

# 2019 Core Knowledge Science Sequence

## Grade 5 Unit 4: Protecting Earth's Resources

### Introduction

This unit focuses on human use of natural resources, scientific ideas, and technology that can be used to protect Earth's resources over time. Humans use renewable and nonrenewable resources for many aspects of modern life—for agriculture, transportation, industry, and daily needs. Our use of these resources can have negative effects on the environment, even when the resources are helpful to people across the world. The erosion of land, acid rain, and air and water pollution are just some of the consequences that may result from the use of natural resources by a growing population. We can, however, draw upon scientific principles to monitor and protect the environment. Through scientific practices and technology, we can detect when air, water, land, and ecosystems are changing and when they might be threatened. By applying scientific ideas, we can act to protect Earth's resources and our environment.

### Note to Teachers and Curriculum Planners

This unit introduces Grade 5 students to real-world examples and fundamental concepts that will be explored in greater depth in later grades. Students will research efforts that many communities take to reduce the impacts of using natural resources. Using their knowledge of how water, air, and land are used for daily needs, students create a series of action/protection plans, which they will have the option to present to a selected audience of experts. The following are preliminary considerations for planning and instruction relative to this unit:

- The study of renewable and nonrenewable resources is addressed as a project-based learning (PBL) unit. Read more about project-based and problem-based learning on page 3 of the unit's Teacher Guide.
- Each part of this unit engages students to learn of particular natural resources used to meet human needs and how communities work to minimize any negative effects of use.
- This unit has been designed to build on prior knowledge, specifically knowledge gained through CKSci Grade 4 Unit 5, *Using Natural Resources for Energy*. For more information about this, please read pages 5–9.
- Students demonstrate their knowledge of natural resources through certain scientific practices, including the following:
  - determining and combining reliable sources of scientific information as evidence to make a scientific argument
  - describing how communities address human activities that potentially change the environment over time
  - constructing an argument that includes the positive and negative effects of human activity
  - creating and presenting an action/protection plan that outlines certain ways that their community can/should use scientific ideas to protect local natural resources and their local environment

# 2019 Core Knowledge Science Sequence

## Grade 5 Unit 4: Protecting Earth’s Resources



2019 CORE KNOWLEDGE SCIENCE SEQUENCE	SUGGESTED LEARNING OBJECTIVES	LANGUAGE OF INSTRUCTION
<p>The Sequence guidelines identify specific content and skills for building knowledge coherently from grade to grade.</p>	<p>These suggested learning objectives may be modified to meet state and local standards as well as the needs of specific schools and classrooms.</p>	<p>This word list provides a sampling of the vocabulary to which students should be repeatedly exposed during instruction. The list is not intended for use in isolated drill or memorization.</p>
<p><b>A. Protecting Earth’s Water</b></p> <p><u>Human activities affect the quality and availability of water.</u></p> <ul style="list-style-type: none"> <li>● All living things depend on water (fresh or saltwater) to survive.</li> <li>● Water pollution               <ul style="list-style-type: none"> <li>○ Pollution from urban and agricultural runoff (for example, the “Dead Zone” at the mouth of the Mississippi River Delta)</li> <li>○ Groundwater pollution from industrial waste</li> <li>○ Untreated sewage</li> <li>○ Oil spills</li> <li>○ Algal blooms from excess nutrients (for example, fertilizers)</li> </ul> </li> <li>● Unlimited use of fresh water sources may result in shortages (for example, during droughts).</li> <li>● Consequences include:               <ul style="list-style-type: none"> <li>○ Destruction of habitats</li> <li>○ Reduction of biodiversity (the variety of different life in an ecosystem)</li> <li>○ Loss of recreational and living space</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Describe the importance of water to all living things.</li> <li>● Obtain information from reliable sources to describe evidence of positive and negative relationships between human activity and Earth’s water resources.</li> <li>● List several sources of water pollution and describe how each harms the environment and human health.</li> <li>● Describe how people have used scientific ideas and technology to protect water resources.</li> <li>● Develop a plan of suggested actions, based on scientific ideas, to show how your community can protect water resources in your area.</li> </ul>	<p>excessive restrained/unrestrained consequences relationships cause and effect natural resource habitat destruction water pollution biodiversity watershed fresh water ground water hydrosphere algal bloom bacteria problem solution water quality (testing) wastewater water treatment (plant) disinfection conserve/conservation action plan scientific ideas technology monitor data protect/protection</p>

# 2019 Core Knowledge Science Sequence

## Grade 5 Unit 4: Protecting Earth’s Resources



<p><u>Applying scientific ideas and understanding to protect Earth’s water</u></p> <ul style="list-style-type: none"> <li>● Sewage treatment             <ul style="list-style-type: none"> <li>○ Solid waste management</li> <li>○ Waste water treatment</li> </ul> </li> <li>● Conservation practices: using only as much water as necessary</li> <li>● Protecting river systems and watersheds             <ul style="list-style-type: none"> <li>○ Communities can monitor and regulate the use of river water upstream, which affects the quality and quantity of water downstream, for example:                 <ul style="list-style-type: none"> <li>– Monitoring the agricultural runoff into the Mississippi River</li> <li>– Measuring water use by industries, agriculture, and residential areas</li> </ul> </li> </ul> </li> <li>● Regulations to prevent and reduce water pollution: Clean Water Act</li> </ul>		
<p><b>B. Protecting Earth’s Air</b></p> <p><u>Human activities affect the quality of air around us.</u></p> <ul style="list-style-type: none"> <li>● Many organisms, including most plants and animals, depend on the atmosphere to survive.</li> <li>● Air pollution: human activities discharge matter into the atmosphere, which changes its chemical composition, for example:</li> </ul>	<ul style="list-style-type: none"> <li>● Describe the importance of Earth’s air to a living organism.</li> <li>● Obtain information from reliable sources to describe evidence of positive and negative relationships between human activity and air quality.</li> <li>● List several sources of air pollution and describe how each harms the environment and human health.</li> </ul>	<p>consequence relationships cause and effect interaction atmosphere air quality (index) air pollution/pollutant smog chemical composition health hazards</p>

# 2019 Core Knowledge Science Sequence

## Grade 5 Unit 4: Protecting Earth’s Resources



<ul style="list-style-type: none"> <li>○ Emissions from automobiles and other forms of transportation (for example, nitrogen oxides and carbon monoxide)</li> <li>○ Emissions from industry and burning fossil fuels (for example, sulfur dioxide)</li> <li>● Consequences include:             <ul style="list-style-type: none"> <li>○ Acid rain</li> <li>○ Ozone layer destruction</li> <li>○ Change in Earth's average temperatures over time</li> </ul> </li> </ul> <p><u>Applying scientific ideas and understanding to protect Earth’s air</u></p> <ul style="list-style-type: none"> <li>● Smog reduction and transportation incentives, for example: car exhaust regulations, HOV lanes</li> <li>● Technologies to reduce emission of harmful gases in automotive exhaust (for example, catalytic converters or hybrid cars)</li> <li>● Regulations to prevent and reduce air pollution: Clean Air Act</li> </ul>	<ul style="list-style-type: none"> <li>● Describe examples of scientific ideas and technology used to protect Earth’s atmosphere.</li> <li>● Develop a plan of suggested action, based on scientific ideas, to show how your community can protect air resources in your area.</li> </ul>	<p>emissions acid rain carbon monoxide ozone sulfur dioxide action plan scientific ideas technology clean energy monitor data reliable (source) protect/protection</p>
<p><b>C. Protecting Earth’s Land</b></p> <p><u>Human activities affect the quality of the land around us.</u></p> <ul style="list-style-type: none"> <li>● Many living things depend on the land around them to meet their needs.</li> <li>● Sources of land pollution, including:             <ul style="list-style-type: none"> <li>○ Dumping solid waste</li> <li>○ Using pesticides and harmful chemicals (that can</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Describe at least one way that an organism depends on the land around it.</li> <li>● Obtain information from reliable sources to describe evidence of positive and negative relationships between human activity and Earth’s soil, land, and mineral resources.</li> </ul>	<p>consequence relationships cause and effect interaction geosphere soil pollution erosion habitat destruction at risk/endangered solid waste</p>

# 2019 Core Knowledge Science Sequence

## Grade 5 Unit 4: Protecting Earth’s Resources



<p>last long after their initial use)</p> <ul style="list-style-type: none"> <li>○ Construction and mining projects (that remove soil, rocks, and mineral resources)</li> <li>● Consequences include:             <ul style="list-style-type: none"> <li>● Pollution and chemical changes to the land</li> <li>● Physical changes to ecosystems: habitat destruction, endangerment of wildlife</li> </ul> </li> </ul> <p><u>Applying scientific ideas and understanding to protect Earth’s land</u></p> <ul style="list-style-type: none"> <li>● Reducing waste in landfills by following the principles of “reduce, reuse, recycle”</li> <li>● Chemical testing of hazardous waste</li> <li>● Satellite tracking of soil erosion</li> <li>● Environmental Impact Assessments: evaluating the anticipated environmental effects of a proposed project (for example, building new roads or an oil pipeline)</li> </ul>	<ul style="list-style-type: none"> <li>● List several sources of land pollution and describe how each harms the environment.</li> <li>● Describe examples of scientific ideas and technology used to protect Earth’s land resources.</li> <li>● Develop a plan of suggested action, based on evidence, to show how your community can protect land resources in your area.</li> </ul>	<p>landfill pesticide mining industry chemical change no-till farming crop rotation impact assessment scientific ideas technology</p>
<p><b>D. Protecting Ecosystems</b></p> <p><u>Human activities affect the living and non-living features of ecosystems.</u></p> <ul style="list-style-type: none"> <li>● Overuse or misuse of water, air, and land resources can harm living organisms and the environment they need to survive.</li> </ul>	<ul style="list-style-type: none"> <li>● Describe an example of an ecosystem, including ways in which components of the system interact.</li> <li>● Obtain information from reliable sources to explain positive and negative relationships between human activity</li> </ul>	<p>consequences relationships cause and effect biosphere ecosystems interactions habitat destruction</p>

# 2019 Core Knowledge Science Sequence

## Grade 5 Unit 4: Protecting Earth’s Resources



<ul style="list-style-type: none"> <li>Monitoring is needed to detect ecosystem changes.</li> <li>Species may become endangered or even extinct (for example, the passenger pigeon).</li> </ul> <p><u>Applying scientific ideas and understanding to protect Earth’s ecosystems</u></p> <ul style="list-style-type: none"> <li>Communities can apply knowledge about how ecosystems interact with other systems of the Earth to help protect them. For example:             <ul style="list-style-type: none"> <li>Conservation areas and restoration of damaged ecosystems</li> <li>Wildlife protection plans to maintain and re-grow populations of endangered creatures [for example, after nearly disappearing from most of the United States decades ago, the bald eagle is now flourishing across the nation]</li> </ul> </li> <li>Regulations to protect and conserve ecosystems and wildlife: Endangered Species Act</li> </ul>	<p>and ecosystems, including living and non-living resources.</p> <ul style="list-style-type: none"> <li>List several sources of ecosystem threats and describe how each may harm the environment.</li> <li>Describe examples of scientific ideas and technology used to protect Earth’s ecosystems.</li> <li>Develop a plan of suggested action, based on evidence, to show how your community can protect an ecosystem in your area.</li> </ul>	<p>endangered species extinction threat biodiversity contaminated land pollutant conservation areas green space survey stewardship restoration biodegradable scientific ideas technology monitor data action plan</p>
<p><b>Possible Science Biographies</b>            Rachel Carson: warned of the environmental impacts of pesticides in her book <i>Silent Spring</i>            John Muir: studied wilderness areas and worked to convince people to protect them            Rufus Stokes: patented an air-purification device to reduce the gas and ash emissions of furnace and power plant smokestacks</p>		

# 2019 Core Knowledge Science Sequence

## Grade 5 Unit 4: Protecting Earth's Resources



This unit references the following standards that are a part of the [Next Generation Science Standards \(NGSS\)](#):

[5-ESS3-1](#) Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. [Evidence Statements](#)

**DCI ESS3.C Endpoint:**

***“By the end of grade 5.*** [students will understand that] Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. For example, they are treating sewage, reducing the amounts of materials they use, and regulating sources of pollution such as emissions from factories and power plants or the runoff from agricultural activities.”