

## Plants, Animals, and Earth Processes, Oh My! Changes to the Environment

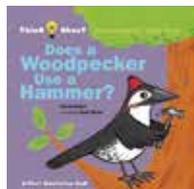
By Christine Anne Royce

The Earth changes over time. Some of the processes that change the Earth's surface are natural, such as weathering and erosion; other changes can be made by plants and animals, including humans. Organisms have had to evolve over time to adapt to new environments. As these organisms evolved, they made still further changes to the Earth and its processes.

The activity for the young students asks them to consider how animals use different parts of their environment to meet their needs and how the environment is impacted by this use. Older students are asked to take the changes seen on Earth a step further by considering how water makes major changes to the Earth's surface through the process of weathering and erosion.

### This Month's Trade Books

#### *Does a Woodpecker Use a Hammer?*

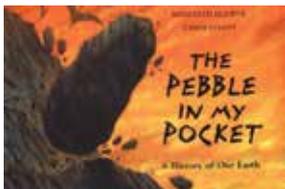


By Harriet Ziefert  
Illustrated by Emily Bolam  
ISBN: 978-1-609054281  
Blue Apple  
32 pages  
Grades K-2

#### SYNOPSIS

This playful book asks readers whether a variety of birds can use a hammer. Through colorful cartoons and illustrations, the reader is introduced to the idea that although animals may not use hammers, they do use their environment to meet specific needs.

#### *The Pebble in My Pocket: A History of Our Earth*



By Meredith Hooper  
Illustrated by Chris Coody  
ISBN: 978-1-84780-768-7  
Frances Lincoln Children's Books  
40 pages  
Grades 2-5

#### SYNOPSIS

Through brilliant and detailed illustrations and descriptive text, this book considers the question, "Where do pebbles come from?" Beginning with the concept of how a rock is formed after a volcanic eruption, the story explains the processes of erosion, weathering, and transportation, the resultant pebble is picked up by a young person. ●

#### ADDITIONAL TEXTS

Koontz, R. 2007. *Erosion: Changing Earth's surface.*

Minneapolis, MN: Picture Window Books.

Maurer, D.D. 2017. *Do you really want to create a mudslide? A book about erosion.* Mankato, MN: Riverstream.



Christine Anne Royce ([caroyce@aol.com](mailto:caroyce@aol.com)) is a professor at Shippensburg University in Shippensburg, Pennsylvania, and President of NSTA.

## Grades K-2: Plants and Animals Can Change the World

### PURPOSE

To investigate ways plants and animals (including humans) can change the environment to meet their needs.

### ENGAGE

Plants and animals can change their environment while using it to meet their needs. Two examples provided in the *Next Generation Science Standards* are of squirrels digging to hide their food and tree roots breaking concrete. Share these two examples with students before beginning the story, and ask them to consider where they may have seen their environment changed by plants or animals. Read *Does a Woodpecker Use a Hammer?* to students and engage them by providing the following prompt: “When you listen to the story, try to think about ways that animals use different objects as tools, and how the animal moved, used, or changed things where they live to help them.” After reading the book, return to the following pages and discuss further to allow students to expand their thinking. Ask them:

- Seagulls dropping clams: Where do you think the seagulls picked up the clams from before dropping them onto rocks?
- Woodpecker using a hammer: When the woodpecker makes holes in trees to find food, the holes are left behind. What do you think the holes do to the tree?



### MATERIALS

- *Does a Woodpecker Use a Hammer?*
- chart paper
- Plants and Animals Can Change Their World Student Data Sheet (see NSTA Connection)
- short video clips (see Internet Resources)
- When Humans Do ... student data sheet (see NSTA Connection)



- Chimpanzee using a stick: What do you think happens to the termite nest when the chimpanzee uses the stick to dig for ants?
- Person plowing the field: When the cows pull the plow in the field, what happens to the soil?

Summarize by asking students to brainstorm a list of different ways that animals or plants change where they live. Record their list on a piece of chart paper.

### EXPLORE

Using a series of short videos (see Internet Resources), students examine different ways that animals and plants can change their environment. The short videos provide visual evidence and some explanation as to how the environment is changed. Using stations set up around the room with the necessary technology (such as tablets or computers) or facilitating this as a whole-class activity, ask students to watch each short video and complete the information on the Plants and Animals Can Change Their World Student Data Sheet (see NSTA Connection). While students watch the videos, use the following questions to help focus them.

- “Squirrels Burying Nuts”: Describe what you see happening in the video. When a squirrel buries a nut,

what does the squirrel do to the ground? How does the process of burying change the area? What do you think would happen if the squirrel doesn't go back to get the nut?

- “The Root Asphalt Driveway Damage”: Describe the ground in the video. What do you think caused the rippling in the concrete? What do you think will happen to the ground as the tree gets bigger and the roots grow?
- “Giant Gopher Digging Hole”: What do you think is moving under the grass? How do you think the gopher got there? As the gopher digs a hole, where do you think the dirt is moved to? How do you think rain would affect the dirt around the hole? What do you think could happen if there are seeds on the plants that the gopher is pulling into the hole?
- “Tree Roots Win Their Battle Against Concrete”: What made all of the different patterns that the tree roots grew around? As the roots grew, why do you think they were able to create the same pattern as the bricks or concrete? What does this tell you about where the roots grow?
- “Fooled by Nature: Beaver Dams”: How does a beaver build a dam? Why does the moving of trees affect the local area? What happens to the river when the beaver builds a dam? As the river gets dammed up, what do you think happens to the surrounding area? How does this change the environment?

### EXPLAIN

Ask students to form teams of three or four, or for younger students, facilitate this activity with the whole class. Ask students to use the reverse side of their student data sheet to complete one of the following prompts. They can list key



words and then verbally explain them during a conference, write out responses, or sketch ideas. The prompts are:

- When tree roots grow underground, they can buckle the blacktop. When this happens, the tree roots change the environment by ...
- Some tree roots will grow through the openings that are easiest to follow. When tree roots grow in between bricks or stones, they might change the environment by ...
- Squirrels often bury nuts for the winter. What changes are made to the environment at the moment when the squirrel buries the nuts? What might happen later if the nut is left in the ground?
- The holes that groundhogs dig are used for their living space. The different ways that the land is changed when a groundhog burrows are ...
- Beavers are animals that live in a lodge and build dams. Some of the ways that beavers change the environment around them are ...

Throughout the discussion of the prompt answers, students should be able to demonstrate that they understand how the actions of plants or animals change their environment. They can return to the list of brainstormed ideas from the Engage phase and decide whether the examples on the list still meet the criteria for change.

### ELABORATE

Students are next asked to consider ways that humans change their environment. Ask students to use the When Humans Do ... student sheet in their groups or as a class to think about and provide an explanation for the following prompts:

- One way that humans change the environment around them is ...



- A reason that humans might make this change is ...
- When this change is made, the ways the land is changed or the environment is changed are ...
- Select one of the ways you mentioned and think about it in more detail to answer the following question. (*Teacher note:* This question allows students to stretch their thinking, and it may be useful to tackle this question as a whole-class discussion first.) When this change is made (e.g., cutting down trees, paving a parking lot), what are some of the ways the area is impacted?

## EVALUATE

Through various media, students demonstrate their ability to brainstorm ways that plants and animals make changes to their environment. Students then connect their understanding to examples in the book. In the Explore and Explain phases, students gather information and connect it to environmental change, how that change impacts the environment, and then why the plant or animal is enacting change based on a need. Finally, students consider how humans make changes to the environment to meet a need.

## Connecting to the *Next Generation Science Standards* (NGSS Lead States 2013)

### K-2: PLANTS AND ANIMALS CAN CHANGE THE WORLD

- The chart below makes one set of connections between the instruction outlined in this article and the *NGSS*. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities.
- The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectation listed below.

#### Standard

#### K-ESS2 Earth's Systems

<https://nextgenscience.org/pe/k-ess2-2-earths-systems>

#### Performance Expectation

K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

DIMENSIONS	CLASSROOM CONNECTIONS
<b>Science and Engineering Practice</b>  <b>Engaging in Argument From Evidence</b>	Students outline specific changes that plants or animals make to their environment by explaining how their actions make those changes.  Students describe how animals (including humans) change the environment to meet their needs.
<b>Disciplinary Core Idea</b>  <b>ESS2.E: Biogeology</b> Plants and animals can change their environment.	Students identify changes that plants and animals have made to their environment after watching short video clips.
<b>Crosscutting Concept</b>  <b>System and System Models</b>	Students outline specific changes that plants or animals make to their environment by explaining how their actions make those changes and what impact the changes might cause.

## Grades 3–5: Exploring Erosion

### PURPOSE

To make observations on different factors that help shape the land and describe the effects of different methods of erosion on land.

### ENGAGE

Pull out a pebble from your pocket and show it to students. Ask them to listen to and answer the following, which is the opening line in the story: “The pebble in my pocket is round and smooth and brown. I found it on the ground. Where did you come from, pebble?” Let students brainstorm to generate initial ideas about the topic.

After students make initial connections and demonstrate their prior conceptions, read *The Pebble in My Pocket* to the class, stopping to discuss the following key points:

- p. 4: Describe the rocks that formed shortly after the Earth started to form. What happened to the land? (It began to tilt upward, fold, buckle, and crumple.)
- p. 5: Describe what happened to the rocks during the different seasons. (They were heated and expanded, and cooled and shrank; cracked; and were pushed apart by ice, forming cracks.)
- pp. 6–8: Describe what happened to the larger rocks over time as they tumbled down the mountain and moved across the land. (Edges were smoothed from sand blowing, big rocks were broken down into smaller rocks, and water moved rocks to different places while smoothing more edges.)
- pp. 10–11: Describe what happened to the pebble that came from the mountain rock when it landed on the shore after millions of years. (Sand filled in the spaces between it and many other pebbles and hardened into a new type of rock.)
- pp. 17–19: After the pebble was moved again, where did it settle this time and what happened to it? (On a sandbar that eventually gets buried.)
- pp. 20–21: Describe what happened to the pebble when glaciers covered the land and then receded. (The pebble was picked up and moved from one place and dropped in another place.)

### EXPLORE

After students listen to the story, show them pictures of land where there has been weathering and erosion (see Internet Resources) and ask them to consider how these

### MATERIALS

- *The Pebble in My Pocket*
- round, smooth brown pebble
- summary table
- Weathering, Erosion, and Deposition slides with pictures (see Internet Resources)
- Erosion Station Investigation Cards (see NSTA Connection)
- plastic bin (at least 18 × 10 in.)
- several small rocks
- spray bottle
- small watering can
- soil or dirt
- tape measure or ruler
- ice cubes/blocks (different sizes)
- sand or small gravel
- shallow plastic tray
- modeling clay
- Erosion Station Student Data Sheet (see NSTA Connection)

pictures and the pebble might be related. As they consider this prompt, ask students to describe what they see in the pictures and what created the different images, which are of erosion, weathering, transportation, and deposition of soil. As students describe the images, record their thoughts on the board or in a table to summarize their thinking.

To help students make their own observations related to erosion, have them participate in two different activities or whole-class demonstrations. In small groups, provide students with the Erosion Station Investigation Cards (see NSTA Connection). A brief description of each station is shown on page 25.



As students participate in these two investigations, ask them to complete their Erosion Station Student Data Sheet (see NSTA Connection), which asks them to make observations and draw conclusions.

## EXPLAIN

Ask students to use the information they obtained from the investigations and the story to discuss the following (where appropriate, introduce the correct terminology to the class as well):

- In your own words, describe what *weathering* and *erosion* are.
- At the water erosion station, what did each part of the model represent (i.e., soil, rocks, spray bottle, watering can)? How are these items similar to and different from the actual objects in nature?
- Using the measurements you took, describe what happened as more soil was eroded from the rocks. If this was in an actual environment, what do you think would happen after enough soil was eroded?
- What did you notice about the bottom of the hill? Describe how this sediment ended up there.
- At the glacier erosion station, what did each part of the model represent (i.e., ice cubes, sand/gravel, clay)?
- When only the ice was used against the clay, what did you observe?

- What happened when sand or gravel was placed beneath the ice cube? Why do you think the sand/gravel created lines or grooves in the clay? If the clay represents dirt or rock, what would have happened to the parts that were carved out?
- After the pan was tilted and some of the ice was allowed to melt, what did you observe?
- How do weathering and erosion help pebbles form?

## ELABORATE

Ask each pair of students to select a pebble from a pile and, using a similar approach to that of the book’s authors, have them write a description of their pebble and a story about how their pebble may have ended up in the area they live. Students should assume that all of the pebbles were located outside in a natural environment (i.e., they were not brought by humans from elsewhere). Ask students to write a short story that contains at least three steps in the life cycle of their pebble and includes terms such as *weathering*, *erosion*, *transportation*, and *deposition*. Students should also illustrate their story with pictures and diagrams to help describe the process. After conferencing with students about the stories, include them in a classroom collection.

## EVALUATE

Students demonstrate their initial understanding of potential ways that a pebble ended up in the teacher’s pocket, which

PURPOSE AND DESCRIPTION	MATERIALS NEEDED	QUESTIONS TO USE
Observe how water helps erode Earth materials. This station will have students create a model stream table.	<ul style="list-style-type: none"> <li>• plastic bin (at least 18 × 10 in.)</li> <li>• several small rocks</li> <li>• spray bottle</li> <li>• small watering can</li> <li>• soil or dirt</li> <li>• tape measure or ruler</li> </ul>	<ul style="list-style-type: none"> <li>• What does this model represent?</li> <li>• What do the spray bottle and watering can represent?</li> <li>• Describe your observations after a light rain and after a heavy rain.</li> <li>• Where did the soil go after it was moved?</li> </ul>
Observe how glaciers can help erode Earth’s materials and transport them to other areas. This station has students create a model glacier.	<ul style="list-style-type: none"> <li>• ice cubes/blocks (different sizes)</li> <li>• sand or small gravel</li> <li>• shallow plastic tray</li> <li>• modeling clay</li> </ul>	<ul style="list-style-type: none"> <li>• What does this model represent?</li> <li>• When you first moved the ice cube across the clay, what did you notice?</li> <li>• After placing some sand or gravel under the ice cube and moving it, what happened? What do you think this represents?</li> <li>• After tilting the tray to a 45-degree angle, placing some sand/gravel beneath the larger block of ice, and allowing it to melt a little, what happened? What does this represent?</li> </ul>

should focus on how the pebble was formed. Through engaging in the story, students discuss different parts of the erosion, weathering, and transportation cycle. They then participate in two investigations that model these ideas. Throughout the investigations, students observe and collect information about the processes, and apply that knowledge by writing their own story about a pebble.

**REFERENCES**

National Governors Association Center for Best Practices

and Council of Chief State School Officers (NGAC and CCSSO). 2010. *Common core state standards*. Washington, DC: NGAC and CCSSO.

NGSS Lead States. 2013. *Next Generation Science Standards: For states, by states*. Washington, DC: National Academies Press. [www.nextgenscience.org/next-generation-science-standards](http://www.nextgenscience.org/next-generation-science-standards).

**INTERNET RESOURCES**

Fooled by Nature: Beaver Dams

**Connecting to the Next Generation Science Standards (NGSS Lead States 2013)**

**3-5: EXPLORING EROSION**

- The chart below makes one set of connections between the instruction outlined in this article and the *NGSS*. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities.
- The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectation listed below.

**Standard**

**4-ESS2 Earth's Systems**

[www.nextgenscience.org/pe/4-ess2-1-earths-systems](http://www.nextgenscience.org/pe/4-ess2-1-earths-systems)

**Performance Expectation**

**4-ESS2-1.** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

DIMENSIONS	CLASSROOM CONNECTIONS
<p><b>Science and Engineering Practice</b></p> <p><b>Planning and Carrying Out Investigations</b></p>	<p>Students investigate, using a model, what happens to the land and/or soil when both water and ice are involved in the processes of weathering, erosion, transportation, and deposition.</p>
<p><b>Disciplinary Core Idea</b></p> <p><b>ESS2.A: Earth Materials and Systems</b></p> <p>Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.</p>	<p>Students investigate, using a model, what happens to the land and/or soil when both water and ice are involved in the processes of weathering, erosion, transportation, and deposition.</p>
<p><b>Crosscutting Concept</b></p> <p><b>Cause and Effect</b></p>	<p>Students make observations about water and glacial erosion's effect on the land through the use of a model.</p> <p>Students write a story that describes at least three stages in the life cycle of a pebble and how it changed due to the effects of weathering, erosion, and deposition.</p>

## Connecting to the *Common Core State Standards* (NGAC and CSSO 2010)

This section provides the *Common Core for English Language Arts and/or Mathematics* standards addressed in this column to allow for cross-curricular planning and integration. The Standards state that students should be able to do the following at grade level.

### ENGLISH/LANGUAGE ARTS

#### Reading Standards for Informational Texts K-5 – Key Ideas and Details

- Grade 4: “Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.”

### LANGUAGE STANDARDS

#### Writing Standards Research to Build and Present Knowledge

- Grade K: “With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.”
- Grade 4: “Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.”

#### Writing Standards K-5 – Text Types and Purposes

- Grade K: “Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.”
- Grade 2: “Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.”
- Grade 4: “Write informative/explanatory texts to examine a topic and convey ideas and information clearly.”

#### Speaking and Listening – Comprehension and Collaboration

- Grade 2: “Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.”

#### Speaking and Listening Standards K-5 – Presentation of Knowledge and Ideas

- Grade K: “Add drawings or other visual displays to descriptions as desired to provide additional details.”
- Grade 1: “Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.”

Vocabulary Acquisition and Use is one of the standards for language. This particular standard is across grade levels: “Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade [appropriate] reading and content.” Furthermore, the *Common Core for ELA* provide a standard related to the Range of Text Types for K-5 where it indicates that students in K-5 should apply the Reading standards to a wide range of texts to include informational science books.

[www.opened.com/video/fooled-by-nature-beaver-dams/42804](http://www.opened.com/video/fooled-by-nature-beaver-dams/42804)

Giant Gopher Digging Hole

[www.youtube.com/watch?v=\\_SwAVRgGROs](http://www.youtube.com/watch?v=_SwAVRgGROs)

Squirrels Burying Nuts

[www.youtube.com/watch?v=5Mt-svDYE3A](http://www.youtube.com/watch?v=5Mt-svDYE3A)

Three Root Asphalt Driveway Damage

<http://bit.ly/2vGDL8Y>

Tree Roots Win Their Battle Against Concrete

[www.youtube.com/watch?v=H2GaePVbni4](http://www.youtube.com/watch?v=H2GaePVbni4)

Weathering, Erosion, and Deposition Slides

<http://bit.ly/2MJXtXX>

### NSTA Connection

Download student handouts at [www.nsta.org/SC1810](http://www.nsta.org/SC1810).