



Types of Air Pollution

Middle School Food and Agricultural Literacy Curriculum

Precepts

- E. Awareness
- E1. Address issues important to the community

National Standards

- PS.02.01.02.a. Describe the effects air, temperature and water have on plant metabolism and growth.
- NRS.02.06.08.b. Describe the impact of pollution on natural resources.
- NL-ENG.K-12.12 – Applying Language Skills
- NS.5-8.6 – Personal and Social Perspectives
- NSS-GK-12.5 – Environment and Society

Student Learning Objectives

- As a result of this **unit** the students will...
- Explain the role of clean **air** in sustaining life.
- As a result of this **lesson** the students will ...
- Describe the impact of **air** quality on plant, animal, and human life.
- Cite three examples and sources of **air pollution**.

Content Outline

Objective 1. Describe the impact of **air** quality on plant, animal, and human life.

I. Define **air**

- A. **Air** is a mixture of gases that surround us that is invisible, tasteless, and odorless.

II. Why is **air** important to plants, animals, and humans?

- A. Plants use **air** in the photosynthesis process that allows them to produce food.
- B. Animals and humans breathe in **air** to exchange gases from natural body functions.
- C. Plants, animals, and humans would not survive without **air**.

Time

Instruction time for this lesson: 60 minutes.

Resources

Lee, Jasper (2006). Natural Resources (2nd ed.). Upper Saddle River, NJ: Pearson.

Tools, Equipment, and Supplies

- Writing surface
- Overhead or Projector
- LCD or SMART board (if available/optional)
- Writing utensils
- Room spray or perfume
- Sealable plastic bag or balloon
- Colored pencils or markers – Enough for class to share
- White Paper – one per student
- MS.NR.2.1.TM.A-F – one per teacher
- MS.NR.2.1.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in **bold italics**:

Air

Air pollution

Air pollutant

III. What impact could poor **air** quality have on plants, animals, and humans?

- A. Plants could produce poor fruit and have damage to their leaf tissue.
- B. Animals and humans can develop breathing problems, as well as certain respiratory diseases caused by poor **air** quality.

Objective 2. Cite three examples and sources of **air pollution**.

I. Define **air pollution**.

- A. **Air pollution** is the contamination of the **air** by smoke and other harmful gases.

II. Define **air pollutant**.

- A. An **air** pollutant is any material that causes **air pollution**.



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III. What are three examples and sources of air pollution?

- A. Carbon dioxide and carbon monoxide are gas pollutants caused by the burning of materials (often from the petroleum industry).
 - 1. Examples: Car exhaust, combustion engines
- B. Sulfur oxides are found in the **air** as a result of a fuel containing sulfur that is burned.
 - 1. Examples: burning of coal or oil
 - 2. If high enough levels are present, sulfur oxides will emit a "rotten-egg" smell.
- C. Particle pollutants are small particles of dust or liquid that pollute the **air**.
 - 1. Examples: smoke from factories, burning trash, forest fires, dust from a dirt road.

Interest Approach

Prior to beginning the lesson, if technology is available, such as an LCD projector or a SMART board, input information from **MS.NR.2.1.TM.A** through F to allow information to be projected instead of written or used on an overhead. This process will take time, so plan accordingly.

Before students arrive to class, take some type of room spray or perfume and spray it heavily in the classroom. Spray enough to make the smell noticeably different when they enter the room without it being too overwhelming. When all students arrive, acknowledge their promptness to class. You may need to be cautious about allergies to perfume.

Can someone tell me what is different about the classroom today?

Wait for student responses. Field answers until a student picks up on the distinct different smell in the room.

That is correct. You may have smelled a distinct difference when you entered the classroom today. We encounter different smells every day. Have you ever thought about what causes that change in smell? In this case, you smelled something that was pleasant, but have you ever been outside and smelled something that was not so enjoyable?

Recently we have talked about the importance of natural resources to us on a daily basis. Have you ever thought what would happen if those resources were jeopardized? **Air** is a very important natural resource that most people do not think about unless there is something wrong with it – such as a smell, it is dirty, or if it is causing health problems.

Let's investigate the smells we have encountered and determine what type of impact, if any, those smells have on our natural resources and you!

Summary of Content and Teaching Strategies

Objective 1. Describe the impact of **air** quality on plant, animal, and human life.

Prior to beginning the lesson, if technology is available, such as an LCD projector or a SMART board, input information from **MS.NR.2.1.TM.A** through F to allow information to be projected instead of written or used on an overhead. This process will take time, so plan accordingly.

To help set up the definition of **air**, take a sealable plastic bag, blow **air** into it, and seal it shut. The bag should be full of **air**, tight so that if you pushed on the outside it would not deflate. Hold up the bag full of **air** in front of the class.

In front of you is a bag. What are the contents of that bag? The general response will be nothing.

Look at the bag again. In order for this bag to be full, there must be something in it. Think again – what could be in this bag?

At this point you may have some students understanding that **air** is present in the bag. If not, lead them to the answer.

Correct. **Air** is in this bag, the same **air** that surrounds us in this room.

If desired, display **MS.NR.2.1.TM.A** using a projector or writing surface, revealing only the definition of **air**.

Air can be defined as the mixture of gases that surrounds us that is invisible, tasteless, and odorless.

I. Define **air**

- A. **Air** is a mixture of gases that surround us that is invisible, tasteless, and odorless.

We are surrounded by **air** every day. But why is it important to us?

Wait for answers to the questions. Most students will understand that we need **air/oxygen** in order to breathe.



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Great answers. Not only do we need good quality (clean) **air** in order to survive, but animals, like humans, also require clean good quality **air** to breathe. Plants also need good clean quality **air**. Having the right "**air**" is important to all living organisms to live, to be productive, and to be able reproduce.

Who will name the process that plants perform that requires **air** so they can produce food?

Wait for responses. Some students may know this answer; others may not. Prompt them with the answer if they do not know.

Plants perform a process called photosynthesis that allows the plant to produce its own food. In order for it to complete this process, Carbon Dioxide **air** must be present.

II. Why is **air** important to plants, animals, and humans?

- A. Plants use **air** in the photosynthesis process that allows plants to produce food.
- B. Animals and humans breathe in **air** to exchange gases from natural body functions.
- C. Plants, animals, and humans would not survive without **air**.

Without **air**, plants, animals, and humans would not survive. As we experienced when walking into class today, there are things that can enter our **air** that change its quality. What impact could poor **air** quality have on an average person?

Wait for students to answer. Students may think of common health problems associated with poor **air** quality, such as asthma.

It is easy for us to understand that poor **air** quality can have an effect on your daily functions. Poor **air** quality has many of the same effects on animals as it does humans. Different types of sickness and disease can result from poor **air** quality. What about plants? How could plants be affected by poor **air** quality?

Students may have difficulty visualizing how poor **air** quality affects plants. Make **MS.NR.2.1.TM.B** available for students to observe.

These pictures give an example of what a plant might look like that has been affected by poor **air** quality. Leaf tissue can begin to deteriorate and fruit produced can be of lower quality.

III. What impact could poor **air** quality have on plants, animals, and humans?

- A. Plants could produce poor fruit and have damage to their leaf tissue.
- B. Animals and humans can develop breathing problems, as well as certain respiratory diseases caused by poor **air** quality.

We live and breathe the **air** we are around on a daily basis. The quality is not only important to us, but is important to the plant and animals that live around us as well. So how does this happen? What causes the **air** quality to be poor? Let's take a closer look at what can cause our **air** to be polluted.

Objective 2. Cite three examples and sources of **air pollution**.

When entering class today, everyone smelled something distinctly different from anywhere else in this building. There was something in the **air** that changed it. Remember, **air** is colorless, odorless, and tasteless. The **air** in the classroom today was definitely not odorless! This is an example of **air pollution**.

Display **MS.NR.2.1.TM.C** on a writing surface or overhead, revealing only the definition of **air pollution**.

Air pollution can be defined as the contamination of the **air** by smoke and other harmful gases.

I. Define **air pollution**.

- A. **Air pollution** is the contamination of the **air** by smoke and other harmful gases.

What made the smell of the room different today?

Wait for answers. Depending on what type of spray or perfume was used, students may have an easier time figuring out what made the smell. Reveal the product that changed the smell of the room.

This item was responsible for changing the smell of the room. This item is an example of an **air pollutant**.



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Display **MS.NR.2.1.TM.C** on a writing surface or overhead, revealing the definition of **air** pollutant.

An **air pollutant** can be defined as any material that causes **air pollution**. In the case of the classroom, it is this bottle of the item that was sprayed before you entered.

II. Define air pollutant.

A. An **air** pollutant is any material that causes **air pollution**.

What is an example of an **air pollutant** we are in contact with on a daily basis?

Students may understand that the example of a pollutant that they are most familiar with is the burning of gasoline from cars. If not, lead them to think about the way they got to school that day and how they intended to get to the movies on the weekend. Display **MS.NR.2.1.TM.D** to illustrate vehicle emissions.

Our vehicles are major sources of **pollutants**, regardless of where you live. Vehicles burn materials that produce carbon monoxide and carbon dioxide. Those fumes that are emitted pollute the **air** that we breathe. What do we notice about the **air** near a larger city and smog alerts or ozone warnings? The volume of vehicles in those locations causes a greater health risk because the carbon emissions are intensified.

III. What are three examples and sources of air pollution?

A. Carbon dioxide and carbon monoxide are gas pollutants caused by the burning of materials often from the petroleum industry

1. Examples: Car exhaust, combustion engines

Sulfur also has an effect on the **air**. Who will share an experience they have had when visiting an area that has a strong smell of rotten eggs?

Wait for student responses. Depending on where students live, this may be something that they have experienced before, but may not have. Display **MS.NR.2.1.TM.E** to illustrate sulfur pollution.

The strong smell of rotten eggs outside really isn't rotten eggs itself. The smell is caused by a large amount of sulfur in the **air** from the burning of coal or oil. This is often found around factories or plants in industrial areas. These types of facilities are another common source of **air pollution**.

B. Sulfur oxides are found in the **air** as a result of a fuel containing sulfur burning

1. Examples: burning of coal or oil
2. If high enough levels are present, sulfur oxides will emit a "rotten-egg" smell

Another type of **air pollutant** that we might not think about on a regular basis is particle **pollutants**. Raise your hand if you like to camp.

Wait for student responses.

At night, what is one essential thing that must be present at your campsite?

Wait for student responses. If they do not lead to a campfire, then lead them to this answer.

A campfire keeps the site safe and keeps the campers warm. How might fires be an example of a particle pollutant?

Give students time to think about this concept.

Creating a fire causes a breakdown of materials. As the items break down, particles are released into the **air** causing **pollutants**. On a larger scale, forest fires, burning trash, or even driving down a dusty road can create these particle **pollutants**.

Display **MS.NR.2.1.TM.F** to illustrate particle pollutants. Allow students to discuss their thoughts on these items.

C. Particle pollutants are small particles of dust or liquid that pollute the **air**.

1. Examples: smoke from factories, burning trash, forest fires, and dust from a dirt road.

Air pollution can play a significant role in the well-being of plants, animals, and humans. Living things need good quality **air** to survive and thrive. Pollutants like carbon, sulfur, and particles can be found in almost every community. Let's take a look back and review our thoughts from today.



Types of Air Pollution

Review/Summary

Utilize the Picasso e-Moment®.

As your exit ticket today, think about **air**, **air pollution**, and **air pollutants**. If you were an artist painting a picture, how could you pictorially represent this information? What would be included in the picture? Is the picture that of a landscape, a portrait, a still life, or an action?

When I say PAINT, take the remainder of the class time to draw a picture that illustrates this information. Select one of the words, **air**, **air pollution**, or **air pollutants**, and give a pictorial representation of what the word means. Make sure that if we were to look at your picture, we would be able to tell which word you were trying to illustrate. Everyone will have one piece of white paper and access to color pencils (use whatever is available – paints, crayons, markers, etc). What questions do you have?

Answer any questions that may arise.

PAINT.

A great way to have students appreciate each other's work is to have a gallery walk. Once all students finish, line up the pictures throughout the room. Label each picture with either a number or a letter. Have students visit each picture, and on their own piece of paper, identify what each picture represents. Refocus as a class and talk about each picture and what the group thought each picture illustrated. This is further talk and learning on these three concepts.

Great job today! It is amazing to see that you picked different things to represent **air**, **air pollution**, and **air pollutant(s)**. **Air pollution** or pollutants can have a direct effect on the **air** we breathe. It is important to be aware that **air** is supposed to be colorless or invisible, odorless, and tasteless. Anything that changes these features is a form of pollution. We need to ensure that we are not part of the problem or that we are taking steps to assist in the management of **air pollution**. Remember your choices have an impact on tomorrow.

Application

Extended classroom activity:

Students can look at pollutants that affect their area directly. Local metropolitan areas, power plants, refineries – have students investigate what type of pollutants they come in contact with each day.

FFA activity:

Have a local **air** quality expert come and demonstrate how to test **air** quality to FFA members.

SAE activity:

Create an agriscience fair project about **air** quality locally and its effects on plant or animal life.

Evaluation

MS.NR.2.1.ASSESS.A

Answers to Evaluation

Section 1: Matching

1. B
2. C
3. E
4. A
5. D
6. G
7. F

Section 2: Short Answer (Must include one of the answers to be correct)

8. Car exhaust, combustion engines, petroleum industry
9. Burning coal, burning oil
10. Smoke from factories, burning trash, forest fires, and dust from a dirt road
11. Answers will vary.



Why Is Air Important to Plant, Animal, and Human Life?

Objective 1. Describe the impact of air quality on plant, animal, and human life.

I. Define air

A. Air is a mixture of gases that surround us that is invisible, tasteless, and odorless.

II. Why is air important to plants, animals, and humans?

A. Plants use air in the photosynthesis process that allows plants to produce food.

B. Animals and humans breathe in air to exchange gases from natural body functions.

C. Plants, animals, and humans would not survive without air.

III. What impact could poor air quality have on plants, animals, and humans?

A. Plants could produce poor fruit and have damage to their leaf tissue.

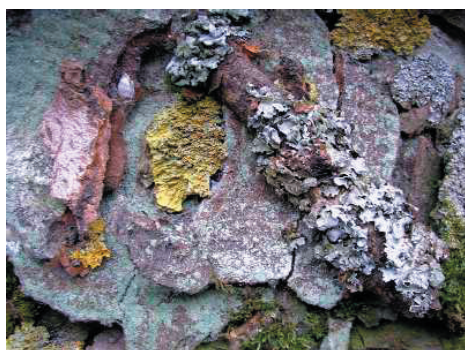
B. Animals and humans can develop breathing problems, as well as certain respiratory diseases caused by poor air quality.



How Poor Air Quality Can Affect Plants



Very Clean Air
Shrubby green lichen,
numerous types



Clean Air....
Leafy green lichen,
numerous types



Slightly Dirty Air...
Flat rounded lichens,
green, yellow, black
or orange



Very Dirty Air
Patches of crusty
orange or grey-green
lichens

Lichens:

Lichens are widely used as environmental indicators. If air is very badly polluted with sulphur dioxide there may be no lichens present, just green algae may be found. If the air is clean, shrubby, hairy and leafy lichens become abundant.

NO LICHENS = Very Dirty Air

Lichen Jungle Pictures (Copyright C.Gourlay 2003)



What Is Air Pollution?

Objective 2. Cite three examples and sources of air pollution.

I. Define air pollution.

A. Air pollution is the contamination of the air by smoke and other harmful gases.

II. Define air pollutant.

A. An air pollutant is any material that causes air pollution.

III. What are three examples and sources of air pollution?

A. Carbon dioxide and carbon monoxide are gas pollutants caused by the burning of materials often from the petroleum industry.

1. Examples: Car exhaust, combustion engines

B. Sulfur oxides are found in the air as a result of burning a fuel containing sulfur.

1. Examples: burning of coal or oil

2. If high enough levels are present, sulfur oxides will emit a “rotten-egg” smell.

C. Particle pollutants are small particles of dust or liquid that pollute the air.

1. Examples: smoke from factories, burning trash, forest fires, and dust from a dirt road.



MS.NR.2.1.TM.D

Vehicle Emissions as Pollutants





Factory Emissions as Pollutants





Particle Pollutant Examples





The Effects of Air Quality on Plant, Animal, and Human Life

Section 1: Matching

Match the letter with the correct definition.

- | | | |
|----------|---|------------------------|
| 1. _____ | The contamination of the air by smoke and other harmful gases. | a. Air |
| 2. _____ | Any material that causes air pollution. | b. Air pollution |
| 3. _____ | A type of pollutant that smells like rotten eggs. | c. Air pollutants |
| 4. _____ | A mixture of gases that surround us that is invisible, tasteless, and odorless | d. Carbon pollutants |
| 5. _____ | A type of pollutant caused by the burning of materials from the petroleum industry. | e. Sulfur pollutants |
| 6. _____ | Animals, humans, and _____ would not survive without air. | f. Particle pollutants |
| 7. _____ | A type of pollutant where small particles of dust or liquid pollute the air. | g. Plants |

Section 2: Short Answer

Answer the following questions in a short answer.

8. Name one source of carbon pollution. _____
9. Name one source of sulfur pollution. _____
10. Name one source of particle pollution. _____

11. Describe the impact of air quality on plant, animal, and human life.
