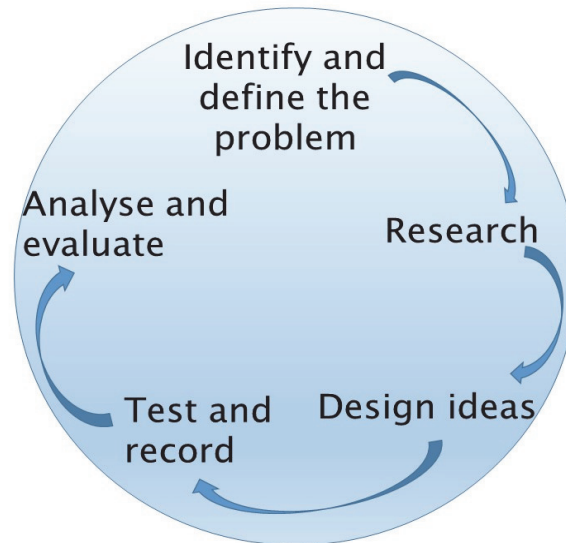


## The Challenge

Have you ever wondered why the Moon is covered in craters, but the Earth's surface is relatively crater free? What leads to these two neighbours being so different? Your challenge is to investigate how natural activity changes the Earth's surface over time.



## Background Information

You may have heard the phrase 'Dynamic Earth', but what does that mean? Dynamic means constantly changing. There are many natural systems and processes on Earth that lead to it being a planet of change.

Water is a major instrument for change on the Earth's surface. Seas can erode cliffs and shorelines; they can move sand and change where beaches are. Rivers can cut down hillsides and create gullies. Glaciers can creep over the land, scouring out chunks and creating wide U-shaped valleys. Rain and snow can enter cracks in rocks and slowly break them apart.

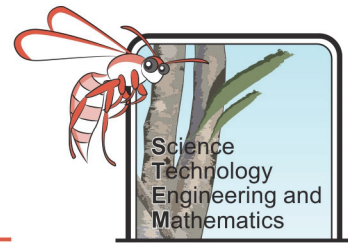
Even the wind is powerful enough to cause changes to the Earth's surface. The wind can carry sand and sediment particles which can erode rocks and landscapes. Wind can move sand dunes and change deserts.

Plants and animals can also change landscapes. Tree roots help to hold soil in place. When trees are removed from an area then we can get landslides, or removal of topsoil by wind and water. Animals can burrow into the ground or produce tracks on the surface.

Furthermore, what is going on inside the Earth can also affect how it looks on the outside.

The Earth is made up of layers and the deeper you go in the Earth, the hotter it gets.

Sometimes hot material is brought up from below the Earth's surface and can erupt out at volcanoes. The lava can spread over the Earth and create new land. Volcanoes can get very big and form mountains.



## Background Research

1. What is the definition of erosion?

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Referenced website:

2. What are some natural causes of erosion?

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Referenced website:

3. How does the atmosphere of the Moon compare to Earth's atmosphere?

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Referenced website:

4. Why does the Moon have lots of craters on its surface when the Earth doesn't?

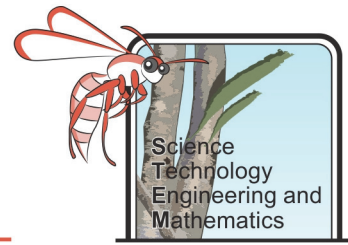
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Referenced website:

## Natural Changes to the Earth's Surface – Student Booklet



5. How does the surface of Mars and Mercury compare to the surface of Earth? Add photos below to show the difference.

Earth	Mars	Mercury

Referenced website:

6. Give three reasons these planets are so different to Earth?

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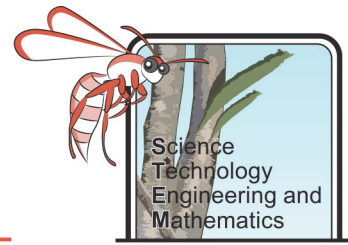
Referenced website:

7. What do we know about the surface of Venus?

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Referenced website:



## Deep Valley

### Objective

To design and carry out an investigation to find out how the distance from the source of a river affects the depth and width of a valley.

### Equipment

Write an equipment list for your experiment.

### Safety

Write any safety precautions that have to be taken.

### Method

Write a list of steps and draw a diagram to show how you will do the experiment. Include instructions on how you will record and present your results. Make sure you make it clear how you will make it a fair test.

### Predictions

What results do you think you will get from your experiment?

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Show your completed equipment, safety and method sections to your teacher, to gain approval to go ahead with the experiment.

### Results and Analysis

1. Present your results in a table and/or graph. If you have taken any photos or made videos of the experiment, make sure you add them.
2. Which of the pictures on the following page do you think is from the upper course (near the top) and which is from the lower course (near the bottom) of a river?

**Natural Changes to the Earth's Surface – Student Booklet**

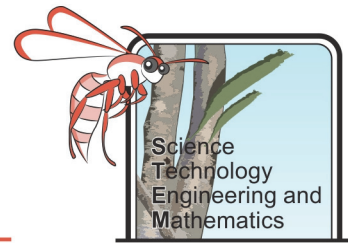


Figure 1 commons.wikimedia.org



Figure 2 [http://ponce.sdsu.edu/the\\_natural\\_function\\_of\\_rivers.html](http://ponce.sdsu.edu/the_natural_function_of_rivers.html)

## Natural Changes to the Earth's Surface – Student Booklet



### Evaluation

1. Was your prediction supported

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2. How could you improve this experiment?

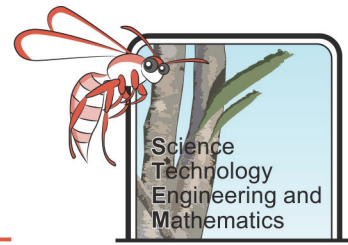
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3. What does this investigation tell you about how rivers can change the Earth's surface?

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## Size of Sediment

### Objective

To design and carry out an investigation to find out how the distance from the source affects the size of the sediment a river can transport.

### Equipment

Write a list of equipment for your investigation.

### Method

Write a list of steps and draw a diagram to show how you will do the experiment. Include instructions on how you will record and present your results. Make sure you make it clear how you will make it a fair test.

### Safety

Write any safety precautions that have to be taken.

### Predictions

Which size sediment do you think will travel the furthest, gravel, coarse sand, or fine sand? Explain your answer.

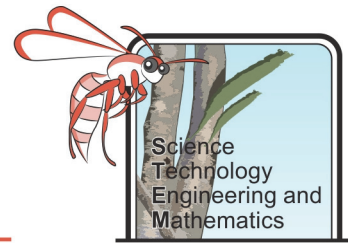
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Show your completed equipment, safety and method sections to your teacher, to gain approval to go ahead with the experiment.

### Results and Analysis

Present your results in a table and/or graph. If you have taken any photos or made videos of the experiment, make sure you add them.

## Natural Changes to the Earth's Surface – Student Booklet



### Evaluation

1. Was your prediction supported?  

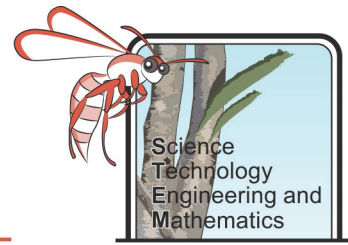
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2. How could you improve this experiment?  

---
3. What does this investigation tell you about how rivers can change the Earth's surface?  

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4. Do you think you would get the same results if there was a large rain event and more water was added to the river?  

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## Gravity Movement

When you drop something, it will fall to the ground. This is because of the force of gravity, attracting objects towards the centre of the Earth. This gravitational pull often causes landslides and avalanches to occur, as rocks and soil on less stable hillsides are pulled downwards.

### Objective

To design and carry out an investigation to find out how the steepness of a hillside affects how fast a boulder will roll down it.

### Equipment

Write a list of equipment for your investigation.

### Method

Write a list of steps and draw a diagram to show how you will do the experiment. Include instructions on how you will record and present your results. Make sure you make it clear how you will make it a fair test.

### Safety

Write any safety precautions that have to be taken.

### Prediction

Do you think there will be a relationship between the steepness of a slope and the time it takes for a ball to roll down it? Explain your answer from any observations you have previously made or scientific understanding you have.

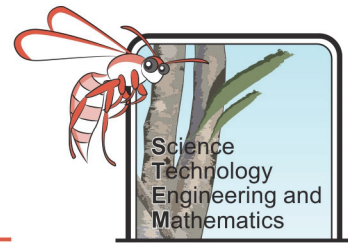
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Show your completed equipment, safety and method sections to your teacher, to gain approval to go ahead with the experiment.

### Results and Analysis

Present your results in a table and/or graph. If you have taken any photos or made videos of the experiment, make sure you add them.

## Natural Changes to the Earth's Surface – Student Booklet



1. Is there a relationship between the steepness of the slope and the time taken for the “boulder” to roll down the slope?

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### Evaluation

1. Was your prediction supported?

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2. What variable(s) did you keep the same in this investigation?

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3. What variable did you change in this investigation?

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4. Was this a fair test?

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5. How could you improve this experiment?

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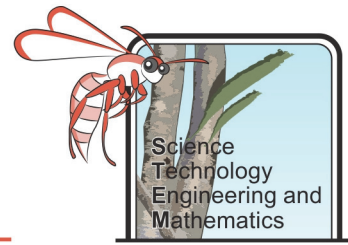
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6. What does this investigation tell you about how the steepness of a hillside might affect the speed at which boulders and sediments could move down it?

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**Natural Changes to the Earth's Surface – Student Booklet**



7. Do you think a landslide would be more likely to happen on a steep hill or one with a gentle slope?

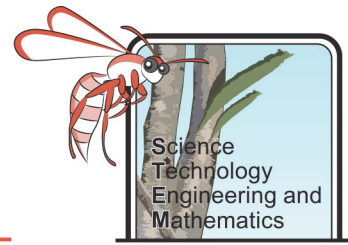
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8. How could you extend this experiment to investigate other factors which could affect the rate at which a boulder or other material might fall down a hill (e.g. if the hill side was wet or covered with trees).

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## Soils on Slopes

All over the world hillsides will have very different soil on top of them, depending on the rocks and vegetation in the area. For example, the Perth Hills (WA) usually have sandy soil on top, although there are some places where the soil has more clay in it. Soils in more tropical regions, like Northern Queensland, can be richer in humus (compost like soil).

### Objective

To design and carry out an investigation to find out if the type of soil on a hillside will affect how quickly it creeps downwards.

Research what soil creep is. Add a labelled picture below to help explain your description.

A large empty rectangular box with a black border, intended for a student to draw a labelled picture explaining soil creep.

### Equipment

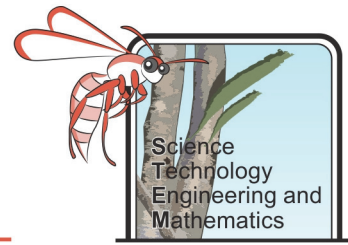
Write a list of equipment for your investigation.

### Method

Write a list of steps and draw a diagram to show how you will do the experiment. Include instructions on how you will record and present your results. Make sure you make it clear how you will make it a fair test.

### Safety

Write any safety precautions that have to be taken.



### Prediction

Do you think there will be a relationship between the type of soil and the amount of creep? Explain your answer from any observations you have previously made or scientific understanding you have.

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Show your completed equipment, safety and method sections to your teacher, to gain approval to go ahead with the experiment.

### Results and Analysis

Present your results in a table and/or graph. If you have taken any photos or made videos of the experiment, make sure you add them.

1. Which type of soil showed the most creep?
- 

### Evaluation

1. Was your prediction supported?  

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2. What variable(s) did you keep the same in this investigation?  

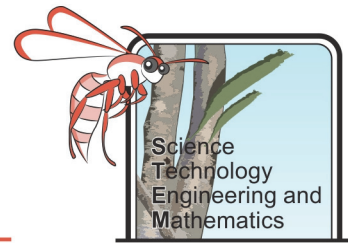
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3. What variable did you change in this investigation?  

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4. Was this a fair test?  

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5. How could you improve this experiment?  

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6. What does this investigation tell you about how the type of soil might affect the amount of downward creep?

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7. Which type of soil do you think would be more likely to be part of a landslide?

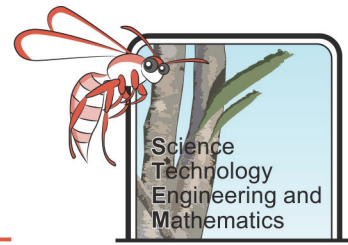
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8. How could you extend this investigation to look at other factors which could affect soil creep (e.g. how much rain there had been in the area).

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## Acid Rain

Rainwater is usually slightly acidic. Increased carbon dioxide and sulphur in the atmosphere makes it more acidic than normal, this can be caused by volcanic eruptions. When acid rain lands on certain rocks it can cause a chemical reaction, which makes them dissolve over time.

### Objective

To design and carry out an investigation to find out which rock types will be most affected by acid rain.

### Equipment

Write a list of equipment for your investigation.

### Method

Write a list of steps and draw a diagram to show how you will do the experiment. Include instructions on how you will record and present your results. Make sure you make it clear how you will make it a fair test.

### Safety

Write any safety precautions that have to be taken.

### Prediction

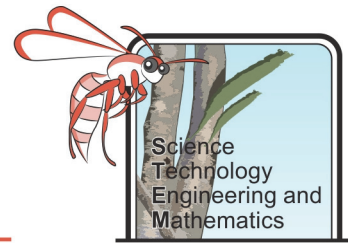
Which rock type do you think will be most affected by acid? Explain your answer from any observations you have previously made or scientific understanding you have.

---

Show your completed equipment, safety and method sections to your teacher, to gain approval to go ahead with the experiment.

### Results and Analysis

Present your results in a table and/or graph. If you have taken any photos or made videos of the experiment, make sure you add them.



**Evaluation**

1. Was your prediction supported?

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2. What variable(s) did you keep the same in this investigation?

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---

3. What variable did you change in this investigation?

---

4. Was this a fair test?

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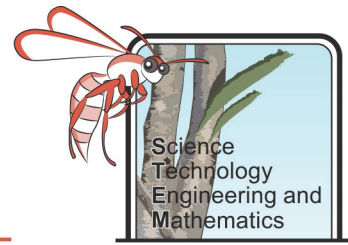
5. How could you improve this experiment?

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6. Which type of rocks would be most affected by acid rain?

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### Land Rebound

Changes on the inside of the Earth can affect what happens on the outside of the Earth. The Earth is made of different layers. The crust is the outer layer of the Earth, it is quite brittle and very thin (if the Earth was shrunk to the size of an apple, the crust would be about the same thickness as the skin). Below the crust there is a layer called the mantle. The mantle is semi-solid – this means it is a solid that flows very, very slowly. A bit like toothpaste, but much more solid. If there is movement in the mantle, it can affect the crust as well. During the last ice age, a lot of the Earth was covered by ice, including some of Australia. When the ice started to melt, water poured off the land and into the oceans which took weight off the Earth's crust.

### Objective

To design and carry out an investigation to find out what happens to the Earth's crust as weight is removed.

### Suggested equipment

- Large plastic container or fish tank
- Block of wood (about 20 cm x 15 cm x 15 cm)
- Ruler
- Masses (5 x 50 g)

### Method

Using the list of suggested equipment and/or any other equipment you want to use, write a list of steps and draw a diagram to show how you will do the experiment. Include instructions on how you will record and present your results. Make sure you make it clear how you will make it a fair test.

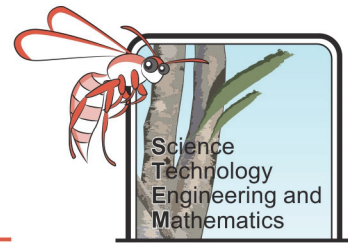
### Safety

Write any safety precautions that have to be taken.

### Prediction

What do you think your experiment will show? Explain your answer from any observations you have previously made or scientific understanding you have.

## Natural Changes to the Earth's Surface – Student Booklet



Show your completed equipment, safety and method sections to your teacher, to gain approval to go ahead with the experiment.

### Results and Analysis

Present your results in a table and/or graph. If you have taken any photos or made videos of the experiment, make sure you add them.

### Evaluation

1. Was your prediction supported?

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2. How could you improve this experiment?

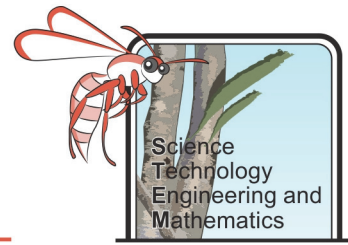
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3. What does this investigation show you about what happened to the Earth's crust as weight (ice) was removed?

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4. In places where this is happening, what do you think is occurring at the shoreline? Would sea level appear to be rising or falling?

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### Mapping Change

#### Objective

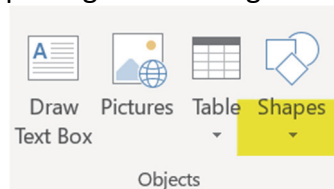
To create a field trip guide showing where surface changes can be observed in a local area which other students could use to find these features.

#### Equipment

Write a list of equipment and resources you will need to create your field guide. Ensure you have appropriate permissions to go on an excursion with your classmates (your teacher may have sent a letter home).

#### Method

1. Have a look at some field guides to gain an idea of what should be included in your field trip guide.
2. Write a list of the different types of natural surface change you will be looking for evidence of and try to find an example picture from the internet for each example.
3. Ensure you have added a map of your area to the field guide.
4. Decide on a route that you will take to look for evidence of natural surface changes and mark this on your map using the drawing tool from shapes (or draw it by hand).



5. Write a plan of how you will collect evidence. Consider how you will make sure that the data (information/photos etc.) is not mixed up and is clearly marked. Remember that the field guide is for others to use so you will need to make sure that your description of sites and how to find them is very clear. When you have made your plan show it to your teacher for their approval or suggested ideas on how to improve it.
6. Walk along your route safely and sensibly, collecting your data and recording information.
7. With or without the use of technology create your field guide.