger” (Peligro), “Caution” (Manéjese con cuidado) o “Warning” (Cuidado).

- Pintura en aerosol
- Removedor de pintura
- Combustible líquido
- Repelente líquido para insectos
- Líquido para limpiar vidrios
- Líquido para pulir muebles
- Destapadores químicos de drenajes
- Desinfectantes
- Líquidos para limpieza general
- Aerosol para el cabello
- Desodorante en aerosol
- Pintura para uñas
- Acetona
- Aromatizadores de ambiente
- Suavizantes para la secadora
- Otros:

MANEJANDO

2. ¿Alguien de tu familia comparte viajes en el carro con otras personas, regularmente?
   a. no   b. sí

3. ¿Alguien de tu familia utiliza regularmente el transporte público?
   a. no   b. sí

4. ¿Alguien de tu familia camina o utiliza la bicicleta o patineta regularmente para hacer mandados, en lugar de ir en carro?
   a. no   b. sí

5. Si salen en carro, ¿tratan de hacer varios mandados a la vez?
   a. no   b. sí   c. no tenemos carro

6. ¿Mantienen el carro en buenas condiciones?
   a. no   b. sí   c. no tenemos carro

7. Cuando le echan gasolina al carro, ¿tratan de no llenar el tanque de más?
   a. no   b. sí   c. no tenemos carro

8. ¿Hacen compras frecuentemente por teléfono, correo o Internet?
   a. no   b. sí

Fecha:__________________________________________________________

PARA CALENTAR LA CASA

9. ¿Cuál es la manera principal en que calientan la casa?
   a. con un estufón de gas o chimenea
   b. con un calentador de gas o eléctrico

10. Si tienen termostato, ¿a qué temperatura lo programan normalmente durante el invierno?
    a. 70° o más
    b. debajo de 70°

PARA ASAR CARNE

11. Si asan carne, ¿qué tipo de asador usan?
    a. de carbón
    b. de gas o eléctrico

12. ¿Algunas veces usan combustible líquido para encender el carbón?
    a. sí
    b. no

PARA MANTENER EL JARDÍN

13. ¿Qué tipo de podadora usan para cortar el césped?
    a. de gasolina   b. eléctrica
    c. manual   d. no tenemos podadora

14. ¿Qué utilizan para limpiar el patio?
    a. soplador de hojas con motor de gasolina
    b. escoba o rastrillo
    c. no tenemos patio

15. ¿Usan pesticidas en el jardín?
    a. sí
    b. no
    c. no tenemos jardín
Glossary

• **air** – a mixture of invisible, odorless, and tasteless gases that surround the Earth’s surface; air is essential for living things to survive.

• **air pollution** – anything that makes the air dirty and harmful to living beings as well as non-living objects

• **car exhaust** – gases and vapors that come out of the tailpipes of vehicles

• **carpool** – more than one person riding in a car; also called ridesharing

• **Check Before You Burn** – a notice issued in the fall or winter when particulate matter is high, either discouraging or prohibiting wood burning

• **climate** – the combined effect of temperature, precipitation, and other factors that create weather patterns

• **emissions** – gases or particles released into the air primarily from burning fuels

• **environment** – the surroundings in which we live

• **ground-level ozone** (O$_3$) – an invisible pollutant formed in hot sunlight when nitrogen oxides (NO$_x$) react with volatile organic compounds (VOCs); ozone is the primary component of smog

• **health notice** – a warning issued when air pollution levels are so high that they pose a risk to public health

• **nitrogen oxides** (NO$_x$) – several gaseous compounds made up of nitrogen and oxygen that result when fossil fuels are burned at high temperatures

• **oxygen** – a clear and odorless gas that makes up 21 percent of the air we breathe

• **ozone** (O$_3$) – an invisible gas that occurs in both the stratosphere, 10 to 31 miles above the Earth, and in the troposphere, from ground-level to about 10 miles above the Earth’s surface. Stratospheric ozone is considered “good ozone” because it absorbs the sun’s damaging ultraviolet rays. Tropospheric ozone, the primary ingredient in smog, is hazardous to our health and environment.

• **particulate matter** (PM10, PM2.5) – tiny bits of solid or liquid matter (soot, dust, ash, vapors, mist, etc.) suspended or carried in the air

• **smog** – a hazardous mixture of emissions from fossil fuels, chemical vapors, and particulate matter combined with sunlight and oxygen in the air

• **trip link** – combining errands to make only one car trip instead of several

• **volatile organic compounds** (VOCs) – a combination of carbon, oxygen, hydrogen, chlorine, and other atoms that form gases easily and escape into the air, often from evaporation from products such as glue, paint, solvent, charcoal lighter fluid, and other household products, as well as from dairies
Air Quality Resources

Air & Waste Management Association
412-232-3444
www.awma.org

American Lung Association
212-315-8700
www.lungusa.org

Antelope Valley Air Quality Management District
661-723-8070
www.avaqmd.ca.gov

Bay Area Air Quality Management District
415-771-6000
www.baaqmd.gov
www.sparetheair.org

California Air Resources Board
916-322-2990
www.arb.ca.gov

Sacramento Metropolitan Air Quality Management District
916-874-4800
www.airquality.org
www.sparetheair.com

San Joaquin Valley Air Pollution Control District
559-230-6000
www.valleyair.org
www.healthylivingair.com

South Coast Air Quality Management District
909-396-2000
www.aqmd.gov

United States Environmental Protection Agency
415-744-1305
www.epa.gov
Forecasts
www.epa.gov/airnow
## Correlations to California Content Standards
### K-2 Investigations and Activities

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## Correlations to California Content Standards
### K-2 Investigations and Activities

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## Correlations to California Content Standards
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