

# Changing Landforms: The Disappearing Cliff

Why is the edge of the ocean cliff closer to the flagpole than it used to be?

How did the edge of the cliff get to be so close to the flagpole?

What are landforms made of? (1.2)

- Read *Landform Postcards* (1.1)
- Discuss and record ideas about landforms on Anticipatory Chart (1.2)
- Observe landforms in *Handbook of Land and Water* (1.2)
- Return to Anticipatory Chart and revise ideas (1.2)

- Landforms are made of rock. (1.2)

How do geologists figure out how something changed when they can't observe it changing? (1.3-1.6)

- Observe sand samples and generate questions about sand (1.3)
- Compare sand samples (1.3)
- Read *Gary's Sand Journal* (1.4)
- Observe a mystery sand (1.4)
- Use evidence from observations of sand samples as evidence for how the sand got to be the way it is (1.5)
- Write and share explanations about sand samples (1.5)
- Use Hard Candy Model to gather evidence that sand and rock can change shape (1.6)

- Even if geologists can't see a change happening, they can use models to visualize how it may have happened. (1.6)
- Even though rock is hard, it can change shape. (1.6)

- Write an explanation as a class to answer the Chapter 1 Question (1.6)

The shape of the cliff changed when the rock it is made of changed.

The problem students work to solve

Chapter 1 Question

Investigation Questions

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to the problem

Explanation that students can make to answer the Chapter 1 Question

# Changing Landforms: The Disappearing Cliff

Why is the edge of the ocean cliff closer to the flagpole than it used to be?

How did the recreation center's cliff change?

What can make landforms change? (2.1-2.2)

- Create diagrams of initial ideas about how landforms change (2.1)
- Observe and discuss images of landforms that have changed (2.1)
- Discuss and record ideas about water's role in landform change on Anticipatory Chart (2.2)
- Use Chalk Model to gather evidence about how water changes landforms (2.2)

How could water change a landform even though landforms are made of hard rock? (2.3-2.5)

- Read *What's Stronger?* (2.3)
- Discuss how water can change the shape of a landform (2.3)
- Create and share diagrams of landform change from *What's Stronger?* (2.4)
- Return to Anticipatory Chart and revise ideas (2.4)
- Use Chalk Model to gather evidence about the scale of erosion (2.5)
- Investigate the scale of erosion with pumice rocks (2.5)
- Use Building on Ideas routine to discuss how landforms change shape (2.6)

- The shape of a landform changes when water causes pieces of rock to break off. (2.4)
- Water hitting a landform causes tiny pieces of the landform to break off. (2.5)
- Scientists make diagrams to show their ideas about how the world works, based on evidence from investigations, models, and books. (2.6)

- Create diagrams of the changing cliff at the recreation center (2.6)
- Write explanations to answer the Chapter 2 Question (2.6)

Water hit the cliff and caused tiny pieces of the cliff to break off and move away.

The problem students work to solve

Chapter 2 Question

Investigation Questions

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to the problem

Explanation that students can make to answer the Chapter 2 Question

# Changing Landforms: The Disappearing Cliff

The problem students work to solve

Chapter 3 Question

Investigation Question

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to the problem

Explanation that students can make to answer the Chapter 3 Question

Why is the edge of the ocean cliff closer to the flagpole than it used to be?

How did the recreation center's cliff erode without the director noticing?

- Interpret maps in *Handbook of Land and Water* (3.1)
- Match side view photos of landforms to bird's-eye view maps of them (3.1)
- Create maps in digital Modeling Tool to represent landforms from above (3.1)

- Maps show where water and land are and where different landforms are. (3.1)

If erosion moves small pieces of rock, how can it cause a big change? (3.2-3.4)

- Create maps of the Mountain Model (3.2)
- Erode the Mountain Model (3.2)
- Discuss scale in Mountain Model maps (3.2)
- Read about slow change over time in *Handbook of Land and Water* (3.3)
- Write about how small changes can accumulate to create a big change (3.3)
- Sort Erosion Cards according to how long erosion takes (3.3)
- Observe landform changes on maps (3.4)
- Model change over time using a digital Modeling Tool (3.4)
- Use Building on Ideas routine to reflect on scale of erosion (3.4)

- Many small changes that are hard to notice can add up to a bigger change that is easy to notice. (3.3)
- When many small changes happen over a long time, the whole landform changes. (3.4)

- Write explanations to answer the Chapter 3 Question (3.5)
- Create diagrams of the cliff's erosion (3.5)

Because the pieces are so small, it took a really long time to observe a big change to the cliff.

# Changing Landforms: The Disappearing Cliff

The problem students work to solve

Chapter 4 Question

Investigation Question

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to the problem

Explanation that students can make to answer the Chapter 4 Question

How did a nearby cliff erode overnight?

Could the recreation center's cliff erode quickly?

How can landforms erode quickly? (4.1-4.4)

- Discuss and record ideas about what could cause a landform to erode quickly on Anticipatory Chart (4.1)
- Create diagrams to show initial ideas about how a cliff eroded quickly (4.1)
- Read about how landforms erode quickly in *Handbook of Land and Water* (4.1)
- Discuss the rate of erosion for landforms with cracks and landforms made of loose material (4.1)
- Model erosion of different materials with the Chalk and Sand Models (4.2)
- Observe a demonstration of how wind erodes landforms made of loose materials (4.2)
- Read *Making Models of Streams* (4.3)
- Reflect on similarities and differences between the real world and models used in the unit (4.3)
- Use a digital Modeling Tool to model the rate of erosion of different landforms (4.4)
- Use Building on Ideas routine to discuss rate of erosion of different landforms (4.4)

- Wind and water can erode a landform quickly if the landform is made of loose materials. (4.2)

- Create diagrams to show new ideas about how the nearby cliff eroded (4.5)
- Write explanations to answer the Chapter 4 Question (4.5)
- Discuss solutions to slow or prevent erosion (4.5)

The nearby cliff eroded quickly because it is made of loose materials, such as clay and dirt, which are not as strong as rock. When wind or water hits the cliff, big pieces can break off. This causes the cliff to change more quickly than rock would.