

Terrarium in a Bottle: Modeling the Atmosphere, The Greenhouse Effect and The Water Cycle—7th Grade

Purpose

In this lesson, the students will explore the atmosphere, air and water quality, the water cycle, the Greenhouse Effect, global warming, climate change, and human-environment interaction through a number of experiments, interactive webquests and projects. They will focus on the importance of understanding meteorology and the cycling of water and gases in and out of the Earth and atmosphere in order to effectively plan, grow and harvest. They will investigate important factors that influence the weather and different methods of predicting the weather. They will analyze how humans interact with and impact the environment. They will build an understanding of the dependency of humans on the natural world, juxtaposed with evaluation of human destruction of the earth. The lesson is ideally conducted over 8 days, using 90 minutes per activity.

Subject Area(s)

English Language Arts, Science, Social Studies

Common Core/Essential Standards

ELA

- Key ideas and details: 2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
- Integration of Knowledge and Ideas: 7. Integrate and evaluate content presented in diverse formats and media, including visually or quantitatively, as well as in words.
- Integration of Knowledge and Ideas: 8. Delineate and evaluate the argument and specific claims in a text, including the validity and reasoning as well as the relevance and sufficiency of the evidence.
- Range of Reading and level of Text Complexity: 10. Read and comprehend complex literary and informational texts independently and proficiently.

Science

- **7.E.1.1:** Compare the composition properties and structure of the Earth's atmosphere to include: mixtures of gases and differences in differences in temperatures and pressure within layers.

- **7.E.1.2:** Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on Earth.
- **7.E.1.4:** Predict weather conditions and patterns based on information obtained from: 1) weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure), 2) weather maps, satellite, and radar, and 3) cloud shapes and types and associated elevation.
- **7.E.1.6:** Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship.

Science as Inquiry Standards

- Explain the importance of validity and reliability in the scientific research process.
- Make observations and form logical hypotheses
- Identify independent variables, dependent variables and control variables.
- Collect, record, and analyze relevant data.
- Formulate evidence-based conclusions from analysis of data and results.
- Apply creative thinking and problem-solving skills to the scientific design and research process.
- Use critical thinking and analysis skills to design experiments, evaluate results, and apply findings to real world situations.
- Interpret, evaluate and analyze charts, graphs, and maps containing meaningful data.
- Create charts, graphs, and maps containing meaningful data.
- Apply the importance of using the scientific method and scientific inquiry skills in conducting real-world scientific research.

Next Generation Science Standards

- MS – ESS3-5: Ask questions to clarify evidence of factors that have caused the rise in global temperatures over the past century.
- MS – ESS3.D Global Climate Change: Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth’s mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS – ESS3-5)
- MS – ESS5 – 5 The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS – ESS2-5)
- MS – ESS2 – 6 Develop and use a model to describe phenomena.

- MS – ESS2 – 5 Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.
- MS – ESS3 – 5 Ask questions to identify and clarify evidence of an argument.

Social Studies

- **7.G.1.2:** Explain how environmental conditions and human responses those conditions influence modern societies and regions (e.g. natural barriers, scarcity of resources and factors that influence settlement).
- **7.G.1.2:** Explain how demographic lead to conflict, negotiation, and compromise in modern societies and regions.
- **7.G.2.2:** Use maps, charts, graphs, geographic data and available technology tools (i.e. GPS and GIS software) to interpret and draw conclusions about social, economic, and environmental issues in modern societies and regions.
- **7.G.1.3:** Explain how natural disasters, preservation efforts, and human modification of the environment affect modern societies and regions.

Agricultural Literacy Outcomes

Science, Technology, Engineering & Math

- Students will explain the importance and fragility of the atmosphere surrounding the Earth.
- Students will explain and graphically represent the gas composition of the air we breathe in the atmosphere.
- Students will evaluate what would happen if any of the key gases were off balance (Nitrogen, Oxygen, Carbon Dioxide, Ozone).
- Students will describe and graphically represent the relationship between altitude and air pressure throughout the layers of the atmosphere.
- Students will describe and graphically represent the relationship between altitude and temperature throughout the layers of the atmosphere.
- Students will explain the path water takes through a continuous cycle in the atmosphere and on Earth: evaporation, transpiration, condensation, precipitation, runoff, collection, and groundwater.
- Students will investigate what would happen to life on Earth if the water cycle was disrupted.
- Students will apply the importance of the water cycle to life on Earth.
- Students will explain the Greenhouse Effect and its importance to life on Earth.
- Students will evaluate the risks of the Greenhouse Effect, including global warming and climate change.

Culture, Society, Economy & Geography

- Students will conceptualize how the Greenhouse Effect combined with human activity has contributed to global warming and climate change.
- Students will analyze how human action impacts air and water quality on Earth.
- Students will evaluate how pollutants and human actions impact the water cycle.
- Students will analyze how air and water quality affects the health of humans and all organisms on Earth.
- Students will describe the different types and sources of human pollution.
- Students will conclude that using less fossil fuels and producing less CO₂ emissions will improve the health of the atmosphere.
- Students will recognize human contribution to air and water pollution and articulate the importance of humans monitoring the air quality of the atmosphere and stewardship.
- Students will analyze human/environment impact in modern societies and regions.
- Students will explain how population growth can lead to conflict or compromise in a given area.
- Students will understand human response to environmental conditions (and vice versa).
- Students will identify how charts, maps, geographic data, and visual arts concepts are used to organize and interpret information about geographic phenomena.
- Students will interpret their own ecological footprint and evaluate their personal impact on global climate change.

Agriculture and the Environment

- Students will apply the significance of the water cycle to growing and agriculture.

Essential Questions

1. *What is the atmosphere?*
2. *What is the Greenhouse Effect?*
3. *Explain the Water Cycle.*
4. *What is Climate Change?*
5. *Explain pollution and the effects of pollution on Earth.*

Vocabulary

Atmosphere: the layer of gases that surrounds the Earth forming the air we live in and breathe

Air Pressure: the weight of the air pushing down on us

Wind: moving molecules of air

Greenhouse Effect: the effect in which the Earth's atmosphere traps in ultraviolet rays from the sun, warming the Earth and keeping gasses and water cycling through

Air Quality: the health state and quality of the air around us

Pollutant: a substance or energy introduced into the environment that causes harm to health of the environment

Acid Rain: any form of precipitation with high levels of nitric and sulfuric acids

Global Warming: the recorded gradual temperature rise on Earth

Climate: the average weather in a specific place recorded over a 30-year time period

Weather: the short-term measurement of atmospheric conditions

Climate Change: a change in global or regional climate patterns attributed largely to the increased levels of atmospheric carbon dioxide produced by fossil fuel emissions

Water Cycle: the continuous cycle of water flowing through different stages and steps in the atmosphere and on Earth

Transpiration: water vapor emitted from plants that is evaporated into the atmosphere

Evaporation: water turns into water vapor and travels up into the atmosphere

Condensation: water collects and transforms from a gas vapor to a liquid and forms clouds

Cloud: a collection of millions of tiny water droplets or ice crystals gathered together with other particles of matter

Precipitation: water falling from the atmosphere to Earth in the form of rain, snow, sleet or hail

Collection: water that gathers and builds up in oceans, lakes, rivers, and streams

Ground Water: water that is stored in the ground or moving underground

Run-Off: water from rain, snowmelt, or other sources that flows over the land surface

Meteorology: the study of processes of the atmosphere and forecasting the weather

Student Motivator

Begin by asking the students, *How are humans able to live on Earth, but not on any other planet?* Bring the class back together by explaining that *they will learn Earth's processes that allow for human life.*

They will also learn about how weather affects Earth, and how humans affect Earth. Ask the students if they can *list some positive and negative aspects about humans living on Earth.*

Background Knowledge

Student knowledge prior to beginning this lesson:

- Students should have scientific process skills knowledge.
- Students should know the steps of the Scientific Method, and know how to apply the steps to experimental situations.
- Students should know how to form experimental questions, hypotheses, and conclusions.

- Students should know how to identify variables: independent variables, dependent variables, control variables.
- Students should know how to create and interpret basic data tables and graphs.

Globally, the current decade is observing severe environmental destruction, climate change and global warming due to human activity. This is drastically impacting agriculture and growing. We see the impacts in severe weather, changing species, melting and changing habitats, the spreading of diseases, food and water shortages and agricultural struggles. We are plagued by air, water and land pollution and our environment is fast deteriorating. Students should be knowledgeable and passionate about these issues and potentials in this field because they will be the active environmental scientists of the future.

In the main project, the bottles represent the Earth's atmosphere. The inside of the bottles represents the Earth. The terrariums model:

1. Atmospheric cycling of gases and water.
2. The Greenhouse Effect
3. The Water Cycle

Students will investigate how terrariums can support plant life and make connections on how our Earth and atmosphere work to support human, animal, and plant life. Students will conceptualize the necessities for healthy plant life in the terrariums and make connections to agricultural plant life and growth. They will investigate what happens when life cycles are disturbed by human activities and make connections to the real world natural life cycles presently being disturbed.

Materials

- Counter/Work space
- Outside access
- Access to sunlight in classroom
- Scissors
- Smart Board to display PowerPoints, videos, etc. (activities could be modified to be done without this)
- Internet access (activities could be modified to be done without this)
- Computer Lab access (activities could be modified to be done without this)
- 2-Liter bottle (2 per student or group is optimal), cut in half for the students, or with a hole poked in the bottle for the students to finish
- Activated Carbon
- Potting soil
- Pebbles

- Plants
- Fast sprouting seeds (bean seeds, radish seeds, sunflower seeds)
- Thermometers
- Spray bottles
- Vaseline
- Note cards
- Construction paper
- Colored pencils, crayons, markers, etc.
- Posters
- Candle (and matches or a lighter to light the candle)
- Water
- Plate
- String
- Zip-loc bags
- Sticky, plain white labels
- Magnifying glasses

Procedures

Activity 1: Introduction to the Atmosphere (use the *Day 1/Day 2 Atmosphere PowerPoint*)

1. Ask the students, *Why do you think that humans, animals, and plants can live on the Earth but not on any other planet? What do you think our air is made of?*
2. Show the [Introduction to Our Atmosphere video](#) and have the students complete the *Atmosphere Guided Notes* worksheet.
3. Summarize the video with the students by reviewing the *Atmosphere Guided Notes* with the class to ensure learning.
4. Set up a demonstration of the Composition of the Atmospheric gas composition by placing a candle in a plate of water. Light the candle and put the jar over it. The candle will burn the oxygen and the water will rise up 20% of the jar and replace the burnt oxygen.
5. Have the students create pie charts representing the air composition of the atmosphere, using the percentages found on slide #10 of the *Day1/Day 2 Atmosphere PowerPoint*.
6. Watch the [Learn About Planet Earth video](#) and the [Air Pressure explained video](#).
7. Ask the students, *What is altitude? What is air pressure?* Give each student an *Atmosphere Graphing Activity* worksheet to complete.
8. For a fun summary of the Earth's layers, you can show [Mr. Lee – Layers of the Atmosphere rap](#).

Activity 2: Atmosphere Creative Projects (using the Day 1/Day 2 Atmosphere PowerPoint)

1. To review the learning from **Activity 1**, ask the students, *What is atmosphere? Why is the atmosphere important to life on Earth? What would happen if we did not have an atmosphere?*
2. Show the [Reveal Earth's Atmosphere video](#) and ask the students, *What layer do we live in? Where do the weather and clouds occur? Does air (our atmosphere) weigh anything?*
3. Using the *Day 1/Day 2 Atmosphere PowerPoint* slides 28-40, review the atmosphere concepts with the students. Use the questions on the slides to retrieve answers from the class. Have the students explain their answers.
4. Give each student a copy of the *Atmosphere Project*. The students will create a foldable brochure using the information they have collected, and each item with a check box should be included in the brochure. Explain that they can use their *Atmosphere Guided Notes* worksheet and *Atmosphere Graphing Activity* worksheets to complete the tasks for the project.

Activity 3: Introduction to the Greenhouse Effect and Climate Change (use the Day 3 Greenhouse Effect PowerPoint)

1. Show the students the picture of the Earth in a blanket (found on *Day 3 Greenhouse Effect PowerPoint*). Ask the students to *explain this picture*. They should explain that the blanket represents the Earth's atmosphere, and how the Earth keeps heat.
2. Using the [EPA's Student's Guide to Global Climate Change website](#), navigate through three different options, and watch the corresponding video for each. Ask the students, 1) *What do you see?* 2) *What's going on?* 3) *What do you wonder?*
3. Give each student a *Greenhouse Effect Guided Notes* worksheet and use slides 3-8 of the *Day 3 Greenhouse Effect PowerPoint* to teach the concept of the Greenhouse Effect.
4. Show [NASA's The Greenhouse Effect video](#) to explain the benefits of the Greenhouse Effect. Deepen the learning by asking the students, *What would happen if Earth did not have an atmosphere? What does the atmosphere trap? Why is it called the Greenhouse Effect?*
5. Next, show [The Greenhouse Effect video](#), which will explain the risks and dangers of Global Warming. Follow up with these questions to the students, *What would happen without the Greenhouse Effect? What is the Greenhouse Effect causing? How are we creating Greenhouse gases? What will happen?*
6. Set up stations around the classroom using the *Climate Change Stations* information sheets about the different impacts of climate change. Students should rotate quietly from station to station learning about climate change and its impacts while filling out a *Climate Change Graphic organizer*.

Activity 4: Atmosphere, Greenhouse Effect, Climate Change, Water Cycle Webquest

1. Review with the students by showing the [What is the Greenhouse Effect? – Global Ideas video](#) and asking the questions, *How is the atmosphere like a greenhouse? What is Global Warming and how could it affect life on Earth?*
2. Have the students complete the *Atmosphere Webquest report* in a computer lab by setting up “stops” or stations where they will explore the following information:
 - 1st stop: Composition of the Atmosphere – adjusting gas levels (Nitrogen, Oxygen, Carbon Dioxide, Ozone) to see what would happen to life on Earth
 - 2nd stop: Sending weather balloons and rockets up into the layers of the atmosphere to see how temperature and pressure change in different altitudes and to see key features at different layers
 - 3rd stop: Weather wiz kids – what causes the weather? Weather vs. Climate, the reasons for the seasons, the water cycle, water supply on Earth, etc
 - 4th stop: Greenhouse Effect, Climate Change, Global Warming
 - 5th stop: Early Finishers weather games

Activity 5: Water Cycle and begin Terrarium project (use *Day 5 Water Cycle Terrarium PowerPoint*)

1. Using the Day 5 Water Cycle Terrarium PowerPoint slide #1, review the Greenhouse Effect with the students. You may opt to show the students the [What is the Greenhouse Effect? – Global Ideas video](#) again while reviewing. Ask them to answer the following questions:
 - a. Describe the Greenhouse or Effect using pictures and/or words.
 - b. How is the Greenhouse Effect helpful to life on Earth?
 - c. How could the Greenhouse Effect be harmful to life on Earth?
2. Review the following vocabulary words with the class: *evaporation, transpiration, condensation, precipitation, run-off, groundwater, collection*. Allow the students to tell you what they already know about these vocabulary words.
3. Show the students [The Water Cycle video](#), and give them each a *Water Cycle Guided Notes worksheet*.
4. Using the water cycle diagram picture found on the *Water Cycle Guided Notes*, the students should draw their own diagram on the back of their papers, and label the diagram accordingly. Allow them to pair up to check their work or compare and contrast diagrams.
5. Review the Water Cycle diagram using slide #8 on the *Day 5 Water Cycle Terrarium PowerPoint*. You may choose to show the [NASA Earth’s Water Cycle video](#) while reviewing.
6. Read the Laboratory instructions found on the *Lab Terrarium in a Bottle worksheet* and watch the [“How to” video](#) while setting up for the Terrarium bottles.
7. Students will construct their Terrarium bottles in groups of 2-3.

8. Set up various whole class experiments:
 - a. What will happen if we take the top off?
 - b. What will happen without soil?
 - c. What will happen if we put the terrarium in the dark?
 - d. What will happen if we pollute the terrarium with things we use in daily life, such as air freshener, shampoo, and Lysol cleaner?
9. Identify Variables and form Hypotheses for each experimental terrarium, using the *Lab Terrarium in a Bottle worksheet*.
10. Have the students set up an experimental terrarium which investigates an experimental question of their personal curiosity. They should use their *Lab Terrarium in a Bottle worksheets* to identify new variables and create new hypotheses for this experiment.
11. Let the Terrariums sit for a week.
12. Ask the students, *What does the bottle represent? What does the inside of the bottle represent?* They should understand that the bottle represents the atmosphere, and the inside of the bottle represents the Earth. Next ask them to explain the two main ideas shown using the Terrarium projects. They should understand that the Terrariums illustrate the Greenhouse Effect and the Water Cycle.
13. Have the students finish their work on the *Lab Terrarium in a Bottle worksheet*.

Activity 6: Human-Environment Interaction with global air and water quality issues (use the Day 7 Human Environment Interaction and Water Cycle Continued PowerPoint)

1. Have the students list 5 things they use water for in their daily lives, using the *Human-Environment Interaction Guided Notes worksheet*.
2. Ask the students to answer the questions on the *Day 7 Human Environment Interaction and Water Cycle PowerPoint*:
 - a. *What would life be like if you didn't have clean water to do these things?*
 - b. *If you had to choose between clean water and clear air, which would you choose and why?*
 - c. *Do you think you drink the same water as the dinosaurs did?*
3. Explain to the students that the Water Cycle is a continuous cycle that provides life on Earth with fresh and clean water.
4. Show slide #5 and #6 of the *Day 7 PowerPoint* to illustrate how water plays a role in the human body, and water accessibility/availability in the world.
5. Show the students the [Water Cycle video](#) to review the steps and cycle of water throughout the Earth and atmosphere. Pause, and let the students list the steps in their *Human- Environment Interaction Guided Notes worksheet*.

6. Show [NASA: The Water Cycle video](#) which shows the steps without captions, and challenge the students to identify the steps without the words. You can also show [The Water Cycle rap](#) for a fun review.
7. Take a “Trip around the Globe” to explore pollution, environmental issues, climate change, etc by showing the students the following videos:
 - 1st Stop: [Ecuador Indigenous Tribes against Texaco oil](#)
 - 2nd Stop: [China Air Pollution](#)
 - 3rd Stop: [Antarctica Polar Bears](#)
 - 4th Stop: [North Carolina Traffic Pollution](#)
8. Review the learning with the students by asking the following questions:
 - a. *Where does the Water Cycle happen?*
 - b. *What is evaporation?*
 - c. *In Condensation, where does the water condense?*
 - d. *Provide 2 examples of precipitation.*
 - e. *What provides energy to the water cycle?*
9. Ask the students to *decide the most interesting global air quality or water quality issue to you and why?*

Activity 7: Air Quality Webquest and Smog City Interactive (use Day 7 Air Quality PowerPoint)

1. Show the [Air Pollution video](#). Give the students the *Air Quality Webquest Guided Notes worksheet*, and have them answer the Daily Do Now questions.
2. Continue the Day 7 Air Quality PowerPoint slides 2-14, allowing for student discussion for each concept, and pausing for time to complete their *Air Quality Webquest Guided Notes worksheet*.
3. In the computer lab, have the students complete the Air Quality Webquest using their *Air Quality Webquest Guided Notes worksheet* for instructions and answers.
4. Next, have them complete the Smog City Interactive. They will manipulate different aspects (pollution, fossil fuel emissions, heat, etc.) to see how they affect smog and pollution levels. Students will conduct experiments and take on challenges to make smog city the smoggiest possible and to save smog city from ozone and pollutants.
5. Allow students to compare and contrast Webquest answers on their *Air Quality Webquest Guided Notes worksheet*.

Activity 8: Terrarium observations (use Day 7 Air Quality PowerPoint slides 16-20)

1. Display slide #16 of the *Day 7 Air Quality Power Point* which shows the Carl Sagan quote: “Anything else you’re interested in is not going to happen if you can’t breathe the air and drink the water. Don’t sit this one out. Do something.”
2. Ask the students the following questions:
 - a. *What is this quote trying to say?*
 - b. *What does it inspire you to do?*
 - c. *Does it make you want to encourage others to take action?*
3. Review the Terrarium Lab with the students. They should understand what the experiment (the Greenhouse Effect and The Water Cycle) represents, including the inside (Earth) and outside (atmosphere) of the bottle. Divide the in half, and assign The Greenhouse Effect to one group and The Water Cycle to the other group. Bring the class back together and have each group present the concepts to the class.
4. Next, the students will conclude their Terrarium projects by observing and explaining the steps of The Water Cycle within the Terrariums.
5. They will evaluate how the Terrariums exhibit the Greenhouse Effect.
6. Ask the students:
 - a. *What happens without the cover?*
 - b. *What steps of the water cannot happen?*
 - c. *Can the water cycle continue without these steps? (Condensation cannot happen; therefore precipitation cannot happen, the Water Cycle cannot continue, severe drought, etc.)*
 - d. *What happened to the terrarium that had no sunlight?*
 - e. *What could not happen that is essential to plant growth? (Photosynthesis from the sun’s energy, also the sun’s energy drive the water cycle)*
 - f. *What has happened to the polluted Water Cycle? (Represents humans polluting the atmosphere)*
 - g. *What happened in your personal experimental water cycle?*
7. Next, set up Air Pollution Traps for the weekend using the *Lab Pollution Detectors experiment worksheet*. The students should complete the Experimental Questions, Background, Materials, Hypothesis, and Procedure. The detector should be in place for 3-4 days.
8. After 3-4 days, have the students observe the pollution catchers and identify pollutants.
9. Students should finish their lab reports, completing the Results and Discussion and Conclusion sections of the *Lab Pollution Detectors worksheet*.

Activity 9: Pollution Brochures

1. Ask the students to record their answers in their notebooks for the following prompts:

- a. *List 10 sources of human pollution.*
 - b. *Explain 5 ways you cause pollution.*
 - c. *Brainstorm 5 things all humans can do to help reduce pollution.*
 - d. *List 3 things you will focus on doing to reduce pollution.*
2. Give each student a copy of the *Pollution reading and brochure document*.
 3. The students should read each section and the vocabulary. Using the information provided, the students will create a brochure about air pollution and what can be done to reduce air pollution. The requirements and instructions for the brochure are listed on the *Pollution reading and brochure document*.

Suggested Companion Resources

- Mr. Lee – Layers of the Atmosphere rap
<https://www.youtube.com/watch?v=AkaY1dvZer4>
- The Water Cycle Rap (with lyrics)
<https://www.youtube.com/watch?v=i3NeMVBcXXU>

Essential Files

- [Day 1/Day 2 Atmosphere PowerPoint](#)
- [Atmosphere Guided Notes worksheet](#)
- [Atmosphere Graphing Activity worksheet](#)
- [Atmosphere Project](#)
- [Day 3 Greenhouse Effect PowerPoint](#)
- [Greenhouse Effect Guided Notes worksheet](#)
- [Climate Change Graphic Organizer \(chart\)](#)
- [Climate Change Stations \(information sheets\)](#)
- [Atmosphere Webquest report](#)
- [Day 5 Water Cycle Terrarium PowerPoint](#)
- [Water Cycle Guided Notes worksheet](#)
- [Lab Terrarium in a Bottle worksheet](#)
- [Day 7 Human Environment Interaction & Water Cycle Continued Power Point](#)
- [Human-Environment Interaction Guided Notes worksheet](#)
- [Day 7 Air Quality PowerPoint](#)
- [Air Quality Webquest Guided Notes](#)

- [Lab Pollution Detectors worksheet](#)
- [Pollution reading and brochure document](#)

Essential Links

- Introduction to Our Atmosphere Video
<https://www.youtube.com/watch?v=I6jIMkPwahQ>
- Learn About Planet Earth – Earth’s Atmosphere Video
https://www.youtube.com/watch?v=fyfN9t_E0w8
- Air Pressure explained Video
<https://www.youtube.com/watch?v=jmQ8FWnM0fA>
- Reveal Earth’s Atmosphere Video
<https://www.youtube.com/watch?v=1YAOT92wuD8#t=48>
- Student’s Guide to Global Climate Change interactive website
<https://www3.epa.gov/climatechange/kids/impacts/effects/index.html>
- NASA Earth Observatory – The Greenhouse Effect video
<https://www.youtube.com/watch?v=ZzCA60WnoMk>
- The Greenhouse Effect video
<https://www.youtube.com/watch?v=5zLuqSYF68E>
- What is the greenhouse effect? – Global Ideas video
https://www.youtube.com/watch?v=BPJJM_hCFj0
- The Water Cycle video
<https://www.youtube.com/watch?v=al-do-HGuIk>
- NASA Earth’s Water Cycle
<https://www.youtube.com/watch?v=oaDkph9yQBs>
- How to Build a Pop Bottle Terrarium
https://www.youtube.com/watch?v=69hYV9ti_R8
- Water Cycle video
<https://www.youtube.com/watch?v=iokKd5FWZOE>
- NASA: The Water Cycle
https://www.youtube.com/watch?v=0_c0ZzZfC8c
- Indigenous People in Ecuador Sue Over Amazon Pollution
<http://www.youtube.com/watch?v=4rpfakOg5GM>
- The Devastating Effects of Pollution in China
<https://www.youtube.com/watch?v=q4DtOhe2LfQ>
- State of the Planet’s Wildlife: Climate Change May be a Death Sentence for Polar Bears
https://www.youtube.com/watch?v=O_HyqPZdN5s

- Urban Air Pollution
- <http://www.youtube.com/watch?v=7VqhaP-OoRY>
- Air Pollution
<https://www.youtube.com/watch?v=UcWpkWBX04E>

Ag Facts

- When farming operations are sustainably managed, they can help preserve and restore critical habitats, protect watersheds, and improve soil health and water quality. ¹
- Some farmers use beneficial insects instead of pesticides to prevent plant destruction. ² Beneficial insects are insects that already live in the area that prey on crop-harming insects.
- Earth Day started on April 22, 1970 and marked the birth of the modern environmental movement. ³

Extension Activities

- Have the students create a “Scientific Weather Report” where they explain the scientific processes for why it’s raining, warm, cold, etc. The reports can then be presented to other classes.
- Students can create posters with slogans like, “Keep our Campus Clean” and “Please do not Litter.” Have them decorate the posters with statistics they have learned.

Sources & Credits

1. http://wwf.panda.org/what_we_do/footprint/agriculture/impacts/
2. http://articles.baltimoresun.com/2013-04-18/explore/ph-ag-letter-snodgrass-0419-20130418_1_conservation-reserve-program-farmers-ranchers
3. <http://www.earthday.org/about/the-history-of-earth-day/>

Lesson Author

This lesson plan was written by Illana Livstrom in partnership with the [Kenan Fellowship Program](#) as a 2014-2015 Kenan Fellow. Her mentor throughout the fellowship was Morgan Jackson, General Manager of Duplin Winery located in Rose Hill, North Carolina.