Accessing Prior Knowledge

Name: _____ Date: _____

Effects of Wind and Water

What do you think this does?
Discuss your thoughts with your neighbor.

Accessing Prior Knowledge

Effects of Wind and Water

What could be done to keep the land by the houses from eroding?
Discuss your thoughts with your neighbor.

Scope Phenomenon

Name: _____ Date: _____

Put Down Some Roots

1. In the video, what do you observe that people have done to try to reduce erosion?

_____
_____
_____

2. How do plants prevent erosion from wind and water?

_____
_____
_____
_____
_____

3. What else can people do to prevent erosion from wind and water?

_____
_____
_____
_____
_____

Explore Student Journal

Name: _____ Date: _____

Stop the Erosion!

Student Journal

Complete the recording table below.

Structure	Before Drawing	After Drawing	Does it prevent water erosion?	Does it prevent wind erosion?
Rocks (dike)				
Wood Sticks (windbreak)				
Moss (living shoreline)				

What did the layer of rocks do?

_____

_____

What did the wood sticks do?

_____

_____

What did the moss do?

_____

_____

Explore

Name: _____ Date: _____

Stop the Erosion!

Student CER

Write a scientific explanation to explain which method works best at preventing erosion.

Claim

_____

_____

_____

Evidence

_____

_____

_____

_____

	2	1	0
Claim	Accurately answers the question based on data.	Answers the question, but is inaccurate based on data.	Does not make a claim, or does not answer the question.
Evidence	Cites comparative data, uses labels, and addresses variables.	Cites inaccurate data from data table.	Cites changes, but does not use data from data table.

Explore

Name: _____ Date: _____

Sand Castles

PBL Entry Document

Are you ready for a spirited competition on the beautiful beaches of California? Welcome to the Annual Sand Castle Days Competition.

Every year during the Sand Castle Competition, there are teams whose castles are destroyed before they are finished, due to water and wind. You will be a part of a design team of experts who will design a barrier system to protect the sand castles from the natural forces of wind and water and the erosional destruction they could cause during the competition. The design team will include: a project manager, an architect, an engineer, and a designer. The barrier system protecting your sand castle must be made from any appropriate materials that are free and recyclable and can be brought from home.

Your team will need to make a poster-sized design sketch before building the actual sand castle and barrier system. The sketch must show how you plan to keep water and wind from destroying your castle during the competition. Your team will then build and test the prototype – redesigning and testing as necessary to meet the criteria. Finally, your team must prepare a presentation for the Sand Castle Days Competition judges that includes photos of the different models that were built and tested, the reasoning used in choosing the barrier system you did, and why you believe it will work.

Your presentation is limited to 10 minutes. In that time, you are to demonstrate how your barrier system protects your castle. Be sure your presentation shares the appropriate and sufficient information and data to convince the judges that you understand the forces of wind and water and how to prevent erosion. Be enthusiastic so you can sway the representative to select your design.

As you watch videos of Water Erosion and Sand Castle Destruction, be thinking of innovative ways you could build a barrier that could protect a sand castle and keep it from being destroyed.

Explore

Sand Castles

PBL Expert Roles

These experts include: a project manager, an engineer, an architect, and a designer. Each of these roles may need assistants to be able to complete the tasks in the allotted time.

Project Manager

As the Project Manager you are responsible for seeing the project through to completion. You will need to constantly assess where team members need help and assist them. You will need to keep the rubric in hand and constantly refer back to it to make sure that your team is meeting the criteria. You will be the lead communicator, making sure that feedback is understood and evaluated. You will work with the team to develop and present your sand castle and barrier system and explain how and why it works.

Engineer

You are responsible for investigating which types of forces are likely to cause erosion and destruction of your sand castle. You will be the consultant for your team in knowing how to build a barrier which will resist these forces. You will share your findings along with your team, in the final presentation.

Architect

You are responsible for researching and drawing the sketches for the design of the barrier system to protect the castle. You will include in your sketch the type of barrier system chosen and innovations that were added as you tested your model. Also, you will clearly mark on the sketch where the different forces are occurring and how the barrier system prevents erosion. This information should help you make decisions about construction of the prototype. You will share your findings along with your team in the final presentation.

Designer

You are responsible for designing and testing the barrier system. You will record data with each test to determine if changes are required. You will help with the preparation of the presentation and share your design during the final presentation.

Explore

Sand Castles

Individual 21st Century Skill Rubric

Innovation	Expert (4)	Competent (3)	Beginner (2)	Novice (1)
Creative Ideas	Develops, implements, and communicates new and creative ideas to others. Makes many real and useful contributions to the project	Develops, implements, and communicates new and creative ideas to others. Makes a useful contribution to the project.	Develops and attempts to communicate new ideas to others, but is not always successful	Develops few ideas, and does not effectively implement ideas or communicate them to others.
Successes and Mistakes	Embraces the idea that experimenting is an important part of the path to success. Approaches opportunities with an understanding that every failed attempt is an opportunity to learn.	Understands the importance of experimenting as part of the path to success, but becomes frustrated with failed attempts.	Does not fully understand the importance of experimenting as part of the path to success, and is reluctant to take risks.	Does not understand how failed attempts are part of the process that leads to success and gives up easily.
Evidence and Conclusions	Is able to look at complex information, successfully draw conclusions, and apply them to the situation	Is able to look at information and draw conclusions with relative success.	Looks at information and sometimes is able to draw conclusions	Looks at information, and rarely is able to draw a conclusion

Explore

Sand Castles, Key

Team Rubric for a Problem/Project Based Learning Challenge

Category	Expert (4)	Competent (3)	Beginner (2)	Novice (1)
The problem is clearly identified and the solution addresses the problem	Clearly identifies the problem, and the solution is clearly outlined	Clearly identifies the problem, and the solution is identified. Leaves some questions unanswered.	Identifies the problem, but does not completely address the solution. Does not address all possible solutions because of lack of testing	Did not address the problem or the solution will not solve the identified problem. Ignores the problem and the possible solutions
Barrier System met criteria as outlined in Entry Document	At least three Barrier System models were built and tested based on strong understanding of erosion. Improvements were made based on evidence.	At least two Barrier System models were built and tested based on sufficient understanding of erosion. Some improvements were made based on evidence.	At least one Barrier System model was built. There was insufficient understanding of erosion. No improvements were made.	No Barrier System model was completed and castle was destroyed by wind and water.
21st-Century Skill Use of Innovation	Continuously applies innovative ideas to make a real and useful contribution to the project	Applies innovative ideas to make useful contributions to the project	Develops innovative ideas, but does not make a contribution	Does not attempt to develop innovative ideas
Scientific content shows depth in understanding and is applicable to the solution of the problem.	Solution shows a strong understanding of the forces of wind and water erosion. Modeling and testing was used to make good, logical decisions based on evidence and data.	Solution shows important connections to understanding erosion. Some modeling and testing was used to make decisions based on evidence and data.	Solution shows some knowledge of erosion. A model was built, but no testing occurred and therefore decisions were not based on evidence. (Unwilling to try more than one model, does not test ideas or see importance)	Solution does not show knowledge of erosion. Model was either incomplete or unsuccessful due to lack of understanding erosion.

Effects of Wind and Water

Picture Vocabulary

Design

A plan or drawing made to show how something should work or be made

Problem

A situation that needs to be changed or needs an answer

Solution

An answer to a problem

Water

A liquid that all living things need to survive

Wind

Moving air

Effects of Wind and Water

Reflect

Have you ever seen a sculpture that has been outside for many years? If the sculpture is of a person, the nose and mouth might be worn down. The face might have cracks in some places. The way the sculpture looks now is probably not how it looked when the artist made it.

The nose of the Sphinx has been worn down over time.

Just like structures that humans build, Earth's **landforms** change over time. Take mountains, for example. Some mountains are tall with steep slopes. They have sharp, jagged peaks. Over time, though, their slopes will become gentler. Their peaks will become more rounded and smooth, just like the face of the Sphinx. These changes happen when rocks break down and move to new places.

What causes weathering?

One way that landforms change over time is called weathering. Weathering happens when forces in nature break down rocks into smaller pieces. Think of the tiny grains of sand on a beach. Those grains of sand used to be parts of larger rocks or shells. However, over time pieces of the larger rocks or shells broke off. The pieces became smaller and smaller. Now they are just tiny grains.

Different things cause weathering. Wind is one way that weathering can happen. Wind carries tiny particles of soil and rock called sediment. As wind blows against a mountain, the sediment grinds against it. This grinding action breaks off pieces of the mountain.

Water can also cause weathering. Rivers carry sediment that grinds against rocks in the riverbed. Over time, large formations like canyons can form.

Weathering from wind, water, and ice helped create these natural arches in Utah. Over many years, parts of the rocks were worn away, leaving empty spaces.

What Do You Think?

The rocks at the edge of a waterfall tend to be rounded and smooth. Why do you think the rocks are this way? What caused the weathering?

Look Out!

Changes to land happen at different speeds. A volcano or an earthquake can change landforms in minutes! Wind and water are just as powerful. For example, sudden waves called tsunamis can uproot trees and shift whole beaches.

In most cases, though, wind and water take much longer to change Earth's surface. They may even take millions of years! Look at the tall, skinny towers of rock in the picture below. They formed a long time ago, but the rock is still changing today. Scientists predict that in another few million years, the rock towers will appear very different.

These towering rock formations are called hoodoos. Short, intense rainfalls weathered and eroded rock to form these structures.

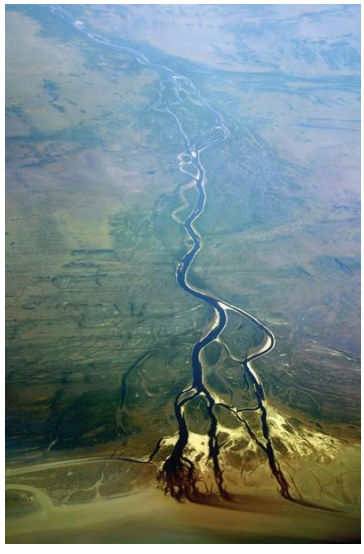
What causes erosion?

Weathering is not the only way that landforms change. When rocks break down into smaller pieces, those pieces often get moved. This movement of rock pieces to a new place is called erosion.

Weathering and erosion work together to change Earth's surface. Many things that cause weathering also cause erosion. Wind causes erosion by carrying away loose sediment from landforms like cliffs or sand dunes. Sand dunes are constantly changing because of wind. Running water carries away loose rock particles in a river.

Look Out!

Eventually, wind and water put down the sediment they carry. This process is called deposition. (If you deposit something, you put it down.) Over time, the sediment can build up. For example, when wind stops blowing, the particles in the air fall to the ground. As more particles collect, they may build new beaches and sand dunes. Rivers may deposit sediment as they enter larger bodies of water because the water slows down. The sediment creates new land at the mouth of a river, called a **delta**.



Sediment piles up at the mouth of this river to form a delta.

Try Now

Take some time to observe erosion and deposition in action and find the best way to hold back the land.

1. To complete this activity, you will need the following materials:
   - Two rectangular baking pans
   - Sand
   - Tap water
   - Two small wooden blocks
   - Topsoil
   - Pebbles/rocks

2. Place one wooden block under the edge of one side of the pan. The pan should be slightly tilted.

3. Add sand to the raised end of the pan. Make your sand like a mini beach. To do this, make sure your sand covers only about half of the pan (the higher part). Place the pebbles and the rocks throughout the sand.

4. Pour water into the lowered end of the pan until it just reaches the edge of the beach. Do not let the water spill over the edge of the pan. If necessary, add more sand to the beach.

5. Dip the second wooden block in the water at the lowered end of the pan. Gently move it up and down to create waves.

Try Now

6. Watch what happens to the sand. What signs of erosion and deposition do you see?

7. Repeat steps 2 through 6 in another pan using the topsoil.

8. Compare the ways the sand and the topsoil help keep the pebbles in place. This simulates how shrubs, grass, and trees hold back the land from erosion.

What Do You Think?

What Do You Know?

Landforms on Earth change in different ways. Read the list of changes in the table below, then check whether each change is an example of weathering (W), erosion (E), or deposition (D). Finally, label the agent of change in each example (wind or water).

Change to Land	W	E	D	Agent of Change (wind or water)
After a sandstorm, sand falls from the air onto a sand dune.				
A creek moves sediment downstream.				
A breeze carries small rock particles away from a mountain.				
Water causes a rock to become smaller.				
A river leaves sand and soil along the coast as it enters the ocean.				

Linking Literacy

Name: _____ Date: _____

Cause and Effect

Complete the Cause and Effect boxes below. Draw and label what caused the change and what happened.

Cause What made it happen?	**Effect** What happened?

Linking Literacy

Name: _____ Date: _____

KWL Chart

K What We Know	W What We Want to Know	L What We Learned

Engineering Connections

Name: _____ Date: _____

Engineering Design Process – Define the Problem, Brainstorm, Plan, Build, and Test

1. Define the Problem

The Problem

Your family would like to grow some flowers outside your kitchen window. Every time you plant some seeds, it rains, and the rain coming off the roof washes the seeds and soil away. Design a model of what you could create for your home so that the rain will not wash the seeds away.

Criteria and Constraints

- The design must show the house and flower bed.
- The design must clearly show how the flower bed will be protected from the rain coming off the roof.
- The seeds are not to be buried in the soil.
- You should create a labeled drawing or sketch of your solution before building it.
- You may only use the materials provided.

2. Brainstorm

Write down any ideas you have to solve the defined problem. If you need more information, write down what you need to know, and ask your teacher for permission to research the answer.

Engineering Connections

3. Plan

Choose one of the ideas you wrote down while brainstorming. Draw your plan, and label the parts. Be sure to list all materials needed to carry out the plan.

4. Build and Test

Build your design, and test it. Does it meet all the criteria and constraints? Does it solve the problem? Use the space below to list what problems you need to fix in your design.

Engineering Connections

Engineering Design Process Student Rubric

Category	3	2	1	0
Brainstorm	The student listed multiple brainstormed ideas.	The student listed a couple brainstormed ideas.	The student listed only one brainstormed idea.	The student did not attempt to brainstorm a solution.
Plan	The plan could successfully solve the problem.	The plan has some issues that would make it unlikely to fully solve the problem.	The plan would not solve the problem at all.	No plan was created.
Build and Test	The student successfully built their planned solution, tested it, and identified areas for design improvement following the test.	The student successfully built their planned solution and tested it but did not identify areas for design improvement.	The student successfully attempted to build their planned solution but did not test it.	The student did not attempt to build.
STEM Skill: Critical Thinking	The student presented an evidence-based solution to the posed problem or scenario.	The student presented a solution to the posed problem or scenario, but they did not include any evidence from research.	The student presented a solution that did not align with the posed problem or scenario.	The student did not present any solution to the posed problem or scenario.
STEM Skill: Promptness and Time/ Resource Management	The student completed work on time and planned and utilized resources or materials appropriately with no waste.	The student completed work on time and utilized some resources appropriately with little waste.	The student completed work on time but did not plan out the use of resources or materials, resulting in waste.	The student did not complete the work on time and wasted resources or materials.

Reading Science

Name: _____ Date: _____

Save the Yard!

1 Rachel was excited. She was going to visit her grandparents. They lived in Rockport. They lived on a **bay**. A bay is a body of water partially enclosed by land but with a wide mouth, affording access to the sea. It was fun to visit Rockport. Rachel liked to fish. She also liked to kayak. Sometimes her grandpa took her for a ride on the boat. She could see dolphins. There were lots of fun things to do and see at the bay.

2 She finally got to her grandparents' house. Rachel ran straight to the back deck. She wanted to see the bay. She wanted to look for fish and crabs. She saw a fish right away. Then she saw a bird floating on the water. She watched the bird. It was moving with the waves of the water. It was a windy day. The bird was moving fast. Soon the bird floated to the house next door. When she looked over there, she was confused. The yard next door was small. Her grandparent's yard was big. She wanted to know why. She looked back and forth at both yards. She saw that they were different. Her grandparents had a bulkhead. A **bulkhead** is a wall, along a waterfront, that acts as a protective barrier. She saw that the yard next door did not have a bulkhead. There was nothing between the yard and the bay water. There was nothing to protect the yard. The wind and water were changing the shape of the land. Rachel looked at the other houses on the bay. She saw that some of them had bulkheads. Others did not. The houses with the bulkheads had bigger yards. They had protection from the wind and water. The houses without anything to protect them had smaller yards. Those yards were being washed away by the wind and the water.

3 Rachel was happy that her grandparents had protection from the water. She was worried about the other yards. She wondered what would happen. What if the wind and water kept eroding the land? The yard would get smaller and smaller. What could they do to save their yard? How could they protect their land from the wind and water?

Reading Science

1 What is a bay?

A An ocean

B A body of water partially enclosed by land but with a wide mouth, affording access to the sea

C A small stream of water

D All of the above

---

2 What did Rachel see floating on the water?

A A fish

B A crab

C A bird

D A boat

---

3 What was protecting her grandparents' yard from the water?

A Grass

B A deck

C A bulkhead

D Nothing

Reading Science

4 What is a bulkhead?

A A wall, along a waterfront, that acts as a protective barrier

B A fish

C The name of the bird Rachel saw on the water

D A fence

---

5 What was changing the shape of the land in the yard with no protection?

A Rocks

B Fire

C Wind and water

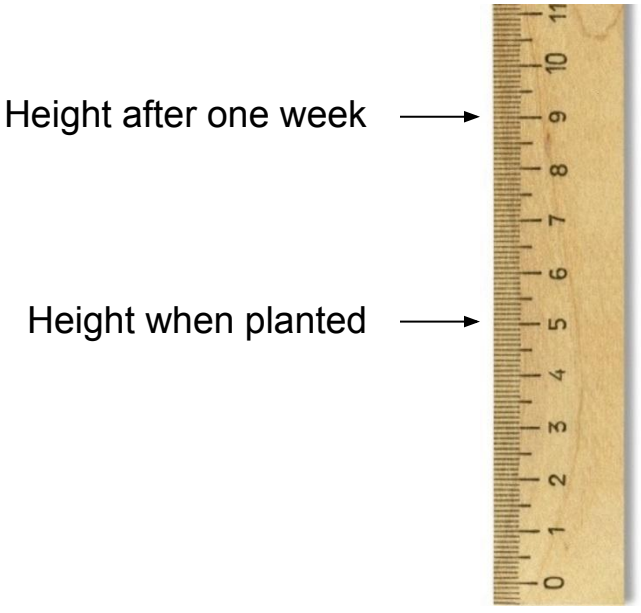
D None of the above

Math Connections

Name: _____ Date: _____

1. Mary's class was doing an experiment about water erosion on a hill. Before the class began, the hill was 100 millimeters (mm) high. After the experiment, the hill was only 46 millimeters high. How much did the height of the hill decrease?

2. Amir and his mother were planting tomato plants. Amir kept track of his plant's height each week and marked it with a centimeter (cm) ruler. How many centimeters did the tomato plant grow after one week?



3. Terri was watching a sand castle competition at the beach. The person with the tallest sand castle was the winner. The winner's sand castle was 96 inches tall. The second-place sand castle was 88 inches tall. How many inches taller was the winner's sand castle?

Math Connections

4. A second grade class at Lincoln Elementary was looking at the width of the different rivers in their state. The Snake River is 79 feet wide. The Rabbit River is 63 feet wide. Choose the equation below that will solve how much wider the Snake River is than the Rabbit River.

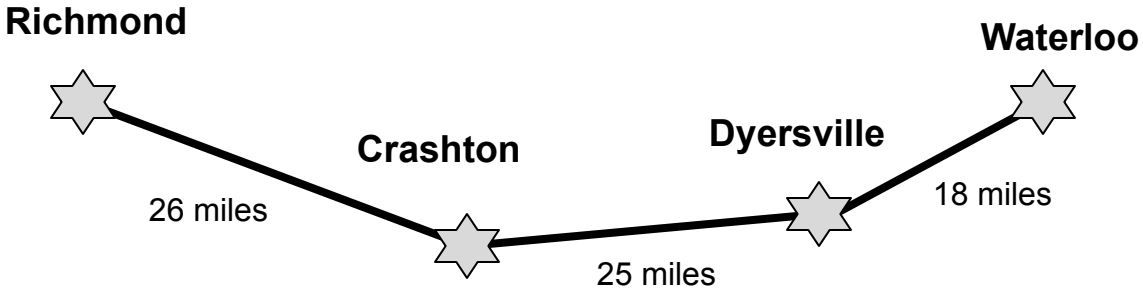
A. 79 + 63 = difference in width

B. 79 – 63 = difference in width

C. 63 – 79 = difference in width

D. 79 + 79 = difference in width

Lacy drew a map of some of the towns near her. The stars show where the towns are. **Use the map to answer question 5**.



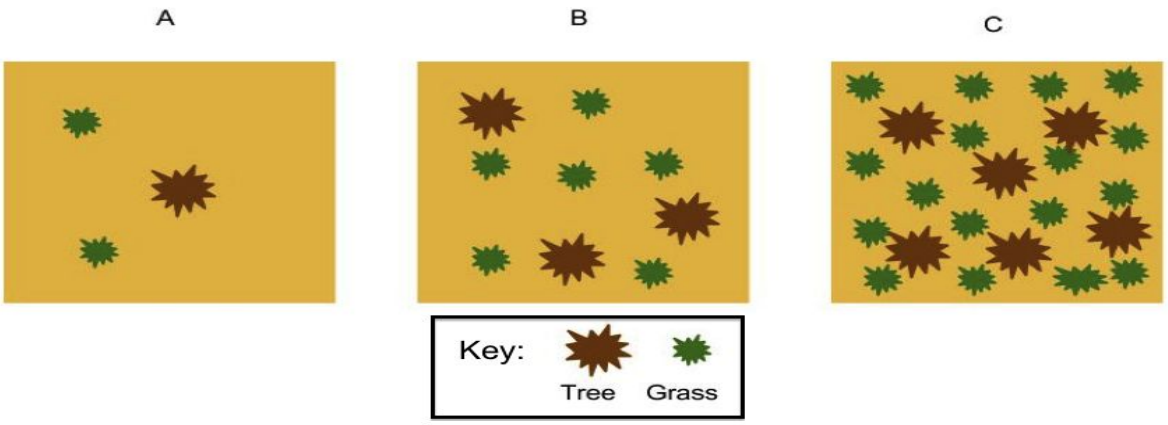
5. Find the total distance between Richmond and Waterloo.

Claim-Evidence-Reasoning

Name: _____ Date: _____

Scenario

People use plants to help prevent erosion from wind and water. Look at the map of three different locations near a river. Then look at the key to see where different types of plants are found in each area.



Prompt

Write a scientific explanation for which location will have the least erosion.

Claim:

_____

_____

_____

Evidence:

_____

_____

_____

_____

Claim-Evidence-Reasoning

Effects of Wind and Water CER

Rubric for writing a scientific explanation

Points Awarded	2	1	0
Claim	Makes an accurate and complete claim.	Makes a claim that is inaccurate or incomplete.	Does not make a claim.
Evidence	Provides more than two accurate pieces of evidence.	Provides one-two accurate pieces of evidence.	No response given or response is off topic.

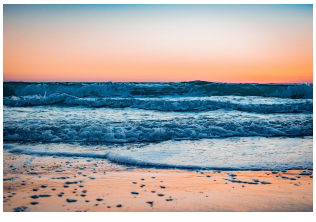
Open-Ended Response

Name: _____ Date: _____

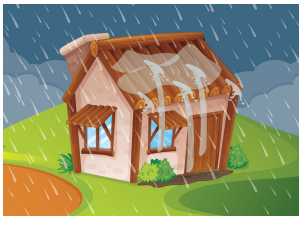
Effects of Wind and Water

Short Answer

1. A beach house is built on the sand. During heavy storms, ocean waves can carry away much sand around the house. How would you try to stop or slow down this process? (Students can write, draw, or both)



2. Rain falls on a rooftop and right down onto a garden in your front yard, creating a gaping hole in the soil. What could you do to prevent the water from entering the garden? (Students can write, draw, or both)



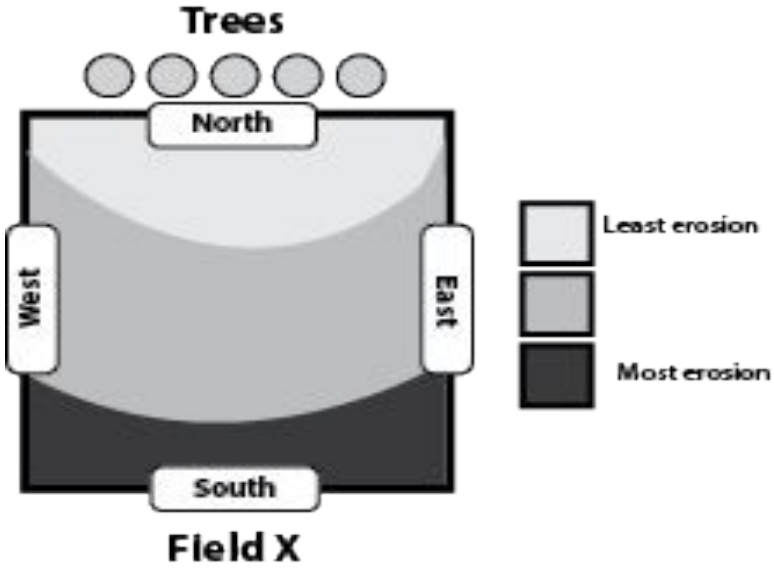
Open-Ended Response

3. How could a farmer prevent the wind from blowing away the good soil where his crops are growing? (Students can write, draw, or both)

Multiple Choice

Name: _____ Date: _____ Group: _____

1 Trees were planted as a windbreak in a school yard. Students will plant a garden where there is the least erosion.



On which side of the school yard should they plant the garden?

A North

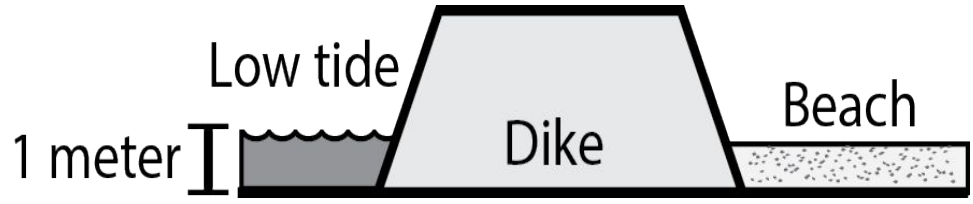
B South

C East

D West

Multiple Choice

2 A dike is a structure built to keep water from the ocean from flooding the land. The illustration shows how a dike is holding back sea water at low tide.



At high tide, the water will rise to three meters. Building a dike takes money, so people want to make the smallest dike possible. What is the height of the smallest dike that will still hold back the water at high tide?

A 1 meter

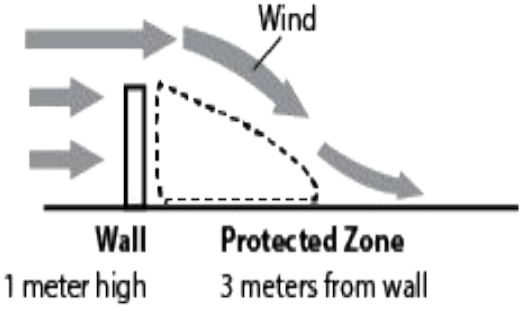
B 2 meters

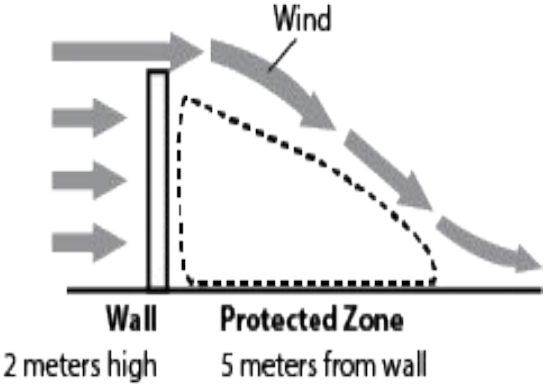
C 4 meters

D 5 meters

Multiple Choice

3 The pictures show how walls can protect from wind.





If the wall is three meters high, how far will the protected zone reach?

A 2 meters

B 4 meters

C 6 meters

D 7 meters

Multiple Choice

4 The table here shows the amount of soil erosion that takes place each year in land planted with different types of vegetation.

Type of Vegetation	Soil Erosion Each Year (Metric Tons)
Crops	3
Forest	1
Orchard	9
Pasture	2

Which type of vegetation is the best choice for preventing soil erosion?

A Crops

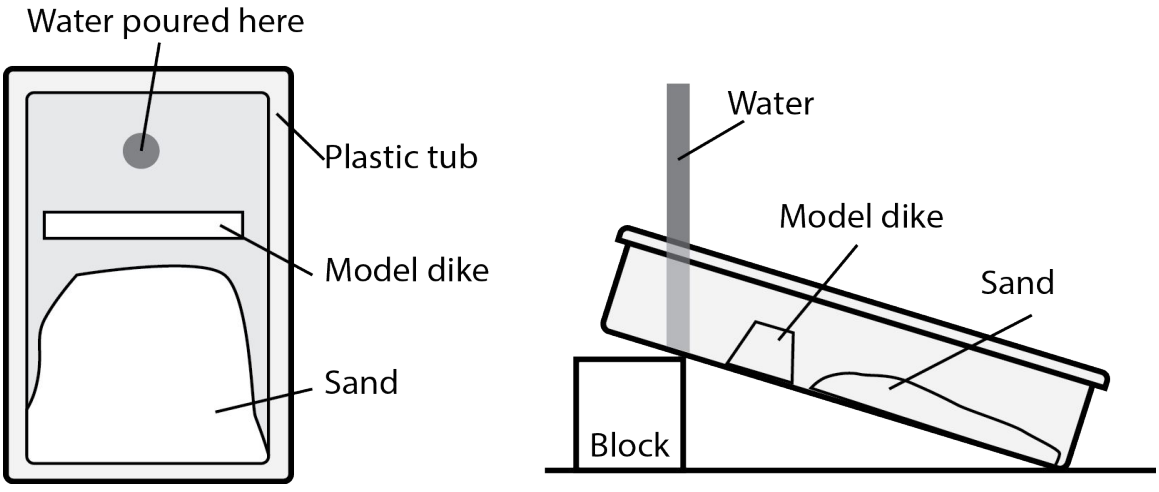
B Forest

C Orchard

D Pasture

Multiple Choice

5 Students want to test their designs of dikes. They put sand into a plastic tub. They prop one end of the tub on a block and add a model dike. The students pour water into the tub and let it run down the tub.



What should students look at to decide which dike is the best at preventing the changes to land caused by flooding?

A The amount of water poured

B The height of the dike

C How much sand was moved

D The size of the block

Effects of Wind and Water

Guided Practice - Schoolyard Field Trip: Erosion Finder

Note: Due to the nature of this element, not all sections of the activity can be completed and submitted online by students.

Description

Students observe examples of erosion found outside near the schoolyard. Students complete a tchart to record their data and solutions.

Materials

Printed Materials

1 Student Journal (per student)

Reusable

Crayons or colored pencils (per student)
Pencils (per student)
Hand lenses (per student)
Clipboards or dry erase boards (per student)

Procedure

1. Pass out Student Journal:, hand lenses, and clipboards or dry erase boards to each student.
2. Explain to students that they will use the clipboard or dry erase board as a hard surface to write their observations on.
3. Take students outside to look for evidences of erosion around the schoolyard. Possible places to look: under slides, under swings, under drains, walking paths, etc.
4. Explain to students that they will need to use their hand lenses to observe closely and record the different examples on the t-chart. Students can use crayons or colored pencils to add to their drawings.
5. Lead a class discussion about the different examples found on the playground and what caused each type of change to the land.
6. Then, have students come up with solutions to stop the erosion in those areas. Students may work independently or with a partner.
7. Decide whether or not you want students to create a model of their solution to test it out.

Guiding Points

- Have students discuss that wind can cause erosion on the playground in places like under the swing, and that water can cause erosion on the playground in places like under the drains, or small streams when it rains.
- Explain the importance of not disturbing the land changes that students find and that their job is to observe and record data.
- Allow students time to develop thorough solutions and possibly test them out.

Guiding Questions

- What causes changes to land?
- How can you recognize erosion?
- How was this land change caused?
- What effect does wind have on land?
- What effect does water have on land?
- What caused the erosion in each of your examples?
- How does your solution address the problem?
- What real-world examples can you think of that would require the same solution?
- Can you think of other ways land is changed?

Guided Practice

Name: _____ Date: _____

Erosion Finder

Observe and record examples of erosion on the playground. Design a solution to stop further erosion in that area.

Examples of Erosion	Possible Solutions

Guided Practice

I. Vocabulary Matching

_____	Moving air	A. water
_____	A liquid that all living things need to survive	B. erosion
_____	The movement of land by wind or water	C. wind

II. Open-Ended Response

Draw and describe a solution to flooding in your neighborhood.

Effects of Wind and Water

Reflect

Have you ever seen a sculpture that has been outside for many years? If the sculpture is of a person, the nose and mouth might be worn down. The face might have cracks in some places. The way the sculpture looks now is probably not how it looked when the artist made it.

The nose of the Sphinx has been worn down over time.

Just like structures that humans build, Earth's **landforms** change over time. Take mountains, for example. Some mountains are tall with steep slopes. They have sharp, jagged peaks. Over time, though, their slopes will become gentler. Their peaks will become more rounded and smooth, just like the face of the Sphinx. These changes happen when rocks break down and move to new places.

What causes weathering?

One way that landforms change over time is called weathering. Weathering happens when forces in nature break down rocks into smaller pieces. Think of the tiny grains of sand on a beach. Those grains of sand used to be parts of larger rocks or shells. However, over time pieces of the larger rocks or shells broke off. The pieces became smaller and smaller. Now they are just tiny grains.

Different things cause weathering. Wind is one way that weathering can happen. Wind carries tiny particles of soil and rock called sediment. As wind blows against a mountain, the sediment grinds against it. This grinding action breaks off pieces of the mountain.

Water can also cause weathering. Rivers carry sediment that grinds against rocks in the riverbed. Over time, large formations like canyons can form.

Weathering from wind, water, and ice helped create these natural arches in Utah. Over many years, parts of the rocks were worn away, leaving empty spaces.

What Do You Think?

The rocks at the edge of a waterfall tend to be rounded and smooth. Why do you think the rocks are this way? What caused the weathering?

Look Out!

Changes to land happen at different speeds. A volcano or an earthquake can change landforms in minutes! Wind and water are just as powerful. For example, sudden waves called tsunamis can uproot trees and shift whole beaches.

In most cases, though, wind and water take much longer to change Earth's surface. They may even take millions of years! Look at the tall, skinny towers of rock in the picture below. They formed a long time ago, but the rock is still changing today. Scientists predict that in another few million years, the rock towers will appear very different.

These towering rock formations are called hoodoos. Short, intense rainfalls weathered and eroded rock to form these structures.

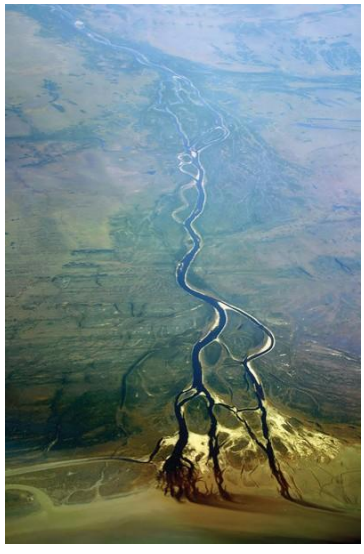
What causes erosion?

Weathering is not the only way that landforms change. When rocks break down into smaller pieces, those pieces often get moved. This movement of rock pieces to a new place is called erosion.

Weathering and erosion work together to change Earth's surface. Many things that cause weathering also cause erosion. Wind causes erosion by carrying away loose sediment from landforms like cliffs or sand dunes. Sand dunes are constantly changing because of wind. Running water carries away loose rock particles in a river.

Look Out!

Eventually, wind and water put down the sediment they carry. This process is called deposition. (If you deposit something, you put it down.) Over time, the sediment can build up. For example, when wind stops blowing, the particles in the air fall to the ground. As more particles collect, they may build new beaches and sand dunes. Rivers may deposit sediment as they enter larger bodies of water because the water slows down. The sediment creates new land at the mouth of a river, called a **delta**.



Sediment piles up at the mouth of this river to form a delta.

Try Now

Take some time to observe erosion and deposition in action and find the best way to hold back the land.

1. To complete this activity, you will need the following materials:
   - Two rectangular baking pans
   - Sand
   - Tap water
   - Two small wooden blocks
   - Topsoil
   - Pebbles/rocks

2. Place one wooden block under the edge of one side of the pan. The pan should be slightly tilted.

3. Add sand to the raised end of the pan. Make your sand like a mini beach. To do this, make sure your sand covers only about half of the pan (the higher part). Place the pebbles and the rocks throughout the sand.

4. Pour water into the lowered end of the pan until it just reaches the edge of the beach. Do not let the water spill over the edge of the pan. If necessary, add more sand to the beach.

5. Dip the second wooden block in the water at the lowered end of the pan. Gently move it up and down to create waves.

Try Now

6. Watch what happens to the sand. What signs of erosion and deposition do you see?

7. Repeat steps 2 through 6 in another pan using the topsoil.

8. Compare the ways the sand and the topsoil help keep the pebbles in place. This simulates how shrubs, grass, and trees hold back the land from erosion.

What Do You Think?

What Do You Know?

Landforms on Earth change in different ways. Read the list of changes in the table below, then check whether each change is an example of weathering (W), erosion (E), or deposition (D). Finally, label the agent of change in each example (wind or water).

Change to Land	W	E	D	Agent of Change (wind or water)
After a sandstorm, sand falls from the air onto a sand dune.				
A creek moves sediment downstream.				
A breeze carries small rock particles away from a mountain.				
Water causes a rock to become smaller.				
A river leaves sand and soil along the coast as it enters the ocean.				