

Erosion

CT Content Standard 4.3



Created By:

Deb Fernandes, Stevens Elementary, Wallingford Public Schools

Kathy Hanisko, Stevens Elementary, Wallingford Public Schools

Michael Ross, Connecticut Science Center

Table of Contents

<u>Section</u>	<u>Page</u>
Title Page	1
Table of Contents.....	2
Summary.....	3
Inquiry Standards.....	4
CT Science Standards and CMT Correlation	5
GLE's and Unpacked Content Standards.....	6
MA Learning Standards	7
Safety Standards.....	8
Misconceptions and Facts	9
Pre-Visit Activity	11
Discovery Center Activity.....	15
Trail Guides	22
Post Visit Activities.....	40
Performance Task.....	51
Guided Exploration (Embedded Task)	
Teacher Manual	55
Student Manual.....	64
Teacher Resources:	
Teacher Background Information	70
Professional Development	74
Interdisciplinary Connections/Extensions	75
Teacher Websites.....	77
Literature Links	79
Videos.....	82
Classroom kits	83
Software	84
Home and School Connections	85
Career Information.....	86
Student Resources	
Websites	87

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

4.3 Summary

Water has a major role in shaping the Earth's surface. This program provides you and your students with pre-visit, visit and post-visit materials related to the topic of erosion. During your visit, your students will enjoy opportunities to make observations, raise questions, and learn about erosion in one of our Discovery Center Classrooms.

In addition, your students will tour the **River of Life Gallery** and the **Planet Earth Gallery**. During their gallery visits, your students will be provided with Trail Guides that will help them make observations, predictions, and raise further questions about specific exhibits within the galleries that are related to erosion.

Also included in this program are lessons that provide interdisciplinary connections, as well as additional resources such as websites, literature links, career information, home and school connections, and related videos.

This unit has been developed to complement some of the core themes, content standards and expected performances of the CT Core Science Frameworks, as well as the National Science Education Standards. It is a supplemental series of “hands-on” investigations that are inquiry-based and designed to engage students as well as to enhance and build upon their prior content knowledge. It may be integrated with other subjects or it may be taught in its entirety within the science classroom.

The complete CT Core Science Curriculum Frameworks is available at the website <http://www.state.ct.us/sde/curriculum/>. See also: American Association for the Advancement of Science, *Atlas of Science Literacy*, Project 2061. In addition, Grade Level Expectations (GLEs) were released in Spring 2009, to “unpack” the science content for grades K-5. Content standard 4.3 examines water's role in shaping the Earth's surface.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Following are the specific sections from the CT Core Science Curriculum Framework that are addressed in this unit. The B INQ information reflects the process skills intended for grades 3-5 specifically representing the content standards of scientific inquiry, literacy, and numeracy.

Grades 3-5 Core Scientific Inquiry, Literacy, and Numeracy

Content Standards	Expected Performances
<p>SCIENTIFIC INQUIRY</p> <ul style="list-style-type: none">Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.	<p>B INQ.1 Make observations and ask questions about objects, organisms and the environment.</p> <p>B INQ.2 Seek relevant information in books, magazines and electronic media.</p>
<p>SCIENTIFIC LITERACY</p> <ul style="list-style-type: none">Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science.	<p>B INQ.3 Design and conduct simple investigations.</p> <p>B INQ.4 Employ simple equipment and measuring tools to gather data and extend the senses.</p>
<p>SCIENTIFIC NUMERACY</p> <ul style="list-style-type: none">Mathematics provides useful tools for the description, analysis and presentation of scientific data and ideas.	<p>B INQ.5 Use data to construct reasonable explanations.</p> <p>B INQ.6 Analyze, critique and communicate investigations using words, graphs and drawings.</p> <p>B INQ.7 Read and write a variety of science-related fiction and nonfiction texts.</p> <p>B INQ.8 Search the Web and locate relevant science information.</p> <p>B INQ.9 Use measurement tools and standard units (e.g., centimeters, meters, grams, kilograms) to describe objects and materials.</p> <p>B INQ.10 Use mathematics to analyze, interpret and present data.</p>

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Grade 4 Core Themes, Content Standards and Expected Performances	
State Frameworks	CMT Correlation
<p><i>Energy in the Earth's System-How do external and internal sources of energy affect the Earth's systems?</i></p> <p>4.3 Water has a major role in shaping the earth's surface. 4.3.a. Water circulates through the Earth's crust, oceans and atmosphere.</p>	<p>B 12. Describe how the sun's energy impacts the water cycle. B 13. Describe the role of water in erosion and river formation.</p>

Science Content Standard 4.3

4.3 Grade-Level Concept: Water has a major role in shaping the Earth's surface

4.3.a. Water circulates through the Earth's crust, oceans and atmosphere.

GRADE-LEVEL EXPECTATIONS:

1. Compare and contrast the major processes of the water cycle, (e.g., evaporation, condensation, precipitation, runoff) and describe the effects of the sun's energy and changes in temperature.
2. Construct models showing how topography influences how precipitation accumulates in streams and rivers that eventually return to an ocean.
3. Design and conduct simple investigations to determine how moving water (flowing downhill or in ocean waves) causes changes to the land, the coastline or the course of a stream or river.
4. Employ simple equipment and measuring tools to quantitatively test factors that affect erosion (e.g., type of earth material in an area, volume of moving water, slope of land, vegetation coverage).
5. Analyze observations and data to determine the relationship between the amount and speed of moving water and the size of earth materials moved (e.g., silt, pebbles, boulders).

UNPACKED CONTENT STANDARDS:

Water moving across the earth in streams and rivers pushes along soil and breaks down pieces of rock in a process called erosion. The moving water carries away rock and soil from some areas and deposits them in other areas, creating new landforms or changing the course of a stream or river.

The amount of erosion in an area, and the type of earth material that is moved, are affected by the amount of moving water, the speed of the moving water, and by how much vegetation covers the area.

Rivers carve out valleys as they move between mountains or hills. The speed of the river's flow depends on the slope of the land. The speed of the river's flow affects the shape of the river's course (straight or meandering), the shape of the valleys it carves (u-shaped or v-shaped), and the amount of earth material that is pushed along or left behind in floodplains and deltas.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Massachusetts Learning Standards

Earth and Space Science, Grades 3-5

12. Give examples of how the surface of the earth changes due to slow processes such as erosion and weathering, and rapid processes such as landslides, volcanic eruptions, and earthquakes.

Earth and Space Science, Grades 6-8

6. Describe and give examples of ways in which the earth's surface is built up and torn down by natural processes, including deposition of sediments, rock formation, erosion, and weathering.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Safety Standards

- Review appropriate behavior expectations and cooperative peer or group work standards
- Review the appropriate use of materials (ie. When you or your students are mixing dry earth materials, extra care should be taken to prevent an excessive amount of dust from entering the air)
- Wash soil off your hands after each activity, so that it will not dry your hands.
- Do not pour any soil down a drain. It might clog the pipes.
- Make any necessary individual student modifications
- Monitor students to make sure they are following directions, handling materials with care and working cooperatively
- For more comprehensive information on science safety, consult the following guidelines:

American Chemical Society –

http://membership.acs.org/c/ccs/pubs/K-6_art_2.pdf,

Council of State Science Supervisors –

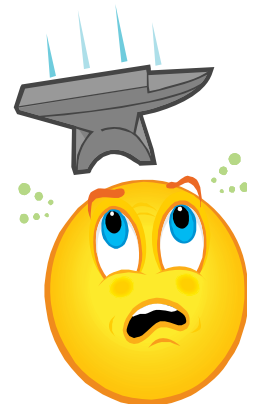
http://www.csss-science.org/downloads/scisaf_cal.pdf

The Connecticut Science Supervisors Association – Science Safety White Paper –

<http://cssaonline.net/cssapositionpapers.html>

Connecticut Department of Education –

http://www.sde.ct.gov/sde/lib/sde/pdf/curriculum/science/safety/scisaf_cal.pdf



The activities included in this package do not contain anything of a highly toxic nature, but common sense indicates that nothing be put in the mouth.

MISCONCEPTIONS AND FACTS ABOUT EARTH MATERIALS AND RESOURCES	
Misconceptions	Facts
Some students believe that the Earth's surface only changes because of earthquakes and volcanoes.	Many things, including water, change the Earth's surface. Humans cause changes to the Earth's surface, too.
Meaning of Weathering and Erosion: Some students believe weathering and erosion are the same thing.	<p style="text-align: center;">Weathering and erosion are two different processes.</p> <p>Weathering is the process whereby rocks and minerals are broken down (by chemical and or physical alteration) into soil. The resultant product might or might not be transported. Weathering creates the soils of the world.</p> <p>Erosion is the transportation of soil from one place to another, usually by running water or wind.</p>
<p>Water Cycle: Some students believe that steam or seeing their breath when it is cold outside is an example of a gas or water vapor.</p> <p>Also, many students think condensation and precipitation are really one step.</p>	<p>Steam is not water vapor; it is water vapor that has already condensed, or changed from the gas state to the liquid state.</p> <p>Condensation is when the water vapor (gas) has changed into liquid water. These tiny liquid drops are not precipitation. The confusion is that because the water vapor has changed into a tiny liquid droplet, that it is now precipitation. In order for precipitation to occur, these tiny droplets must bump into each other and form larger droplets. Drops need to be big enough for gravity to overcome the wind and other atmospheric issues, then the drops fall to the ground as precipitation.</p> <p>*** If students make a mini model of the water cycle: make sure that the students understand that the water vapor is really invisible in their clear plastic box. Also, make sure that the students know that the condensation on the plastic wrap isn't precipitation.</p>
Role of Slope: Students think there is more gravity when the slope is increased.	There is not more gravity because the stream table model is sloped. However, there is more potential energy because of the increase in height, and therefore more energy of motion (kinetic energy).

MISCONCEPTIONS AND FACTS ABOUT EARTH MATERIALS AND RESOURCES	
Misconceptions	Facts
<p>Role of Plants: Some students may think that the soil doesn't erode because the plants "soak-up" the water.</p>	<p>Although this is not entirely incorrect and plants do use water out of the soil, the reason plants slow down erosion is because their roots keep dirt particles from being washed away. Also, if the plant drops leaves, the water drops hit the leaves, and the leaves lessen the force that the water droplet hits the earth material, thus limiting the erosion.</p>
<p>Role of Water: Students don't identify that the speed of water is an agent of change. They often only focus on the amount of water.</p>	<p>With a greater flow of water, the more speed it has, therefore more erosion occurs.</p>
<p>Role of Sediment Type (Size and Weight): Students don't see the connection between the size and weight of the material and how it is being eroded and deposited.</p>	<p>Finer-grained soils are more susceptible to erosion than coarser-grained soils. Since lighter particles (typically smaller and less dense) can stay in suspension at slower velocities they are deposited farther downstream than heavier particles which are the first to settle when water velocity decreases.</p>

http://www.wastatelaser.org/support/toolkits/stc/land_and_water/misconcepts.asp

PRE-VISIT ACTIVITIES

The visit to the CT Science Center begins in your classroom with the pre-visit activities. Please consider these activities as a prerequisite to prepare your students for the actual visit. We encourage all teachers who bring their students to the CT Science Center to do these pre and post activities and plan to provide follow up assessments and activities which integrate your visit into a meaningful unit of study.

INTRODUCTION

The Earth is in a constant state of change. To bring that awareness to students is to go no further than the banks of a meandering river or the end of a gutter downspout. Water's impact on the Earth's surface is everywhere. Where people choose to live, how contractors build homes near a body of water, and how designers construct a school playground are all controlled by how water and erosion may impact the structure. The concept of erosion as an agent of change is demonstrated throughout these activities provided for you in this curriculum package.

PURPOSE

- Students will identify examples of erosion around their homes and school.
- Students will raise questions about the flow of water, the type of sediment, and different land formations which they can investigate at the CT Science Center.
- They will communicate their observations with others and record the questions they would like to investigate at the CT Science Center.

SCIENCE CONCEPTS

- Erosion is the transportation of earth material (such soil and rocks) from one place to another.
- The factors that affect erosion are amount of water, height of the slope, type of sediment (size, weight), vegetation, and human activities.

PRE-ASSESSMENT

Have the children write a response to the following prompts:

1. What is erosion?
2. What is weathering?
3. Draw a picture of the water cycle and label the parts.

*****Following your pre-visit activities, classroom activities, and post-visit activities, have the students answer the same prompt to assess their learning.**

PRE-VISIT ACTIVITY

A Walk Around the School, Neighborhood, and Home

ACTIVITY SUMMARY

In this lesson, students will begin to notice the affects of rain on the land around them and identify it as erosion. They will generate a number of questions, which may be answered when they visit the Connecticut Science Center.

ACTIVITY PREPARATION

1. Scout out your school/neighborhood looking for examples of erosion. For example; at the bottom of gutters, a small slope of land, a ravine, deteriorated concrete, a dirt path, or a hole in the driveway. Also note sides of buildings, walls, etc., that have splatter marks.

MATERIALS

Science notebooks or paper with clipboards
Chart paper
Erosion Observation Sheet

ENGAGING ACTIVITY

1. Bring students around the schoolyard or neighborhood to places where you know they will see some sort of erosion, or attempts at repairing or preventing erosion. Have them record in their science notebooks things they Notice and Wonder on the walk. (Have them draw a line down the middle of a science notebook page and label one column "I Notice" and the other column "I Wonder")
2. Come back to the classroom and discuss what they noticed and wondered- record both on large chart. Focus on the 'agent of change". (In many of the cases it will be water.)
3. Have students do a similar walk around their home and record what they notice and wonder. Have them bring their observations to school next day and compare with information gathered yesterday.
4. Use the *Erosion Observation Sheet* (see next page). You can use it for points in discussion, a language arts writing assignment, or a formative assessment.
5. Bring the students' questions to the center when you visit. During the CT Science Center's classroom visit and in the CT River Gallery some of their questions may be answered.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Pre-Visit Activity Erosion Observation Sheet

1. What are the examples of erosion happening around your school, neighborhood, or home?

2. What agent or force is causing the erosion to happen?

3. Where is the eroded material going?

4. What can be done in order to reduce the amount of erosion?

5. Can you think of another similar example of erosion and describe it?

6. Draw an illustration of one example and label the information.

PRE-VISIT ACTIVITY CONCLUSION

Now that you have completed the pre-visit activity, your students have a number of wonderings/questions that they would like to investigate. Sort them into the following categories:

- Flow
- Slope
- Type of Sediment
- Man-made features

The students will now be prepared to come to the Science Center with questions either on index cards or written in their science notebooks. They will be exposed to information about flow, sediment, and man-made features at the River of Life Gallery's stream table and see connections in the CT Science Center classroom experience and generate more questions.

During their visit the students should be reminded to continually focus on their questions (wonderings) and write down any information they learn to help them understand more fully the role water plays in erosion.

When you complete your visit to the Science Center, your students will have a number of questions and new learnings. You will find a number of activities in our post visit section that will help your students investigate their questions back in your classroom.

CT Science Center Discovery Center Activity (45 min.)

Stream Table Exploration

Content Covered

4.3.a Water circulates through the Earth's crust, oceans and atmosphere

GLE's

3) Design and conduct simple investigations to determine how moving water (flowing downhill or in ocean waves) causes changes to the land, the coastline or the course of a stream or river.

4) Pose testable questions and employ simple equipment and measuring tools to collect data about factors that affect erosion (e.g. type of earth material in an area, volume of moving water, slope of land, vegetation coverage).

5) Present evidence to support a scientific claim about the relationships between the amount and speed of moving water and the size of earth materials moved (e.g., Silt, pebbles, boulders).

Purpose

- Students will conduct an exploration using stream tables and various amounts of water and slope heights.
- They will discover that slope and flow have an effect on the erosion of land.
- They will generate a number of questions that can be investigated in the post activities back in your classroom.
- They will make observations, predictions, and draw conclusions.
- They will communicate their findings and questions to their peers.

Advance Preparation for the Teacher:

Before students arrive, they should have had an opportunity to generate some questions about the effects of water flow, type of sediment, slope, and man-made features on the erosion process based on their walk around the school, neighborhood, and home (**Pre-visit Activity**).

Materials: (per group of 2 or 3)

Foss Stream Table Kit or Plastic Pan approximately 12"x24"x4"

Furring Strips (cut into 8 inches, one for each flow table, and two for each slope table)

Ruler

Play Sand, mixed with a few pebbles and coarse sand

2 x 32 oz Deli or yogurt containers, one with a ¼" hole in the bottom and one with an 1/8" hole in the bottom (only one, 1/8" holed container needed for slope tables)

Catch Basin

Water

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Points for the Facilitator:

1. Follow the directions for setting up stream tables according to the Foss Kit Manual (see image below). Make sure the sand is saturated with water before the students do their activity. If Foss kit is not used follow these two steps to create the drip buckets and the stream table pan;
 - a. Drill a ½ inch hole at one end in the center of each pan.
 - b. Drill a ¼ inch hole in 5 yogurt containers, and 1/8 inch hole in 10 yogurt containers.



2. Some examples of questions the students will raise are:
 - *What height of the slope will allow for the most erosion to occur?*
 - *If I change the speed of water, what effect does that have on erosion?*
 - *What effect does the type of sediment have on erosion?*
 - *What man-made features would slow down erosion?*
3. Make copies of the direction cards and place them at each station for the students to follow. They will work as a group. Number of stations set up will be dependent upon the number of students in the class.
4. Give student 15-20 min. at each station. Encourage the writing of their observations and questions in their notebooks.
5. After they have visited both stations, have the students share their observations and questions with the whole group.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Directions for Flow Activity (Have a copy of these directions at each flow station if the students are working independently.)

1. Start with an **even surface of sediment about 1/3** of the way down the stream table (pan).
2. Make sure there is a block under the stream table.
3. Make sure the catch bucket is under the hole in the stream table.
4. Take the 1/8" hole container, place it at the top of the tray; support it between the edge of the tray and the wood.
5. Add water to your container so that it is about 1/2 full.
6. Observe what happens to the water and the sediment and record your observations and questions. Decide how to measure the erosion with the ruler.
7. When you are ready, varying the flow of the stream table by removing the 1/8" hole container and using the container with the 1/4" hole.
8. Keep the stream table raised on one block.
9. As before, run the water through the 1/4" holed cup.
10. Record your observations and questions. Is there a difference in erosion between the two different flows? If so why is there a difference?



CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Directions for Slope Activity (Have a copy of these directions at each slope station if the students are working independently. This station requires the stream table, water, and catch bucket, in addition to the image of the material below.)

1. Start with an **even surface of sediment about $\frac{1}{3}$** of the way down the stream table (pan).
2. Make sure there is only **ONE** thin block under the stream table.
3. Make sure the catch bucket is under the hole in the stream table.
4. Take the $\frac{1}{8}$ " container, place it at the top of the tray; support it between the edge of the tray and the wood.
5. Add water to your $\frac{1}{8}$ " container so that the water level stays constantly at about $\frac{1}{2}$ full, until you run out of water.
6. Observe what happens to the water and the sediment and record your observations and questions. Decide how to measure the erosion with your ruler.
7. When you are ready to vary the slope. Remove the small block out and replace it with the big block.
8. Remember to prepare an **even surface of sediment about $\frac{1}{3}$** of the way down the stream table again before filling the container.
9. As before, run the water through the $\frac{1}{8}$ " holed cup.
10. Observe the sediment and water. Decide how to measure the erosion with your ruler. Record your observations and questions. Is there a difference in erosion between the two different slopes? If so why is there a difference?
11. Record your observations and questions in your notebook.



CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Points for the Facilitator:

The students will share their observations and questions after the activity. Discussing what relationship slope and flow have to erosion. Show pictures of erosion and ask the students what they notice in these pictures, how they relate to their experiment, and any questions for further investigation. Encourage the investigation of these questions back in their classroom, as well as at the stream table exhibit. At the stream table exhibit, they will be able to explore the effects of the flow of water and the type of sediment on erosion. They will also have an opportunity to explore structural elements, such as bridges and dams, to experiment with their effects on the landscape over time. If time show this deposition animation

http://www.classzone.com/books/earth_science/terc/content/visualizations/es0604/es0604page01.cfm?chapter_no=visualization

Changing the Flow

1. Start with an **even surface of sediment about 1/3** of the way down the stream table (pan).
2. Make sure there is a block under the stream table
3. Make sure the catch bucket is under the hole in the stream table.
4. Take the 1/8" hole container, place it at the top of the tray; support it between the edge of the tray and the wood.
5. Add water to your container so that it is about 1/2 full.
6. Observe what happens to the water and the sediment and record your observations and questions. Decide how to measure the erosion with the ruler.
7. Remember to prepare an **even surface of sediment about 1/3** of the way down the stream table again before filling the container.
8. When you are ready, varying the flow of the stream table by removing the 1/8" hole container and using the container with the 1/4" hole.
9. Keep the stream table raised on one block.
10. As before, run the water through the 1/4" holed cup.
11. Record your observations and questions. Is there a difference in erosion between the two different flows? If so why is there a difference?
12. Remember to measure the erosion with the ruler somehow.

Changing the Slope

1. Start with an **even surface of sediment about 1/3** of the way down the stream table (pan).
2. Make sure there is only ONE thin block under the stream table.
3. Make sure the catch bucket is under the hole in the stream table.
4. Take the 1/8" container, place it at the top of the tray; support it between the edge of the tray and the wood.
5. Add water to your 1/8" container so that the water level stays constantly at about 1/2 full, until you run out of water.
6. Observe what happens to the water and the sediment and record your observations and questions. Decide how to measure the erosion with your ruler.
7. When you are ready to vary the slope. Remove the small block out and replace it with the big block.
8. Remember to prepare an **even surface of sediment about 1/3** of the way down the stream table again before filling the container.
9. As before, run the water through the 1/8" holed cup.
10. Observe the sediment and water. Decide how to measure the erosion with your ruler. Record your observations and questions. Is there a difference in erosion between the two different slopes? If so why is there a difference?
11. Record your observations and questions in your notebook.

Teacher Trail Guides

Trail Guide Geologic Connecticut: 4.3 Erosion

PLANET EARTH GALLERY

Geologic Connecticut

Think about the rocks as you are sorting them. Work in a group to make your predictions for the following questions. Let your partners know what information you are using to determine the answers.

1. Which rocks are conglomerates?
2. How do you think they were formed?
3. What do you think causes weathering and erosion?
4. What do you think these rocks are made of and why?

Use your science notebook to record your thinking.

Teacher Notes:

Conglomerates are sedimentary rocks and are made up of large sediments like sand and pebbles that are cemented together with dissolved minerals. They are usually found along ancient rivers or beaches. But they are also often found much higher than the current ocean or lake levels. Weathering broke rocks into small parts and erosion carried those pieces away. As the smaller pebbles mixed with sand and were exposed to pressure, they cemented together with minerals that were dissolved in ground water.

Trail Guide Stream Table A: 4.3 Erosion

THE RIVER OF LIFE GALLERY

A Geologic Time Machine (Stream Table)

Predict what will happen when you change the flow of the stream table by damming up the water. Write your prediction in your science notebook.

Write what actually happens on the stream table to the sediment when you do this.

Record your answers in your science notebook.

Teacher Notes:

Focus the students on the fact that the amount of erosion and the type of earth material that is moved are affected by the amount of moving water and the speed of the water.

Trail Guide Stream Table B: 4.3 Erosion

THE RIVER OF LIFE GALLERY

A Geologic Time Machine (Stream Table)

Turn and talk with a partner about how you think adding structures like dams and bridges can change the river.

How does that happen in real life?

What happens on the stream table when you do this?

Write your thoughts in your science notebook.

Teacher Notes:

Remind the students that how much vegetation covers an area can affect the amount of erosion that occurs in a place. Structures can be used to divert or channel water to lessen the possibility of erosion.

Trail Guide Stream Table C: 4.3 Erosion

THE RIVER OF LIFE GALLERY

A Geologic Time Machine (Stream Table)

Predict what kind of pellets (sediment) will travel the furthest. Try it on the stream table.

How accurate was your prediction?

What pellets (sediment) stay near the beginning of the stream table? Observe the stream table to determine this. Why do you think this happens?

Talk with a partner and write your thoughts in your science notebook.

Teacher Notes:

The speed of a river's flow affects the amount of earth material that is pushed/pulled along or left behind. Have the students focus on the size of the material that remains behind. The larger, heavier material will not move as far as the smaller, finer material. This is one of the reasons that in areas that erosion may occur, people have placed larger rocks so that the water flows through, rather than eroding away, smaller particles.

Trail Guide Habitat Junction: 4.3 Erosion

THE RIVER OF LIFE GALLERY

Habitat Junction

If the flow of the CT River changed, how do you think the animals of the many ecosystems could be affected?

What could be done to prevent those problems?

Discuss your ideas with a classmate and write your ideas in your science notebook.

Teacher Notes:

Remind the students that the living and non-living things in an ecosystem depend on each other in order to exist. If an animal's habitat were to have more or less water, the living things may not be able to survive if they could not adapt.

Trail Guide Overlook Balcony A: 4.3 Erosion

THE RIVER OF LIFE GALLERY

Overlook Balcony

As you observe the CT River, think about the following:

1. What do you think is happening to the sediment under the water?
2. What type of sediment is being moved? Where is it going?
3. What would happen to the flow of water if a dam was built here?

Talk with a classmate about these questions and then write what you

Teacher Notes:

Students should be able to identify that sediment is moving under the water. The smaller the sediment is, the faster it is moving downstream. The larger sediments are not moving as much, if at all.

If a dam were built here, it would hold back the water and stop the movement of the sediment.

Trail Guide Overlook Balcony B: 4.3 Erosion

THE RIVER OF LIFE GALLERY

Overlook Balcony

As you watch the movement of the Ct River, what evidence do you see of erosion right now?

Discuss what you are observing with a partner. Illustrate in your science notebook.

Teacher Notes:

Have the students notice the banks of the river. Is the moving water reshaping the sides? Is the vegetation being encroached upon? Ask the students to note the color of the water-does it look a bit brownish indicating sediment mixed in?

Trail Guide CT River Watershed: 4.3 Erosion

THE RIVER OF LIFE GALLERY

The Connecticut River Watershed

1. What do you think brings pollutants down to Long Island Sound?
2. What must the slope of the land be like?
3. What about the rivers and their flow of water?

Discuss these questions with a partner and write the ideas discussed in your science notebook.

Teacher Notes:

All of Connecticut is considered a watershed area. That means that all the rivers, streams, and runoff eventually make their way into Long Island Sound carrying the water, sediments and pollutants in them. The slope makes the water, and therefore the pollutants travel faster downstream.

Student Trail Guides

Trail Guide Geologic Connecticut: 4.3 Erosion

PLANET EARTH GALLERY

Geologic Connecticut

Think about the rocks as you are sorting them. Work in a group to make your predictions for the following questions. Let your partners know what information you are using to determine the answers.

4. Which rocks are conglomerates?
5. How do you think they were formed?
6. What do you think causes weathering and erosion?
4. What do you think these rocks are made of and why?

Use your science notebook to record your thinking.

Trail Guide Stream Table A: 4.3 Erosion

THE RIVER OF LIFE GALLERY

A Geologic Time Machine (Stream Table)

Predict what will happen when you change the flow of the stream table by damming up the water. Write your prediction in your science notebook.

Write what actually happens on the stream table to the sediment when you do this.

Record your answers in your science notebook.

Trail Guide Stream Table B: 4.3 Erosion

THE RIVER OF LIFE GALLERY

A Geologic Time Machine (Stream Table)

Turn and talk with a partner about how you think adding structures like dams and bridges can change the river.

How does that happen in real life?

What happens on the stream table when you do this?

Write your thoughts in your science notebook.

Trail Guide Stream Table C: 4.3 Erosion

THE RIVER OF LIFE GALLERY

A Geologic Time Machine (Stream Table)

Predict what kind of pellets (sediment) will travel the furthest. Try it on the stream table.

How accurate was your prediction?

What pellets (sediment) stay near the beginning of the stream table? Observe the stream table to determine this. Why do you think this happens?

Talk with a partner and write your thoughts in your science notebook.

Trail Guide Habitat Junction: 4.3 Erosion

THE RIVER OF LIFE GALLERY

Habitat Junction

If the flow of the CT River changed, how do you think the animals of the many ecosystems could be affected?

What could be done to prevent those problems?

Discuss your ideas with a classmate and write your ideas in your science notebook.

Trail Guide Overlook Balcony A: 4.3 Erosion

THE RIVER OF LIFE GALLERY

Overlook Balcony

As you observe the CT River, think about the following:

1. What do you think is happening to the sediment under the water?
2. What type of sediment is being moved? Where is it going?
3. What would happen to the flow of water if a dam was built here?

Talk with a classmate about these questions and then write what you

Trail Guide Overlook Balcony B: 4.3 Erosion

THE RIVER OF LIFE GALLERY

Overlook Balcony

As you watch the movement of the Connecticut River, what evidence do you see of erosion right now?

Discuss what you are observing with a partner. Illustrate in your science notebook.

Trail Guide CT River Watershed: 4.3 Erosion

THE RIVER OF LIFE GALLERY

The Connecticut River Watershed

1. What do you think brings pollutants down to Long Island Sound?
2. What must the slope of the land be like?
3. What about the rivers and their flow of water?

Discuss these questions with a partner and write the ideas discussed in your science notebook.

Post-Visit Activities

Now that you have returned from your visit to the Connecticut Science Center-classroom and galleries, your class has many questions they would like answers to. The following activities have been designed for you to use with your students to help them with their investigations. The children could also investigate their questions independent of these activities.

Some of these activities are extensions to further your students' understanding of erosion, soils, and the water cycle. You may choose to do them in any order because there is no special sequence to them. You should match the activities to your students' needs.

In this section, you will find:

- 6 activities “Ready to Go”.
- You will also find a performance task that you may use with your students in order to apply their new learning.

Post-Visit Activity 1: The Effect of Slope on the Erosion Process Investigation

ACTIVITY SUMMARY

This activity will help students further investigate slope.

The students will be investigating the effect that slope has on the erosion process. They will conduct an investigation in small groups to answer their questions on slope and report their findings to the whole group.

1. Some examples of questions students may have raised are:
 - What type of slope creates the most erosion?
 - What type of slope creates the least erosion?
 - What effect does slope have on the erosion process?
 - At what height of the slope will the most erosion occur?
 - What effect does slope have on the direction of the water?
 - What effect does slope have on the flow of the water?
 - What effect does slope have on the depth and width of the stream's channel?
2. You need to discuss the type of measurements the students will take in order to know how much erosion took place. They will be using one of the following: measuring the amount of sediment washed away or measuring the size of the channel's width/depth.
3. Have your students work in groups of 3 or 4 to investigate their question. These children will conduct their investigation together.

Directions:

Materials for each station:

1. 1 pre-set stream table per work area (number of work areas based on the number of students in class). You could use aluminum lasagna pans in place of stream tables.
2. Pitcher of water - 2 Liters
3. Blocks of wood, number to be determined by the group
4. Scrapers
5. Cups with the exact hole size
6. Various measuring cups-metric
7. Rulers
8. Data record sheets (paper for students to design their own)
9. Catch bin for runoff

Investigations:

These directions should be given to each group of students on cards.

Student Investigations

First Run

Stream Table First Run Directions:

1. Begin with one block of wood under the head of the stream table.
2. Run 2L of water through the cup continuously by keeping the water level with the line at the top of the cup.
3. Notice what is happening to the sediment/water - what the water does to the sediment and what the sediment does to the water.
4. Draw and record your observations.
5. Take the measurement that you and your group decided upon - measuring the amount of sediment washed away or the width and depth of the channel.
6. Record this on your data record sheet.
Notice the type of sediment at the bottom of the stream table. Record this on your data record sheet.

Student Investigations

Second Run

Stream Table Second Run Directions:

1. For the second trial, raise or lower your slope according to your group's plan.
2. Remember to start with an even surface about $\frac{2}{3}$ of the way down the stream table.
3. Run 2 L of water through the cup continuously by keeping the water level with the line at the top of the cup.
4. Notice what is happening to the sediment/water - what the water does to the sediment and what the sediment does to the water.
5. Draw and record your observations.
6. Take the measurement that you and your group decided upon - measuring the amount of sediment washed away or the width and depth of the channel.
7. Record this on your data record sheet.
8. Notice the type of sediment at the bottom of the stream table. Record this on your data record sheet.
9. Now make a comparison between the first and second measurements. Write a conclusion statement for your findings on your data record sheet.
10. Record any questions you still have.
11. Your group can decide how you will share this information with the class.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Explain and Elaborate/Communication

Students will present their findings to the whole class.

Post visit Activity 2- Washing Away Activity

Rain can change the way the land looks. Try this experiment and see how. Set this up the day before rain is predicted to fall in your area.

Materials (per child)

- 2 index cards
- 2 popsicle sticks
- Tape

Procedure:

1. Tape a popsicle stick to the back of each card.
2. Find a grassy spot somewhere outside your school. Push the popsicle stick into the soil. The edge of the card should touch the ground.
3. Find a spot where the soil is bare. Push the second card on the popsicle stick into the ground.
4. Check the cards after it rains. Draw a picture of what each card looks like.

Card in bare soil	Card in grassy soil

5. Which has more mud-splatter marks, the card in the bare soil or the card in the grassy soil? _____

6. The mud-splatter marks are a sign that the rain is wearing the soil away. This is called erosion. Based on this activity, how can you help keep the rain from wearing and eroding the soil away?

(Literature-Based Science Activities Audrey Brainard and Denise H. Wrubel Scholastic Publication)

Post Visit Activity 3 – Demonstration-Percolation

This activity demonstrates that water percolates through soils with different grain sizes at different rates.

Materials:

- 5 plastic columns 100 cm (40 inches) long and 5 cm (2 inches) in diameter
- 5 gauze pads and rubber bands
- 5 beakers to catch the water that percolates through each column
- Samples of clay, coarse sand, fine sand, gravel, and topsoil or 5 graduated sizes of plastic beads, approximately 2 measuring cups each.
- Measuring Cup
- Stopwatch

Procedure:

1. Secure a gauze pad to the bottom of each column with a rubber band.
2. Place a different soil sample or size of bead in each column until the column is approximately half full. Make sure all columns are filled to the same level.
3. Pour 100 ml (3.5oz) of water through the columns one by one.
4. Time the passage of water through each column.
5. Measure the amount of water that passes through each column.
6. If using soil samples, note the color of the water in the collection beaker.

Questions for Discussion:

- Did the water go through all of the columns at the same rate?
- If not, why not?
- Describe the relationship between the rate at which water passes through the soil and the size of its grains.

(USDA Natural Resources Conservation Service-Water Cycle Poster)

Post Visit Activity 4 -Water Cycle

(This is from STC Land and Water Kit- Lesson 2)

The water cycle is an abstract concept, and not all its processes will be easily observed in this lesson. You should not expect students to master the concept immediately. Throughout the discussions of land and water, continue to reinforce the idea that the water students pour into their models represents a stream that originated as precipitation and is part of the water cycle. Encourage students to think about why the soil in their models dries out overnight. *Help them to understand that the movement of water over and through land is part of the water cycle.* Eventually, students' understanding of the continuous flow of water on earth will develop more fully.

Materials: Stream table materials for each group of 4

- 1 clear plastic bin 40 x 28 x 15 cm (16x11x6 in) with lid, drain hole, and rubber stopper.
- 1 small absorbent pad 58.4x61 cm (23x24 in)
- 1 large absorbent pad 58.4x91.4 cm (23x36 in)
- 1 plastic plaster spreader
- 1 spoon
- 1 metric ruler
- 2 hand lenses
- 1 catch bucket 3.8 liters (1 gal)
- 1 capped, 2-liter soda bottle containing 0.5 liter (500 ml or 1 pt) of **warm** water
- 1 piece of plastic wrap 60x35 cm (24x14in)
- 1 large rubber band
- Masking tape to hold plastic wrap in place after securing with rubber band
- 1 small frozen ice pack 7x3.5x12 cm (2 ¾ x 1 3/8 x 4 ¾ in)
- Sediment materials for plastic bin - assortment of humus, gravel, clay, sand
- Each students' science notebooks

Procedure:

Students will follow direction cards at each group (see pg.21)

Students will be noting their observations in their science notebooks.

They will use I Notice/I Wonder columns

Questions for Discussion:

- After what you observed in this lesson, what do you know about rain?
- What do you know about how water meets land?
- How is the “vocabulary” of the water cycle shown in our model?
Water vapor, condensation, evaporation, clouds, precipitation, water table, groundwater, surface runoff, transpiration.

Follow-up activity to this lesson:

Have students find evidence of parts of the water cycle in their homes and outdoors. (Examples would include condensate that forms on the outside of a glass of iced drink, morning dew on blades of grass that evaporates as the day progresses, and rain showers and puddles that evaporate on a sunny day. Encourage students to write about their observations through prose or poetry.

Student Instructions for Modeling the Water Cycle

1. Cover your work area with the large absorbent pad. Make sure the absorbent side faces up and the plastic side down.
2. Place the small absorbent pad on the floor so the absorbent side faces up.
3. Place the clear plastic bin of soil on the large absorbent pad.
4. Make certain the rubber stopper is in the drain hole from inside the box.
5. Mix the soil with the plastic spreader.
6. With the spreader, “bulldoze” the soil. Push it away from the drain hole toward the opposite end of the bin.
7. Now create a lake in your model. Pour the warm water into the box. **Do not pour the water on the soil.**
8. Cover your land and water model (the bin) with plastic wrap. Fasten the plastic with a large rubber band. Then reinforce it with masking tape, all around the edges.
9. Get a frozen pack from your teacher.
10. Place the ice pack on the plastic so it is above the land. Do not touch the ice pack during the next 5 minutes.
11. What do you think will happen in the model? While you wait, discuss your predictions within your group. Record your predictions in your notebook.
12. After five or more minutes, remove the ice pack from the plastic. Look at the plastic. Discuss your observations within your group. Record your observations.
13. Tap gently on the plastic where you placed the ice pack. Record your observations.
14. Prepare for whole group discussion

Post Visit Activity 5 Glaciation

Glaciation Using Stream Tables

Procedure:

1. Freeze cubes of ice that have sand or gravel in the water.
2. Allow groups of student to do this or use as a demonstration.
3. Use the cube of ice to represent a glacier. Move it down hill. Observe the moraines that form and the u-shaped valley.
4. Let the ice cube sit and thaw. Observe the cirque or kettle lake (depending on location) and the pile of debris.

Key questions:

1. Does this model accurately reflect how glaciers work? Why/why not?

(No, glaciers have snow added to them at the tops, and melt back at the tongues; glaciers are continuous formations that are larger than the ice cube can represent. In addition they are not actually blocks of ice. They are more of a plastic like fluid that flows down the slope. Internally, they have different flow directions which cause the glacier to be almost like a conveyor belt lifting sediment from the bottom and bringing it to the top, all the while it is flowing down the slope to the end. This movement of sediment creates the terminal moraine.

See <http://www.physicalgeography.net/fundamentals/10ae.html> for diagrams of glacial flow lines. Other glacial features are produced by glacier melt water, such as the stratified drift, kettle lakes, and lateral moraines.)

Post Visit Activity 6 Watersheds

Procedure:

1. Give the students information about watersheds and how they operate.
2. Create two hills in the sand (sand needs to be saturated) with a valley in between that could have a stream. Have the water turned off for this demonstration.
3. Sprinkle the hills with water to show that the runoff goes into the stream. This illustrates that the watershed is the land that collects the water from rainfall, with the stream being the discharge area. Also observe the amount of soil that runs off the hills during the rainfall.
4. Reshape the hills if needed. Place a piece of netting over one hill. The netting will illustrate roots or grass on the hill. Sprinkle with water. Observe the decrease in runoff of soil when roots are helping to hold soil in place.
5. Reshape the hills if needed. Place small model pine trees on the hill. These can be on top of the netting or separate. Sprinkle with water. Observe the decrease in runoff of soil when trees are slowing the fall of water to the soil.
6. Reshape the hills if needed. Remove the trees to simulate a fire or clear cutting situation. Sprinkle with water. Observe the increase in runoff of soil when trees have been removed.
7. Reshape the hills if needed. Place Popsicle sticks or smaller rope along the contours of the hill to simulate reclamation work on the hills after a fire. (Crews will place tubes stuffed with straw along the contour lines to slow the flow of water and the runoff of soil after a fire.) Sprinkle with water. Observe the decreased in runoff of soil when reclamation work is done.
8. Demonstrate other variations of watershed/land management as desired.
9. Discuss what was observed in terms of watershed management and health, including the ethics, politics, and values of management decisions.
10. Discuss the use of models, how they can be great visualizations of systems, and how they can exaggerate or under-represent portions of a system.

Key questions:

1. Point out or ask about the size of watersheds; that they can be very large (encompassing all the land that water falls on that flows out the Mississippi River) and very small (one stream between two hills).
2. Talk about the health of watersheds, bringing in the ethics of land use.

Performance Task

Planning Our Home Sites: Designing and Building a Landscape

Planning Our Home sites: Designing and Building a Landscape, is based on an STC Land and Water kit activity (Lessons 15 and 16) and can be used as a **performance task** for assessing your students' knowledge. A checklist is included in this packet for your use.

You will need to have the children begin growing grass a few days before they actually try out their hypothesis. The fastest growing grass seeds are rye and mustard. They take about 4 days to grow.

Materials:

1 stream table or lasagna pan per group
Sediment (from your area)
1 level
1 bucket to catch the runoff
measuring tools (measuring cups, spoons, rulers)
grass seed- rye and/or mustard
blocks for slope
cups pre-holed for flow of water

Background for the Teacher

The process of erosion is affected by the height of the slope, the flow of water, the type of sediment, and structural elements. Vegetation can also affect the erosion process.

Basically:

1. The greater the flow of water, the more erosion that occurs.
2. The steeper the slope, the more erosion that occurs.
3. Lighter particles of sediment (typically smaller and less dense) are deposited farther downstream than heavier particles.
4. Dams and other man-made structures can affect erosion.
5. The number and type of vegetation affects erosion. Plant roots slow erosion by holding the soil in place.

Planning Our Home Sites: Designing and Building a Landscape

Task:

You have just purchased a house near the banks of the Connecticut River. Design a landscape for your property that minimizes erosion. For example; consider the use of rocks, plants, and soil type; and then decide where you will place these items.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Procedure:

Work with your team members to:

- Decide on the features you will use in your stream table and where your house is.
- Write a scientific explanation for why you made these choices. You may want to use the **Plan Your Landscape Record Sheet** (found on pg. 38)
- Draw a diagram of your landscape. Label all the features you are adding. Also, have them label the different centimeter cubes (which will represent your homes) with the name of each team member.
- Build your landscape according to your plan and place your homes in the best location so as not to be disturbed by the erosion process.
- Adjust your plan once you begin building your landscape, if necessary.
- Test your home site by running 2 L of water on your stream table.
- Your design is successful if all the homes (centimeter cubes) were not moved/disturbed while the water was poured into the stream table.
- You will assess yourself on this task using the checklist (found on pg. 39)

Performance Task
 Record Sheet 15 A
 Part A: Plan Your Landscape

Landscape Choice	Why will this help prevent/control erosion?
Sloped Steam Table OR Level Steam Table (circle one)	
Fast Moving water (cup with large hole) OR Slow Moving water (cup with small hole) OR Multiple water source (cup with three holes) (circle one)	
EARTH MATERIALS- Which materials will you plan to use? Clay, Humus? Gravel? Sand? (Or) a combination of them? (List the earth materials below-one on each line)	
LAND FEATURES: Which features will you use? Rocks? Others? (list the features below- one on each line)	
OTHER ADDED FEATURES: Which other features will you use? Plants? Other? (List the features below- one on each line)	

On the back: Draw your plan, label the different features.

Performance Task Checklist

Criteria	Self-assessment	Peer assessment	Teacher assessment
Has a well written plan (follows our class criteria)			
Includes diagram of landscape with labels			
Observation page in Notebook with Noticings and Wonderings			
Gives reasons for placement of structures in landscape			
Explains how grass/vegetation would help lessen erosion in their model			
Explains reasons for choice of sediments used			
Uses man-made or natural features in their landscape properly			

This checklist is a sample of one way you may assess your students on the performance task.

Guided Exploration Erosion

Content Standard 4.3



SIZING UP SEDIMENT

Authored By Norm Barstow
For the Connecticut Science Center

TEACHER MANUAL

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Sizing up Sediment

A Guided Exploration of How the Variety of Earth Materials Affects Erosion.

Objective: Understanding that not all earth materials erode at the same rate and this affects the amount and extent of erosion in a particular area.

Science Concept:

4.3: Water has a major role in shaping the Earth's surface.

Expected Performance: Describe the role of water in erosion and river formation.

Background Information:

Earth processes such as mountain building and erosion are very slow and are described in units of geologic time. It's difficult to comprehend fully such vast periods of time.

Erosion and deposition have been reshaping the earth's surface for millions of years. On this grand scale, human structures and other efforts to modify the surface of the earth can be likened to the period (.) at the end of a chapter of Earth history.

The factors that affect erosion are the amount and flow of water, the height of slope, the type of sediment (size, weight), vegetation and human activities.



CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Teacher Notes:

Over thousands of years, rain falling on the earth and into streams and rivers and erodes certain sediment. This sediment moves along with the water flow and is deposited downstream. In this activity, the students will investigate a variety of sediments to learn how their properties affect erosion.

Here are some misconceptions and facts about the role of sediment in erosion.

MISCONCEPTIONS	FACTS
Role of Sediment Type (Size and Weight): Students don't see the connection between the size and weight of the material and how it is being eroded and deposited.	Finer-grained soils are more susceptible to erosion than coarser-grained soils. Lighter particles (typically smaller and less dense) are deposited farther downstream than heavier particles.

ENGAGE-

Teacher:

- Show the students a rectangular sugar cube and a small amount of gravel and 2 paper bags.
- Tell them that the cube represents one kind of earth material and that gravel is another type of earth material.
- Place a sugar cube in one bag, and the sugar cube and a small amount of gravel in the other bag.
- Ask the students to predict what will happen when you shake the first bag.
- Shake the bag for about a minute and remove the sugar cube. What do you notice?
- Ask students to predict what will happen to the cube when you shake bag 2.
- Shake bag 2 for the same amount of time, remove the cube. What do you notice?
- What happens when 2 types of earth materials rub together?)

Follow up with some questions:

- What could cause earth materials to rub against each other?
- What happens to the earth when it rains?
- Where does the water go?

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

- What happens when it rains on the grass? On the playground? On the street?
- How is mud formed?

EXPLORE –Part 1

Procedure:

- Prepare clear plastic cups (one for each group) with **one layer** of rectangular sugar cubes in the bottom of each cup. Fill dropper bottles with water. Have one hand lens for each group.
- Before passing out the materials, hold up a sugar cube and explain that this represents a kind of earth material.
- Pass out the materials.
- Ask each group to take out one sugar cube and examine it closely and note its properties on their O.W.L. paper.
- The sugar cube should be returned to the cup.

<u>Observations</u> What you notice.	<u>Wonders</u> Questions or ideas you have.	<u>Learning</u> What I Have Learned

Instruct the students to use the dropper bottles to slowly drop water onto the 'earth material' and observe what happens. ABOUT 10 DROPS.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

*Encourage them to fill out their **wonders**.*

B INQ.4

EXPLORE –Part 1 STUDENT

1. **Observe** one sugar cube. **Record** your observations.
2. **Return** the cube to the cup, making sure to cover the bottom of the cup with cubes (one layer).
3. Use the dropper bottle to slowly add 10 drops of water on to the cubes.
4. What did you **notice**? Do you have any **questions**? Did you **wonder** about anything you saw? Did you **learn** anything?
5. **Record** your ideas on your **O.W.L.** chart.

Teacher Notes:

As you circulate, you may need to prompt the students to make observations and to fill in the O.W.L. chart.

Examples of student work:

Observations: The cube changes shape, the particles can be seen in the cup, the water makes holes in the cube.

Wonders: Why does the water do that? Would another liquid work as well? What would happen if I used more water? What would happen with another earth material?

Learning: Water changes the cube.

EXPLORE – Part 2

Teacher Notes:

- **Ask:** What happens when rain falls on different types of earth materials?
- **Tell** them you have other earth materials for them to use.
- Ask them to form a plan that can be investigated. You may have to help them form an Investigable question from their Wonderings. **B INQ.1**,
- Have the students **think about** or **brainstorm** how they might test other earth materials.
- Ask them to think about **another question** to add to their **I Wonder column**.
- **Sample testable questions:**
 1. What would happen if the soil samples were mixed together?
 2. What kind of earth material erodes more quickly than another?
- **Prepare 'sentence strips' –poster paper cut into strips for student questions.**

Student:

1. THINK ABOUT THIS QUESTION:

What happens when rain falls on different kinds of earth material: rocks, clay, sand, gravel, dirt, driveways or a material like the cube?

2. More to THINK about:

- Your teacher has some other earth materials for you to use.
- Think about how you could use these other materials.

3. Brainstorm your ideas with other members of your group.

4. Now THINK about a New Question and record it on your O.W.L. chart in the Wonders section.

5. Write your question from your 'I wonder' column on a sentence strip and post it on the wall of your classroom.

6. Now get ready to Explore.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

EXPLORE – Part 2

Experiment:

Teacher Notes:

- *Finer-grained soils are more susceptible to erosion than coarser-grained soils. Lighter particles (typically smaller and less dense) are deposited farther downstream than heavier particles.*
- *The concept of density and weight are difficult for elementary students. **Density** is best explained as the amount of 'stuff'/matter in an object/material, and that **weight** is the pull of gravity on that 'stuff'/matter.*

Teacher Notes:

- *Prepare the cups of materials and dropper bottles, etc.*
- *Set a time limit for plan and investigation.*
- *Help the children form their investigable questions (I wonder)*
- *Have the students include a Prediction as part of their plan.*
- *Plan (you may want to let the students know that they will communicate [share] their investigation because this may influence the need for other materials like a balance scale or stop watch.*
- *Teacher approves plan which includes a way to capture data- maybe a self assessment for the plan (checklist)-*
- *Possible pair-share for each other to check over their plans (makes it easier for teacher*

Materials for each group:

Cups of Earth Materials:

Non-oily clay
Rock salt
Gravel
Sand
Chalk
Sugar cubes
Halves of Styrofoam peanuts

Dropper bottle of water
Water supply
Hand lens
Ruler
Plastic trays
Supply of plastic cups
Material to elevate trays

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Student Instructions:

1. **Design** a procedure that will help you answer your question. **List** the steps you will follow to in your science notebook. Include enough detail so that anyone could repeat your experiment.

Teacher notes:

Show students what materials are available to them before they decide their plan. (packing peanuts were included to simulate a light [less dense] sediment)

2. Have your teacher **check your plan** before starting.

3. In your science notebook, record the **independent variable** you will investigate, the **dependent variable** and the variables that must be kept constant in your experiment.

Teacher notes:

*If your students are not experienced with designing controlled experiments, you may lead a class discussion about the **dependent variable** (the one thing that will change) and the **independent variable** (the outcome to be measured)*

4. **Design** a **data table** to record your findings. Does the data table seem reasonable? Do you need to repeat trials?

5. **Gather** your earth materials.

6. **Conduct** your **experiment** and **record** your findings. Does the data seem reasonable? Do you need to repeat trials?

7. **Interpret** the data. Use your data to reach a conclusion about how different earth materials erode.

8. **Plan** for **Communicating** your results. What information have you learned during your investigation that you would want to share with your classmates?

9. **Communicate** your conclusions/findings.

EXPLAIN: The student section will include this wording:

- Share your procedure and conclusions with others in your group.
- How are they alike? How are they different?
- What additional questions does it make you think about?
- What changes could be made to the procedures to make the results more similar?

Teacher notes:

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

- *As you go from group to group, you should make note of any science concepts that are discussed or demonstrated. This is when you might identify and correct misconceptions.*
- *During the presentations, encourage questioning and clarification from the students. Add any new learnings that are expressed to your list.*
- *While the students are present, you may chart the concepts and scientific content.*
- *Lead a post activity discussion in which data is displayed from groups that investigated the same independent variable.*
- *This is a great opportunity to discuss reasons for possible differences in results among groups. Good time to talk about 'experimental errors' that might affect student confidence in their results.*
- *This is also a good time to review the Fair Test concept.*

BINQ 5

Experiment

Step 1. Pass out the materials requested by each group,

Step 2. Monitor progress and time.

Step 3. Remind them that each group will have to share (charts, graphics) their results with the other groups.

Synthesis:

1. *Put the student findings on chart paper and share with the class. Summarize the evidence presented and tie the concepts together.*
2. *Synthesis is very important as the student's work is validated and the learning is reinforced.*

ELABORATION

APPLYING YOUR FINDINGS TO SOLVE A PROBLEM BINQ. 3

Teacher notes:

You may want to add grass seed, straw and other materials available for the students.

There is a hill behind the new shopping center. Whenever it rains there is a mudslide. The parking lot floods and is covered with mud, sand and rocks.

Your job is to come up with a plan to stop the mudslides and to control the erosion.

Here are two important steps:

1. *Research and Plan how you would address the problem.*
2. *Share your plan with your teacher before you start to work.*

Guided Exploration Erosion

Content Standard 4.3



SIZING UP SEDIMENT

Authored By Norm Barstow
For the Connecticut Science Center

STUDENT MANUAL

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Sizing up Sediment

A Guided Exploration of How the Variety of Earth Materials Affects Erosion.

Not all earth materials erode at the same rate and this affects the amount and extent of erosion in a particular area.

Science Concept:

4.3: Water has a major role in shaping the Earth's surface.

Expected Performance: Describe the role of water in erosion and river formation.

Background Information:

Earth processes such as mountain building and erosion are very slow and are described in the units of geologic time. It's difficult to comprehend fully such vast periods of time.

Erosion and deposition have been reshaping the earth's surface for millions of years. On this grand scale, human structures and other efforts to modify the surface of the earth can be likened to the period (.) at the end of a chapter of Earth history.

The factors that affect erosion are the amount and flow of water, the height of slope, the type of sediment (size, weight), vegetation and human activities.



ENGAGE

Think about these questions:

What happens when earth materials **rub** against each other?

What natural **forces** could cause earth materials to rub against each other?

EXPLORE

Experiment 1

1. **Observe** one sugar cube. **Record** your observations.
2. **Return** the cube to the cup, making sure to cover the bottom of the cup with the cubes (one layer).
3. Use the dropper bottle to slowly add **10** drops of water on to the cubes.
4. What did you **notice**? Do you have any **questions**? Did you **wonder** about anything you saw? Did you **learn** anything?
5. **Record** the information on your **O.W.L.** chart.

<u>Observations</u> What you notice.	<u>Wonderings</u> Questions or ideas you have	<u>Learning</u> What I Have Learned

EXPLORE –Part 2

1. THINK ABOUT THIS QUESTION:

What happens when rain falls on different types of earth materials: rocks, clay, sand, gravel, dirt, driveways or a materials like the cube?

2. More to THINK about:

- Your teacher has some other earth materials for you to use.
 - Think about how you could use these other materials.
3. Brainstorm your ideas with other members of your group.
 4. Now think about a New Question and record it on your O.W.L chart in the Wonderings section.
 5. Write your question from your 'I wonder' column on a sentence strip and post it on the wall in your classroom.
 6. Now get ready to Explore.

EXPLORE

Experiment 2:

Materials for each group:

Cups of Earth Materials:

Non-oily clay

Rock salt

Gravel

Sand

Chalk

Sugar cubes

Halves of Styrofoam peanuts

Dropper bottle of water

Water supply

Hand lens

Ruler

Plastic trays- cafeteria or similar sized trays

Supply of plastic cups

Material to elevate trays

1. **Design** a procedure that will help you answer your question. **List** the steps you will follow in your science notebook. Include enough detail so that anyone could repeat your experiment.
2. Have your teacher **check your plan** before starting.
3. In your science notebook, record the **independent variable** you will investigate, the **dependent variable** and the variables that must be kept constant in your experiment.
4. Design a **data table** to record your findings in your science notebook.
5. **Gather** up to 4 of the earth materials your teacher provides.
6. **Conduct** your **experiment** and **record** your findings. Does the data seem reasonable? Do you need to repeat trials?

7. **Interpret** the data. Use your data to reach a conclusion about how different earth materials erode.
8. Plan for **Communicating** your results. What information have you learned during your investigation that you would want to share with your classmates?
9. **Communicate Your Conclusions/Findings.**
 - a. **Share** your procedure and conclusions with others in your group.
 - b. How are they **alike**? How are they **different**?
 - c. What additional **questions** does it make you think about?
 - d. What **changes** could be made to the procedures to make the results more similar.

APPLYING YOUR FINDINGS TO SOLVE A PROBLEM

There is a hill behind the new shopping center. Whenever it rains, there is a mud slide. The parking lot floods and is covered with mud, sand and rocks.

Your job is to come up with a plan to stop the mudslides and to control the erosion.

Here are two important steps:

1. Research and Plan how you would address the problem.
2. Share your plan with your teacher before you start to work.

TEACHER RESOURCE INFORMATION

Underlying Science Concepts (Key Ideas)

- The landscape is a result of the long-term integration of a variety of natural processes that act on the surface of the earth.
- Water has an important role in shaping the land, and land forms may change the direction and flow of water. Humans can affect these processes.
- Different elements of earth systems interact to characterize the land and water landscape.
- Streams and rivers slowly reshape the earth's land surface by eroding and carrying soil and rock.
- The properties of soils and the flow characteristics of water determine the nature of erosion and deposition.
- The interactions among the elements of the earth and circulating water change the landscape.
- Humans interact with natural elements to affect changes in the landscape.

The National Academy of Science 2003

BACKGROUND FOR THE TEACHER

Erosion by Water

In many places, running water is the agent of erosion. Rivers and streams transport eroded material. All materials transported by the rivers and streams are called the stream load. The composition of the stream load is dependent on the speed, volume and slope of the water in the stream. Heavier particles of material bounce along the bottom of the stream, grinding and wearing down surfaces they strike. This action is called abrasion. Lighter particles become suspended in the water and are eventually dropped when the stream slows in velocity. The weight and composition of these particles influence the order in which the deposition of particles takes place. Running water can even be so powerful that it creates new landscapes. Rainwater carries particles down mountain slopes and forms river valleys between two mountains.

(From: The Scoop on Soil-TeacherVision)

Weathering and erosion are two different processes.

Weathering is the process whereby rocks and minerals are broken down (by chemical and or physical alteration) into soil. The resultant product might or might not be transported. Weathering creates the soils of the world. Erosion is the transportation of material from one place to another, usually by running water or wind.

Who Needs Dirt Anyway?

Dirt! Without it, we would be naked, homeless, and starving. Plants, which rely on dirt for survival, fill some of our most basic human needs. Shelter and clothing, whether made from natural or synthetic materials, are plant based. Our food, even if it's animal, can be traced to a reliance on plants. Dirt isn't so dumb after all.

What Is It and Where Does It Come From?

Dirt, or soil, is made from rocks that break apart or wear away over many years. This is referred to as weathering. It may take 100 to 1000 years for 1 cm of soil to form through weathering. Soil also contains air, water, and humus; the decayed remains of dead animals and plants. Soil can actually be separated into 5 main parts: humus, clay, silt, sand, and gravel.

Humus: *A dark, moist soil composed of bits of dead, rotting insects, animals, leaves, roots, sticks, and food. Humus adds nutrients to the soil which plants need to grow and live.*

Clay: *A soil that holds water. When wet, clay feels slippery and slimy. It is made of particles that are smaller than 0.004mm.*

Silt: *Soil that looks like fine grains or tiny pieces of rock. Particles classified as silt measure from 0.004mm to 0.006mm.*

Sand: *Soil that is coarse and drains quickly. Sand particles measure from about 0.06mm to 2.00mm.*

Gravel: *Visible rock particles, sometimes referred to as pebbles.*

The smaller the particles in the soil, the smaller the air spaces between them. This makes it hard for plant roots to push through, but this type of soil retains moisture longer than soil with larger particles. A plant that needs a dry environment, like the cactus, does well in soil that is coarse, like sand, which does not retain a lot of water. Plants that require more moisture, like vegetable plants, do better in a soil that has a balance of humus, clay, and sand. Nature does not always cooperate by providing the best type of soil for the crops farmers want to grow. Therefore, they plow, add fertilizers, and irrigate to create a healthy growing environment for their crops.

Why is Soil Data Important to Scientists?

Soil characterization data are key pieces of the picture of how an ecosystem works. We need to know the properties of soil horizons so that we can predict how fast water will

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

move through them. Soil properties also tell us whether the soil has the potential to store enough water to keep plants growing through a drought, to withstand a flood, and to provide the right combinations of chemicals to plants (as indicated in measurements of pH, and N, P, K levels) so that they will grow properly. The chemical and physical properties of soils that you measure in the GLOBE Soil Characterization protocols also tell us specific information about how well the soil will perform as a filter of wastes, as a home to organisms, as a location for buildings, and in other important uses.

For more information on soils and lessons, go to <http://soil.gsfc.nasa.gov/>

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Safety Disclaimer:

The content of this Teacher's Resource section is intended to serve as an educational resource for teachers and students.

Preparing for the safety of yourself and your students is a critical step in planning for any hands-on science-related activities. Prior to conducting any of the activities included in this resource section, please familiarize yourself and your students with any potential hazards, and take the necessary precautions appropriate for each specific activity.

Connecticut Science Center is not responsible for the contents of any books, videos, websites or other resources to which we provide a reference and does not necessarily endorse the opinions, activities, services, products or information expressed within them.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Professional Development Opportunities

Field Trip Professional Development Workshop

Come be a student for two days. Prior to bringing your class to the CT Science Center, you are encouraged to spend time at the Center and explore the exhibits and programs available to you and your students by participating in our two day Field Trip Professional Development Workshop.

During these two days, you will have an opportunity to explore the River of Life Gallery, Planet Earth Gallery and other relevant galleries using our standards based Trail Guides. These guides will lead you and your students on the pathway toward enjoying the museum while maintaining focus on your grade level or content standard.

You will also have the opportunity to participate as a learner in the pre visit, visit and post visit activities provided by the CT Science Center. In addition, you will participate in a Guided Investigation aligned with content standard 4.3. Afterward, you will process the various activities and discuss their applications in your classroom and in your students' learning.



4.3 Content Workshop

Energy in the Earth's System

This is a five day content workshop focused specifically on standard 4.3 which focuses on the concept that water has a major role in shaping the earth's surface. Through participating in this inquiry-based workshop, you will deepen your understanding of this standard and more importantly, better prepared to guide your students to an in depth understanding of this concept as well.

During this workshop, you will have the opportunity to experience multiple inquiries that will guide you to a deeper understanding of the science concept, as well as the opportunity to then process the inquiries as a teacher and discuss their applications in your classroom and in your students' learning.

You will also experience the integration of language arts and science through vocabulary, non-fiction texts and science notebooking.

Come for the week and collaborate with other Grade 4 teachers across the state as you design and develop your own inquiry-based lesson to be used in your classroom with your students.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Interdisciplinary Connections/ Extensions:

The following Interdisciplinary activities address all, part, or some of the following state standards:

Grades 3-5 Core Scientific Literacy Standards:

B INQ. 2 Seek relevant information in books, magazines and electronic media.

B INQ. 6 Analyze, critique and communicate investigations using words, graphs and drawings.

B INQ. 7 Read and write a variety of science-related fiction and nonfiction texts.

B INQ. 8 Search the Web and locate relevant science information.

Language Arts Standards:

Standard 1 Reading and Responding

Performance Expectations: Students read, comprehend, and respond in individual, literal, critical, and evaluative ways to literacy, informational, and persuasive texts in both print and multimedia formats.

Standard 3 Communicating with Others

Performance Expectations: Students will produce written, oral, and visual texts to express, develop, and substantiate ideas and experiences.

Activities:

Language Arts:

- Have the children create a brochure advertising the best landscape for homes they are selling - guaranteed not to be affected by erosion.
- Dinah Zike foldables: instructions for paper folding to present information by the students in many different ways using only 1-3 pieces of paper.
(<http://www.dinah.com/catalogpage/catalog.htm>)
- Read newspapers and magazines looking for real life examples of erosion taking place today. Report back to the class.
- Have students write to state tourist bureaus to request brochures that describe canyons, river beds, deltas, ocean cliffs, and mountains. Then have students select the examples they find interesting, describe what they think happened to form this landscape, and give their opinion of whether the cause could be weathering or erosion.
(Reading the Environment- Education Development Center, Inc.)
- Read Jane Yolan's book **Letting Swift River Go**, (ISBN 0-316-96860-9) which illustrates changes that take place along a river over a number of years. Then ask students to write a story about a place changing over time.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Social Studies:

- World Region study of Tropical Rain Forests and the deforestation that is occurring there. What will be the effect on the land where all the plants have been removed? How does this affect the people living there?
- Geography- draw a map of the school grounds labeling areas of erosion
- Find out about the geography of the area that is home to the people you are studying in social studies. Examine the pictures in your books. Do you find examples of erosion or weathering in these regions?
(Reading the Environment- Education Development Center, Inc.)

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Teacher Websites

Connecticut River Watershed Council

<http://www.ctriver.org/>

This is the web site for the Connecticut River Watershed Council

USGS Connecticut Water Science Center

<http://ct.water.usgs.gov/>

This is a site for the USGS Connecticut Water Science Center. Here you can ask questions or find answers to frequently asked questions about the watershed, run-off, soils, etc.

Earth Science for Children

<http://www.libraryvideo.com/guides/K7065.pdf>

The video *All about Weathering and Erosion* is described with pre-viewing discussion, focus questions, and vocabulary.

Natural Resources Conservation Service

www.soils.usda.gov

Information for teachers and students that helps in the understanding of soil.

Soils Sustain Life Educational Resources for Teachers

www.soils.org/lessons

State Soils, Activities for soil and erosion, Earth Science week information kit.

US Geological Survey

<http://education.usgs.gov/>

The U.S. Geological Survey provides scientific information intended to help educate the public about natural resources, natural hazards, geospatial data, and issues that affect our quality of life. Discover selected online resources, including lessons, data, maps, and more, to support teaching, learning, education (K-12), and university-level inquiry and research.

Soil Net Project

www.soil-net.com

Soil-Net.com is a free and compelling environmental Internet resource for Key Stages 1-4 providing teachers and students extensive curriculum-based information about soil. As one of the three major natural resources, alongside air and water, soil is vital to the existence of life on earth. Soil-Net.com will help you discover what soil is, the teeming life in soil and about the many environmental threats facing soils. Remember, soil is all around us, just under our feet.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

Gravity, an Agent of Erosion

<http://www.usoe.k12.ut.us/CURR/Science/core/8thgrd/sciber8/geology/html/gravity.htm>

Gravity, an Agent of Erosion Short article with examples of gravity and its role in erosion. Also, great photographs of examples of water, wind, ice and land erosion. (Lesson 6)

Literature Links

From:

http://www.wastatelaser.org/support/toolkits/stc/land_and_water/literature.asp

TITLE	AUTHOR(S)	ISBN	PUBLISHER	*How resource has been used in the unit
<u>Rookie Read-About Science: Where to Puddles Go?</u>	Robinson, Fay	ISBN 0-516-06036-8	Children's Press, Inc.	This book tells about the water cycle using photographs and everyday situations. Low readability level. Use this book with. It does a great job explaining condensation and the other stages of the water cycle with a low reading level. (3.2).
<u>A True Book: Water</u>	Ditchfield, Christin	ISBN 0-516-22345-3	Children's Press A Division of Scholastic Inc.	This book has fun water facts, tells about the water cycle and talks about water as a natural resource. On pages 28-33, it tells about the water cycle and the importance of the water changing temperature in that process.
<u>A New True Book: Rivers</u>	Carlisle, Norman and Madelyn	ISBN 0-516-01645-8	Children's Press	This book uses photographs and a low readability (4.1) to describe how rivers are formed. It especially does a nice job of describing the continental divide and the role of dams.
<u>My World of Geography: Lakes</u>	Royston, Angela	ISBN 1-4034-5591-0	Heinemann Library	This book uses photographs and illustrations to describe how lakes form, including rivers, dams, reservoirs and recreation. This book could be used as independent reading for students who need a lower reading level.
<u>Science Works: A Drop in the Ocean, The Story of Water</u>	Bailey, Jacqui	ISBN 1-4048-0566-4	Picture Window Books	This book does a great job of personifying water. It also describes the different parts of water focusing on the water molecule's motion. Use this book. It is a fun way to talk about the different parts of the water cycle. Also, it would provide some prior knowledge to the selection in Lesson 6, "Where Does Our Drinking Water Come From?"
<u>A True Book: Valleys and Canyons</u>	Brimner, Larry D.	ISBN 0-516-21569-8	Children's Press a Division of Grolier Publishing	This book uses photographs to describe the different types of valleys.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

<p><u>Follow the Water from Brook to Ocean</u></p>	<p>Dorros, Arthur</p>	<p>ISBN 0-06-021598-4</p>	<p>Harper Collins Publisher</p>	<p>An easy reading (readability 4.7) book that discusses many of the concepts of this unit; including, streams, rivers, deltas, canyons, groundwater, dams reservoirs and the role of gravity. This would be a great book to do as a pre-read for students who may have little interaction with streams and rivers or English Language Learners. This could also be a review of the unit, reading and discussing how the book is similar or dissimilar to their experiences.</p>
<p><u>Canyons</u></p>	<p>Rothaus, Don</p>	<p>ISBN 1-56766-322-2</p>	<p>The Child's World, Inc.</p>	<p>Beautiful photographs of canyons from around the world. The text describes the different canyons and what makes them unique. This would be a great enrichment book for students that finish early or students that are interested. Pages 8 and 11 describe erosion in a very meaningful way.</p>
<p><u>The Story of Dunes: Sand on the Move</u></p>	<p>Gallant, Roy</p>	<p>ISBN 0-531-20334-4</p>	<p>Franklin Watts: A Division of Grolier Publishing</p>	<p>Detailed description of how dunes are formed and the different types of dunes. The photographs are amazing! Chapter 1 (pages 7-12) of this book does a great job of telling how a rock becomes sand. It also tells about how the sand can reach the sea.</p>
<p><u>The Drop in My Drink: The Story of Water on Our Planet</u></p>	<p>Hooper, Meredith</p>	<p>ISBN 0-670-87618-6</p>	<p>Viking: Published by Penguin</p>	<p>This book, with its beautiful water color illustrations tells how a drop of water got to your faucet. Although it is done in a narrative format, it is still informational text. This book really stresses how water is recycled, focusing on how this drop of water was once part of the ocean, an iceberg, or saw "life on Earth begin." Because of the story format, this may book may make the information more accessible for some students.</p>
<p><u>The Story of the Earth: River</u></p>	<p>Bender, Lionel</p>	<p>ISBN 0-531-10554-7</p>	<p>Franklin Watts</p>	<p>Using photographs and drawings this book tells about the formation of a river from the source to the delta. This is the best overview book I've found.</p>

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth’s surface.

				This is a GREAT book that reviews all the different parts of the river. It does an excellent job of describing how a river erodes its banks.
<u>The Magic School Bus: Wet All Over; A Book About the Water Cycle</u>	Cole, Joanna	ISBN 0-590-50833-4		The students in Ms. Frizzle’s class go on another adventure. They change into drops of water, evaporate, condense, rain, and land in a river and travel to the ocean. They also go through a water treatment (waterworks) plant.
<u>Restless Earth: Mountains</u>	Jennings, Terry	ISBN 1-931983-19-4		This book is filled with photographs explaining the different ways mountains are formed. The sections in this book entitled, "Rivers at Work" and "Glaciers" would be an excellent independent reading activity for students.

Other Non-Fiction Text

<u>Title of Books</u>	<u>Company</u>	<u>ISBN Number</u>
<u>Soil Science</u>	Delta	1-59242-376-0
<u>Water Cycle</u>	Delta	1-59242-379-5
<u>Erosion</u>	Delta	1-59242-523-2
<u>The Water Cycle</u>	Harcourt School Publishers	0-15-342857-6
<u>Changes to the</u>	Harcourt School Publishers	0-15-343856-8
<u>Earth’s Surface What Happens to Rock?</u>	Wright Group	0-7802-2719-0
<u>Investigating Rocks</u>	Newbridge	1-58273-082-2
<u>Earth:Slow Changes</u>	Benchmark Education	978-1-4108-5079-9
<u>Soil Erosion and Pollution</u>	Children’s Press	0-516-41188-8

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

VIDEOS

[All About Weathering and Erosion](#) by Earth Science for Children
Schlessinger Science Library

http://soilerosion.net/doc/photos_videos.html

Soil erosion

<http://geochalkstone.wordpress.com/2007/07/22/coastal-erosion-time-lapse-video/>

Coastal erosion

<http://www.weru.ksu.edu/vids/>

Wind erosion

<http://www.cbsnews.com/video/watch/?id=3440105n>

Beach erosion

<http://www.schoolvideos.com/videos/2521S>

Weathering and erosion

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

CLASSROOM KITS

STC Land and Water Kit
Carolina Biological Supply Co.

www.carolina.com/STC

DSM III Erosion Kit and Foss Stream Table
Delta Education

<http://www.delta-education.com/>

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

SOFTWARE

Helping People Understand Soils- CD

National Soil Survey Center

100 Centennial Mall North Federal Building, Room 152

Lincoln, NE 68508

Phone 402-437-5499

HOME/SCHOOL/COMMUNITY CONNECTION

- You could invite parents to come and watch their child's Performance Task presentations.
- Have the children look for examples of erosion or features that are preventing erosion in their own yards. They can make a list or take pictures to bring in and share with the class.
- Hold a Family Science Night and have children demonstrate their Performance Task or one of the other Post Activities.
- Invite an expert into your classroom (Mary Mushinsky- State Representative of the 85th Assembly District-Member of the Environment Committee)
- Students write newsletters home describing their experience at the CT Science Center and what they've learned about erosion.
- Ask for parent volunteers to come in and assist you with the Pre and Post activities.
- A field trip to a cemetery will reveal weathering and erosion of tombstones and even disasters that may have occurred in the past.
- Ask your local historical society to share old pictures of the school neighborhood. Students can then take pictures of those same spots and compare the changes.
- Students can make "Splash Cards" to put around their home before a projected rainfall. Staple five 3x5 index cards near to top of craft sticks. Insert the sticks into the soil until the card is just touching the ground in several locations around their home. After the rain, students look for evidence of soil movement by the amount of mud splashed up on the cards. Where was the most soil movement? The least? Share that information with their parents and discuss ways to correct the area that had the most soil movement.
- Contact your local Wetlands Committee and ask for a guest speaker to visit your classroom

CAREER INFORMATION

Picture Yourself as a Soil Scientist

<http://www.csss.ca/students.html#careers>

Great description of soil science application.

National Society of Consulting Soil Scientists

www.nscss.org/jobs.html

National Society of Consulting Soil Scientists

This site contains links to job search and placement resources, internships, job markets, executive placement.

Vocational Biographies

<http://www.vocbio.com>

This is a fee site. Perhaps your school system already has access. They explore careers by telling the stories of persons working in those careers. Our biographies track workers from their school experiences through their current jobs and lifestyles. It is set up as a 4 page newspaper article-easy to read.

Conservation Careers

http://investigate.conservation.org/xp/IB/conservationcareers/educational_choices/educational_choices.xml

www.soils.org

Finding a major to match your interests and goals can be confusing. This guide serves as a reference to the wide variety of study paths available to students entering the conservation and environmental arenas.

Conservation Career Gateway

<http://www.nwf.org/careergateway/>

Listing of intern, volunteer and paid positions to give students an understanding of all the opportunities available in the field of conservation.

U.S. Consortium of Soil Science Associations

www.soilsassociation.org

This association strongly supports the activities of field soil scientists, researchers, and educators in providing and distributing quality soil survey information to the American public.

STUDENT RESOURCES

Safety Disclaimer:

The content of this Student's Resource section is intended to serve as an educational resource for students.

Preparing for the safety of yourself is a critical step in planning for any hands-on science- related activities. Prior to conducting any of the activities included in this resource section, please familiarize yourself with any potential hazards, and take the necessary precautions appropriate for each specific activity.

Connecticut Science Center is not responsible for the contents of any books, videos, websites or other resources to which we provide a reference and does not necessarily endorse the opinions, activities, services, products or information expressed within them.

CT Science Standard 4.3 – Erosion

Water has a major role in shaping the Earth's surface.

WEBSITES:

Terrain Builder

http://www.soil-net.com/dev/page.cfm?pageid=activities_terrainbuilder

How does a landscape form? How does erosion affect the shape of the land? One way to see this is to have a go with 'TerrainBuilder'. TerrainBuilder is a free software tool which simulates the action of erosion on differing landscapes.

Water Erosion

www.thinkquest.org/library/

The ThinkQuest Library provides innovative learning resources for students of all ages on a wide range of educational topics. Featuring over 6,500 websites, the library is created by students from around the world.

Newton BBS

www.newton.dep.anl.gov

This site allows students to ask questions of a scientist.

Droplet and the Water Cycle

<http://kids.earth.nasa.gov/droplet.html>

Video game with the main character, Droplet, going through the different parts of the water cycle.

British Council: Games

<http://www.learnenglish.org.uk/words/activities/waterdr.html>

This website has interactive activities where students see if they can label the parts of the water cycle.

Deposition

http://www.classzone.com/books/earth_science/terc/content/visualizations/es0604/es0604page01.cfm?chapter_no=visualization

This is animation of sediment deposition in a river.