# *Changing landscapes* Teaching and learning plan

**Learning intentions**

Students will be able to:

* state that the surface of the Earth changes over time;
* identify human activities which cause changes to the Earth’s surface;
* state that moving water washes away (erodes) soil;
* explain how plants help prevent soil erosion;
* appreciate that science knowledge helps people understand the consequences of their actions;
* follow instructions to identify investigable questions about familiar contexts and predict likely outcomes from investigations;
* make accurate observations; and
* draw conclusions based on evidence.

**Suggested time for this CLE**

The time needed to complete the *Changing landscapes CLE* will depend on how much time will be allocated for students to develop their own investigation. The teacher can alter the time frame by the amount of assistance given to students during the development of their investigation, and whether students are expected to look for supporting evidence for their conclusions. Allow 3–4 hours.

[**Planning ahead and equipment list**](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Planning_and_equipment_list_yr4_Changing_landscapes.docx)

## Safety considerations

When you and your class are completing your Risk Assessment, consider the following safety points and add any other relevant ones to the list.

* Sift sand that has been collected from an outdoor source to ensure it does not contain sharp objects (such as twigs and rocks), insects and/or potentially harmful substances such as animal faeces.
* Care should be taken when collecting and handling dead leaves and mulch. A scoop or trowel could be used for scooping mulch out of a container.
* Students should wash their hands with soap after they have finished their investigation.

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## Introduction

This CLE focuses on how human activities produce changes in the landscape. In Year 4 HASS, students explore the history of the Australian landscape and the arrival of the First Fleet. It is possible that teachers could draw on this material to get the students to imagine the landscape at the time that Captain Cook landed at Kurnell and to identify changes that have occurred in the landscape since then. Students would then be encouraged to think about the possible consequences of these changes.

### What to do

1. Ask students to close their eyes and imagine that they were on The HMS Endeavour with Captain Cook in 1770 when he sailed into Botany Bay. You could show them some images of Botany Bay then and now. (See [Digital content](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Digital_Content_yr4_Changing_landscapes.docx) for some ideas.)
2. Ask students to think about the sounds they would hear, what they might smell and what they might see around them as they sail into Botany Bay. Discuss as a class.
3. Ask students to describe what they would see today. You may like to show photographs of the area as it is today or take the students there via Google Earth.
4. **ALTERNATIVELY,** use local historical photographs and Google Earth (Google Maps) to show students significant places (in their local area), which have changed over time. For example, areas that have been cleared for agricultural or industrial purposes.
5. Make a list of the differences on the white board.
6. Guide students into describing the loss of trees from the time of the historical photos until today, as a significant difference in the landscape.
7. Ask students to suggest reasons as to why there are fewer trees now, than when the original photos were taken. (What human activities have led to the loss of trees?)

## Core

### Investigation 1: How plants hold soil together

### Equipment needed

Per class:

* tray of small potted plant/seedlings, not root bound

Per group:

* 1 seedling
* 2 sheets of newspaper
* 1 bamboo skewer (or paddle pop stick twisted and broken to get a pointy end)

### What to do

1. Carefully remove the seedling from the pot or seedling tray. Make sure that the soil is not dislodged from the roots and place the plant on a sheet of newspaper on each student desk.
2. Ask the students to hold the plant by the stem and leaves, then carefully lift the plant above the paper. Students should be able to identify that the soil is held firmly by the roots and that a large clump of soil can be lifted above the paper without falling as the plant is lifted.
3. Ask the students to look closely at the roots to find out how the roots are able to hold the soil together while the plant is raised. (Most of the soil should be held tightly by the tiny roots, which are twisted around the soil.)
4. Ask students if they can see the soil trapped between the roots of the plant.
5. Ask the students to gently shake the plant to see what happens.
6. Ask the students to place the plant back down onto the paper and use the bamboo skewer or paddle pop stick to investigate how the roots trap the soil.
7. Ask students to describe how the roots are keeping the soil together in the root ball.
8. Students use the skewer to carefully remove all the soil from the root ball.
9. Ask students to describe the appearance of the soil that has been removed from the root ball.
10. Ask the students to push the soil together into a pile and using just their fingertips, try to lift as much soil as possible.
11. Ask students what happens to the soil when they try to pick it up.

**Group discussion and writing exercise**

Ask students to work together in groups to:

1. discuss and explain how the roots of plants are able to hold the soil together;
2. suggest what would happen to the soil if all the plants were removed from the soil;

Students should write the responses to these questions in their workbook.

### Expected results and explanations

Students should be able to see soil clinging to the roots as the plant is suspended in the air. Tiny root hairs penetrate the clumps of soil preventing the soil from falling. A gentle shaking will release these small clumps of soil, but much of the soil will remain trapped within the network of roots. Prying the roots apart will reveal the way the soil is held within the root network and students should be able to see the roots intertwining and surrounding clumps of soil.

Once students have removed all the soil from the roots and collected the soil together in a little pile, they will not be able to lift all the soil from the paper. This demonstrates the ability of the roots to hold the soil together.

Discussion about student’s observations should focus on the importance of plants in holding the soil together and that removal of plants from the soil will leave the soil susceptible to erosion from moving water.

### Investigation 2: Impact of land clearing

### Aim:

To find out if plant cover protects soil from the effects of rain.

### Equipment needed

Per group:

* 2 shallow trays approximately 20 cm X 10 cm
* sand
* bag of mulch or a mixture of leaves, twigs and grass
* ice cream container of water
* foam cup (prepared with holes in the bottom)
* wooden block
* Student worksheet, [Problem-Solving Scaffold](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Problem_Solving_Scaffold_yr4_Changing_landscapes.docx)
* Student worksheet, [Observation sheet](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Observation_Sheet_yr4_Changing_landscapes.docx)

### What to do

Students are presented with a problem in which they investigate how the movement of soil (erosion) is affected when plants are removed from the soil.

1. Recall initial discussion about changes in the environment after European settlement in Australia.
2. Students are asked to work together in groups to draw a diagram with 2 images. One image showing a hill covered in trees, as Captain Cook would have seen as he entered Botany Bay, and a second image of the same hill with all the trees removed.
3. Students brainstorm in groups to make a prediction about what they think will happen when heavy rain falls on the hill with the vegetation and the hill that has all the vegetation removed. Students try to explain their ideas.
4. Student groups share their ideas with the class.
5. Show the students the equipment that they will be provided with to do the investigation and lead them through the set up of the trays. (See **Suggested experimental steps** below.)
6. Use the [Problem-Solving Scaffold student worksheet](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Problem_Solving_Scaffold_yr4_Changing_landscapes.docx) to explain that the stages in the problem-solving activity reflect the stages that scientists use to conduct scientific investigations.
7. As a class, discuss steps 1 and 2 on the worksheet and answer the question prompts.
8. Draw students’ attention to the fact that they will need to confirm their findings by conducting some additional research to find out whether their results are supported by scientific knowledge.
9. In groups, students discuss how they will conduct their investigation to find an answer to the problem being investigated. These decisions will include: how to provide the ‘rain’, how much ‘rain’, where it should ‘rain’ and what observations to make. They should now complete steps 3 and 4 of the [Problem-Solving Scaffold student worksheet](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Problem_Solving_Scaffold_yr4_Changing_landscapes.docx).
10. Guide students through this process by providing leading questions.
11. Students conduct their investigation and compare their observations from the two trays. Students complete the [Observation sheet](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Observation_Sheet_yr4_Changing_landscapes.docx).
12. As a class, discuss what each group has found out about the erosion of soil. Compare and contrast procedures and discuss the reliability of their results. The students can now complete steps 5 and 6 of the [Problem-Solving Scaffold student worksheet](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Problem_Solving_Scaffold_yr4_Changing_landscapes.docx).

### Suggested experimental steps (per group)

1. Three-quarter fill two trays with sand.
2. Level out the sand so that it slopes gently from one end of the tray, down towards the other end of the tray leaving the bottom quarter of the tray free of sand.
3. Spread mulch or leaf and grass mixture (‘vegetation’) over the sand in one tray.
4. Scoop up a cup of water from the ice cream container and allow the water to ‘rain’ (out of the holes in the bottom of the cup) over the sand in the tray **without** ‘vegetation’.
5. Move the rain cup over the surface of the sand making sure that the rain is evenly spread over the surface of the sand.
6. Carefully watch the way the sand moves as the rain falls on it.
7. Continue scooping out the water from the ice cream container until all the water has been has been used as rain.
8. Repeat steps 4–7 with the tray with sand that has been covered by mulch or leaf and grass mix.
9. Compare the appearance of the sand in both trays and the amount of sand washed down to the bottom of the trays to determine whether the plant cover helped reduce the ability of the water to move the sand.

### Expected results and explanations

Soil that is covered by plants is not affected by rain as much as soil without plants.

Students should notice that the falling water washes the sand without vegetation cover down the slope on the tray. The water falling on the mulchy cover runs over the plant material and trickles down onto the sand. The sand in this tray remains mostly undisturbed because the plant cover has reduced the impact of the water on the sand. The water in this tray tends to trickle down into the sand rather than run off the sand. Students should also notice that there is more sand in the bottom of the tray without plant cover than the one with plant cover.

## Conclusion

1. Plants play an important role in protecting soil from erosion. The activities of humans can result in the removal of plants from soil and this can contribute to serious problems with soil erosion.
2. Explain to students that humans have a responsibility to protect natural resources, such as soil, by reducing their impact on the soil through activities such as land clearing.
3. Discuss the role of scientific research in developing an understanding about the impact of humans on the environment and how this knowledge can influence the development of laws and regulations to look after valuable resources and the environment.
4. Ask students to write a paragraph on why people need to think carefully about actions (such as land clearing) that can cause damage to the environment.

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### Additional lessons and activities about the impact of land clearing:

Students can conduct research on the Internet to investigate other impacts of land clearing:

* ‘Land clearing: Australia is still clearing too much vegetation’, Bush Heritage Australia website, <http://www.bushheritage.org.au/about/our-challenge/natural_world_land_clearing>
* ‘Deforestation, Facts causes and Effects’, *LiveScience* website, <http://www.livescience.com/27692-deforestation.html>
* ‘Tropical rainforest’, Internet Geography website, <http://www.geography.learnontheinternet.co.uk/topics/rainforest.html>

### Assessment opportunities

This would be a good opportunity to assess student’s problem-solving and group-work skills.