

Science

Queensland Comparable Assessment Tasks (QCATs) 2012

Being a soil scientist

Student booklet

4



Given name:

Family name:

School:

Setting the scene

Talk about erosion

- How is the ground surface being changed?
- What might be causing the change, or speeding it up?

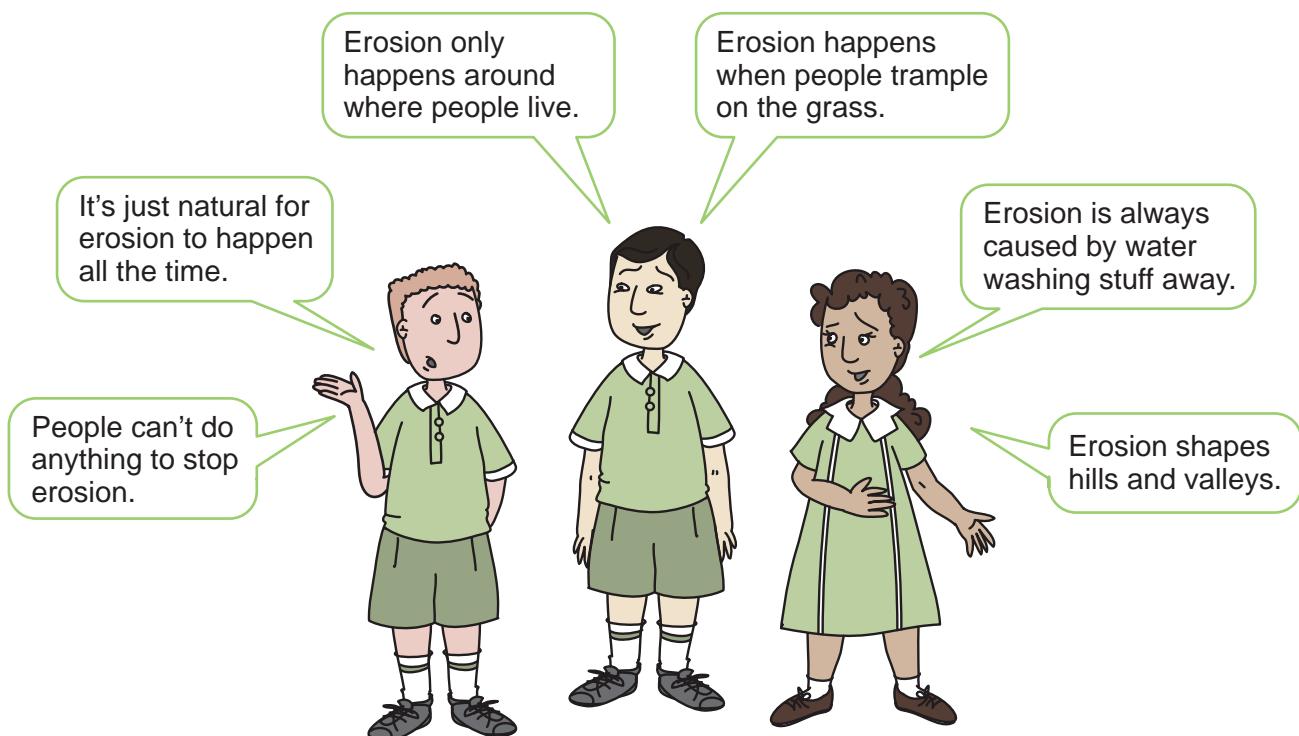


- Where is erosion happening in your local area?
- What is causing it?

Opinions

Read the children's comments below.

Talk about whether you **agree** or **disagree** with each opinion.



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Setting the scene

Being a scientist

Anna is a soil scientist.

She studies how the landscape changes.

- What kinds of data would she gather?
- How would she record changes to a local creek, a beach or a hillside?
- How would she explain her findings?



In this assessment, you will:

- model the way erosion works
- investigate how different ground surfaces can affect erosion
- explain how people can cause erosion problems
- plan a strategy to control an erosion problem.

How does water move soil?

One way a scientist can learn how a system works is to **model** it.

Make this simple model of water erosion.

Materials

- soil mixture that contains fine soil, gravel and small rocks
- flat surface that can be tilted,
e.g. tray, board, tidy box
- 1 litre of water



Predict

How will the soil move if you pour water on it?

Observe

Pour the water slowly and look closely at what happens.

Explain

- Why did some particles move more than others?
- What did the water look like afterwards?
- What patterns or shapes formed?
- What data could a scientist like Anna collect from this model?

Being a scientist – Modelling erosion

Think about how you modelled erosion. How would a scientist record the results?

1. Show what happened to the soil when water flowed over it.

- Draw the shape of the soil in the **Before** and **After** diagrams to show what changed.
- Label both diagrams to describe what changed.
- Use arrows to show movement.



Hint

Your labels might use some of these words.

soil
sand
rocks
gravel
pebbles

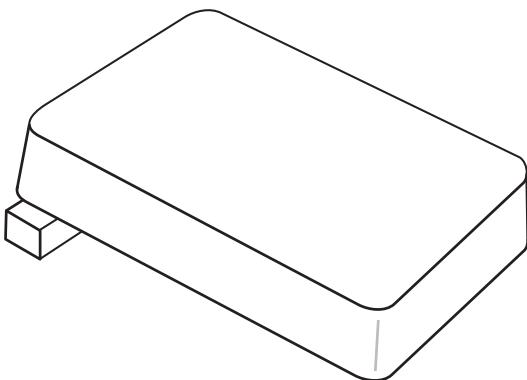
large
small
heavy
light
clean
muddy
deep
shallow

gully
ridge

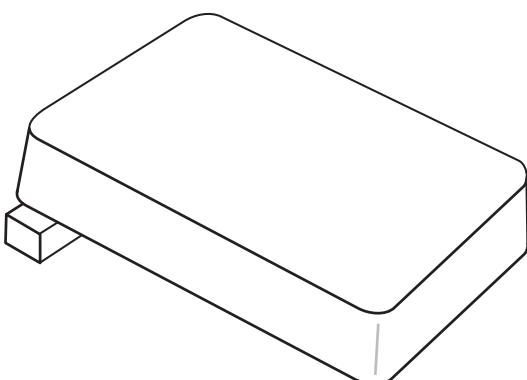
further
faster
slower

moved
carried
rolled
floated
sank

Before



After



Models can help us learn how nature works but they are not exactly the same as nature.

2. List the ways that this erosion model is **similar** to nature, and how it is **different**.

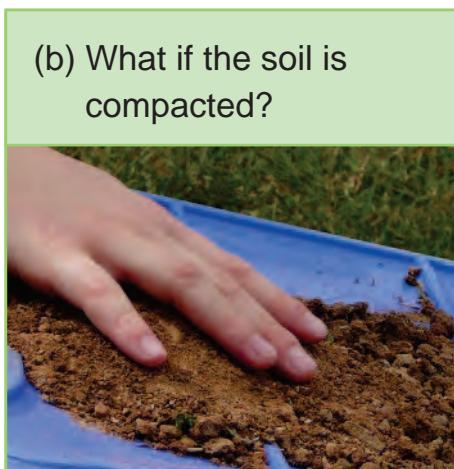
Similar to erosion in nature	Different from erosion in nature
•	•

Changing variables

3. If we change something in the model, it can change the erosion.

Predict how the erosion will be different. **Explain** why you think that will happen.

(a) What if there are plant roots in the soil mix?	I predict that because
(b) What if the soil is compacted?	I predict that because



Being a scientist – Investigating erosion

When you look at the ground around your school, you will notice lots of differences in the surfaces.

Different properties of the ground surface will change the erosion.

You will work like a scientist to investigate this question:

How do different types of ground surface change the erosion?

Here are some properties that might make a difference:



Field investigation plan

Materials

- bucket of water
- 1 litre container
- metre ruler, tape measure (or other way to measure 1 metre)
- this booklet and a pencil to record what you see

Instructions

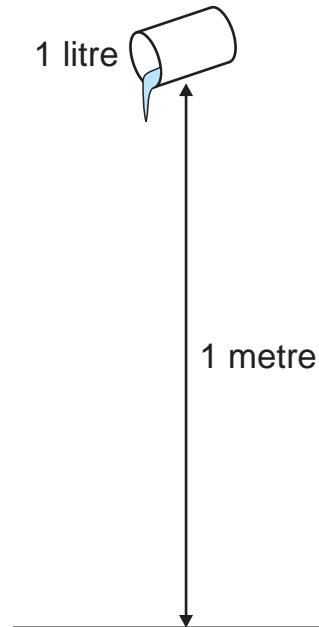
Choose **two sites** with very different types of ground surface.

- (a) **Describe** the properties of each site.
- (b) **Predict** how falling water will change the site.
- (c) **Observe** and **explain** the changes when you tip water on each site.

Method for both sites:

1. Fill a 1 litre container with water.
2. Hold it 1 metre above the ground.
3. Pour the water out slowly.
4. Record changes to the ground where the water fell.

- (d) **Compare** the changes at each site.



4. Field investigation notes

(a) Describe

List properties of the ground that affect erosion.
(e.g. flat, full grass cover, very compacted)

(b) Predict

How will the ground change when you pour water here?

Site 1:

Site 1 has

I predict that at Site 1

because

Site 2:

Site 2 has

I predict that at Site 2

because

(c) Observe and explain

What happened to the **water**?

How did the **ground** change?

(d) Compare

Compare the erosion at the two sites when water was poured on them.

I observed that the water

because

I observed that the ground

because

I observed that the water

because

I observed that the ground

because

Both sites:

Erosion was different at the two sites because



Hint

You might use some of these words

- soil, sand, rocks, gravel, pebbles
- large, small; heavy, light
- clean, muddy; deep, shallow
- gully, ridge
- further, faster, slower
- moved, carried, rolled, floated, sank

Being a scientist – Controlling erosion

Erosion can be natural, or it can be caused by humans. Sometimes it is a problem.

5. What strategies can soil scientists use to control erosion?

Show the erosion problem.

Explain why it is a problem.

Example

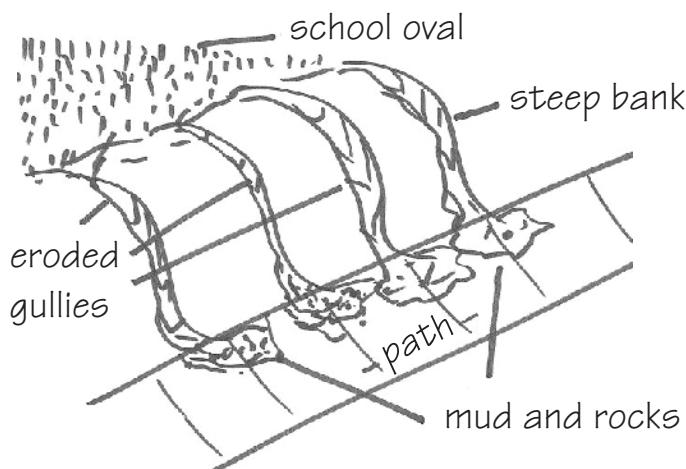


Example

Why is erosion a problem here?

Wind is blowing the sand dunes away.

Sand is blocking the road.



Why is erosion a problem here?

Workers dug a steep bank when they made the path.

When it rains, mud washes down onto the path.

(b) Draw and label an erosion problem that people caused around your school.

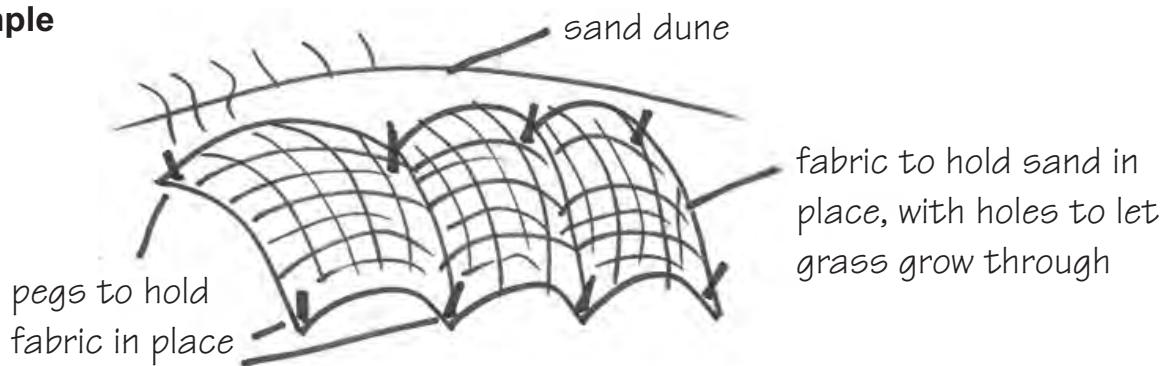
(c) Why is erosion a problem here?

When erosion is a problem, my job is to plan how to control it.



Draw a labelled diagram to show how a soil scientist might solve the problem.

Example



(a)

(d)

6. Explain the strategy you described in Question 5d to control the erosion.

(a) List the **steps** in your strategy.

Step 1

(b) Explain **why** your strategy would work.



I need to collect evidence to show whether my plan has worked.

7. Plan a science investigation to test whether your strategy reduced erosion.

List the steps in your investigation.

Hint

After a year:

- how could you check that your strategy has worked?
- what data could you collect as evidence?

Step 1

Guide to making judgments – Year 4 Science

Student name ..

Focus: Represent, investigate and explain how natural processes and human activity change the Earth's surface.

Understanding		Skills				
Science Understanding	Science Inquiry Skills	Science as a Human Endeavour	Science as a Human Endeavour	Science as a Human Endeavour	Science as a Human Endeavour	Science as a Human Endeavour
Earth and space sciences Describes how natural processes and human activity change the Earth's surface through erosion. Questions 1, 2, 3, 4, 5b–c	Use and influence of science Identifies how science knowledge helps people control erosion problems. Questions 5, 6	Questioning and predicting Communicating Makes observations and predictions based on prior knowledge. Represents and communicates scientific ideas and observations using labelled diagrams and scientific language. Questions 1, 3, 4b, 5 (Note that all responses inform the assessment of Communicating.)	Planning and conducting Processing & analysing data & information Suggests scientific ways to investigate erosion. Analyses data to identify patterns of change and suggest reasons for findings. Questions 4c–d, 5a, d, 6, 7	A B C D E 		Identifies problem erosion and suggests a practical strategy to control it. Explains erosion process and applies knowledge to detailed explanation of model. Describes effects of erosion and relevant properties of ground that affect it. Identifies natural processes and human activities that cause erosion. Lists properties of ground at different sites. Identifies how people cause erosion. Predicts outcomes of investigations. Records findings of investigations. Records ideas in simple drawings and everyday language.