

Unit 4: Water and Air Pollution Environmental Science

13 Class Meetings

Rev. June 2019

Essential Questions

- How do human activities cause water and air pollution?

Enduring Understandings with Unit Goals

EU 1: Freshwater is used for agriculture, industry, and personal consumption, but faces pollution as a result of these activities.

- Explain the sources and effects of major water pollutants.

EU 2: Natural processes and human activity impact the quality of our air.

- Explain the sources and effects of major atmospheric pollutants.

Standards

Next Generation Science Standards:

- **HS-ESS3-4.** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Common Core State Standards

- **CCSS.ELA.CONTENT.WHST.9-12.9** Draw evidence from informational texts to support analysis, reflection, and research.
- **CCSS.ELA.CONTENT.RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account
- **CCSS.MATH.CONTENT.MP.2** Reason abstractly and quantitatively.
- **CCSS.MATH.CONTENT.MP.4** Model with mathematics.
- **CCSS.MATH.CONTENT.HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **CCSS.MATH.CONTENT.HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **CCSS.MATH.CONTENT.HSS.IC.B.6** Evaluate reports based on data.

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MSMHS Academic, Civic and Social Competencies

Competency 1. Read and write effectively for a variety of purposes.

Competency 2. Speak effectively with a variety of audiences in an accountable manner.

Competency 3. Make decisions and solve problems independently and collaboratively.

Competency 4. Apply scientific knowledge and concepts to a variety of investigative tasks.

Competency 5. Contribute to a positive learning environment with respect and responsibility.

Unit Content Overview

- Unit Phenomena (such as damaged marble statues)
- Freshwater
- Surface water
- Runoff
- Watershed
- Groundwater
- Aquifer
- Water table
- Water diversion
- Reservoir
- Point source and non-point source pollution
- Nutrient pollution
- Toxic chemical pollution
- Sediment pollution
- Thermal pollution
- Oil spills
- Great Pacific Garbage Patch
- Clean Water Act
- Properties of the atmosphere
- Air pollution
- Indoor air pollution
- Indoor air pollution health effects
- Emissions
- Primary air pollutant
- Secondary air pollutant
- Smog
- Temperature Inversions
- Acid rain
- Clean Air Act
- Scrubber

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- Catalytic converters
- Ozone hole
- CFCs
- Montreal Protocol

Interdisciplinary Connections

- Marine Studies I- Nitrogen Cycle
- Biology- Ecosystems, Photosynthesis

Learning Objectives with TWPS Activities

Students will be able to...

- Design a model that explains how marble statues become weathered.
 - *Explain how the marble statue has become weathered.*
- Discuss how freshwater can be both renewable and limited.
 - *Discuss how freshwater can be used and how that water can become polluted.*
- Relate the causes of freshwater depletion to their effects.
 - *Analyze the map of the monthly drought outlook. Explain how droughts can impact various ecosystems around the United States.*
(<https://www.drought.gov/drought/data-maps-tools/outlooks-forecasts>)
- Discuss the main categories of freshwater pollution.
 - *Describe the possible ways that tap water can become unsafe.*
(https://www.youtube.com/watch?v=_QJ0wv5qVdI)
 - *Refer back to your model about how marble statues become weathered. Describe if freshwater pollution can contribute to destroying those statues.*
- Describe the sources and effects of major pollutants in the ocean.
 - *Describe the regulations you would put into place if you were in charge of regulating ocean pollution?*
 - *Looking at the Save the Sound graphic, explain how the one sample collected in Waterford, scored an “F.”*
- Identify the main layers of the atmosphere, and describe the conditions found in each.
 - *Imagine being asked by NASA to take a trip to space. Explain how the atmosphere changes as you pass through it to reach outer space.*
- Explain how both natural processes and human activities can cause air pollution.
 - *After watching clips from “The Crown,” explain the cause of smog in London in 1952.*
- Model the effect of acid rain on the environment.
 - *Black snow has been falling in Siberia, Russia this February. Explain why the snow is black instead of white.*
- Explain ways air pollution affects human health.

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- *You are about to spend a semester abroad in Beijing with a friend. Your friend says they aren't going to wear a mask during your time there. Explain some of the health effects your friend might display.*
- Discuss legislation designed to prevent air pollution.
 - *You have just become mayor of your community, and the EPA has informed you that your county has failed to meet air quality standards for sulfur dioxides and nitrogen dioxides. Your community includes an old coal-fired power plant that causes pollution but also provides employment for many people. Explain the measures you would suggest that will deal with the pollution problem but still keep people employed.*
- Analyze EPA emissions data for Connecticut and other states.
 - *In your opinion, should cities start a congestion-charging program (like London has created) to help reduce the amount of air pollution?*

Instructional Strategies/Differentiated Instruction

- **HLP:** Academically Productive Talk
- **HLP:** Writing to Learn (TWPS)
- **HLP:** Effective Feedback
- Power Point Lecture with note-taking
- Guided note-taking
- Warm up activities
- Flexible grouping
- Independent reading
- Foldables
- Exit slips
- Graphic Organizers
- Creating authentic connections for students
- Vocabulary word bank
- Rephrasing and restatement of information and concepts
- Tiered instruction
- Alternative test settings
- Student use of headphones
- Reading and accountable talk discussions of texts
- Student-led instruction
- Homework assignments

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Assessments

FORMATIVE ASSESSMENTS:

- Acid Rain Lab Report
 - MSMHS Rubric 4: Scientific Research
- Guided notes
- Homework
- Accountable Talk Discussion
- Daily Think-Write-Pair Share (TWPS)
- Oral questioning
- Warm ups
- Exit slips
- Close reading and interpretation of text

SUMMATIVE ASSESSMENTS:

- Quiz on EU 1
- Quiz on EU 2
- Acid Rain Lab Report
- Unit Test

Unit Task

Unit Task Name: Acid Rain Lab Report

Description: Students will design and conduct an investigation about the effects of acid rain using information learned about air pollution (EU 1) and water pollution (EU 2). They will perform the lab which tests the effects of acidic rain on natural materials, such as marble, shells or calcium carbonate. After completing the lab, students will write a lab report following the MSMHS guidelines and using the MSMHS scientific research rubric.

Evaluation: MSMHS Rubric 4: Scientific Research

Unit Resources

- Textbook (Environment Science. Jay Withgott, Pearson Education, Inc. 2011.) Chapters 14 and 15
- MSMHS School-wide Rubrics
- Internet databases

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- Newsela articles: Ocean Pollution
- Data Nugget
- YouTube Video Clips
- The Crown on Netflix
- Graphing calculators
- Large format poster printer
- Microsoft Power Point or Prezi
- Laptops