



## Landscape Changes and Timescale - Teacher's Notes

### Landscape Changes and Timescale - Classroom Discussion

During Western Australia's geological history there have been massive changes in the landscape.

1. Rocks that crystallised 5km under the surface of the Earth 1.8 billion years ago have been uplifted to eventually form the relatively low-lying granite gneiss landscape around Margaret River. As the rocks rose, they were worn away by weathering and erosion down to present day levels.
2. Seafloor rose to become mountains. The wonderful red plateaus of the Kimberly were shallow marine coral reefs over 360 million years ago. Fossils can tell us about landscape changes. Fossil coal found at Collie in the southwest and near the Irwin River behind Geraldton tell us that these areas were once great swamps rich with lush rotting vegetation from which the coal formed.
3. The Darling Range behind Perth is the result of a massive fault or break in the Earth's surface that runs north south along the western edge of our state. The eastern side keeps slowly moving up and the weathered material of many millions of years is washed down to form the lower Swan Coastal Plain. Over 15 kilometres of sediment has accumulated on the downward moving western side.

More recently:

4. Sea level rise and fall during the most recent Ice Age (Pleistocene) has left raised beaches and old cliff lines inland and conversely signs of early Aboriginal arrival are now found under the sea. Skin divers can find great heaps of abalone shells (kitchen middens) and old campfire sites under what is now sea. These were important meeting and feasting places. Aboriginal people could (and did) walk over to what is now Rottnest Island (Wadjemup) at the mouth of the Swan



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River until comparatively recently because water was still locked up in glaciers.

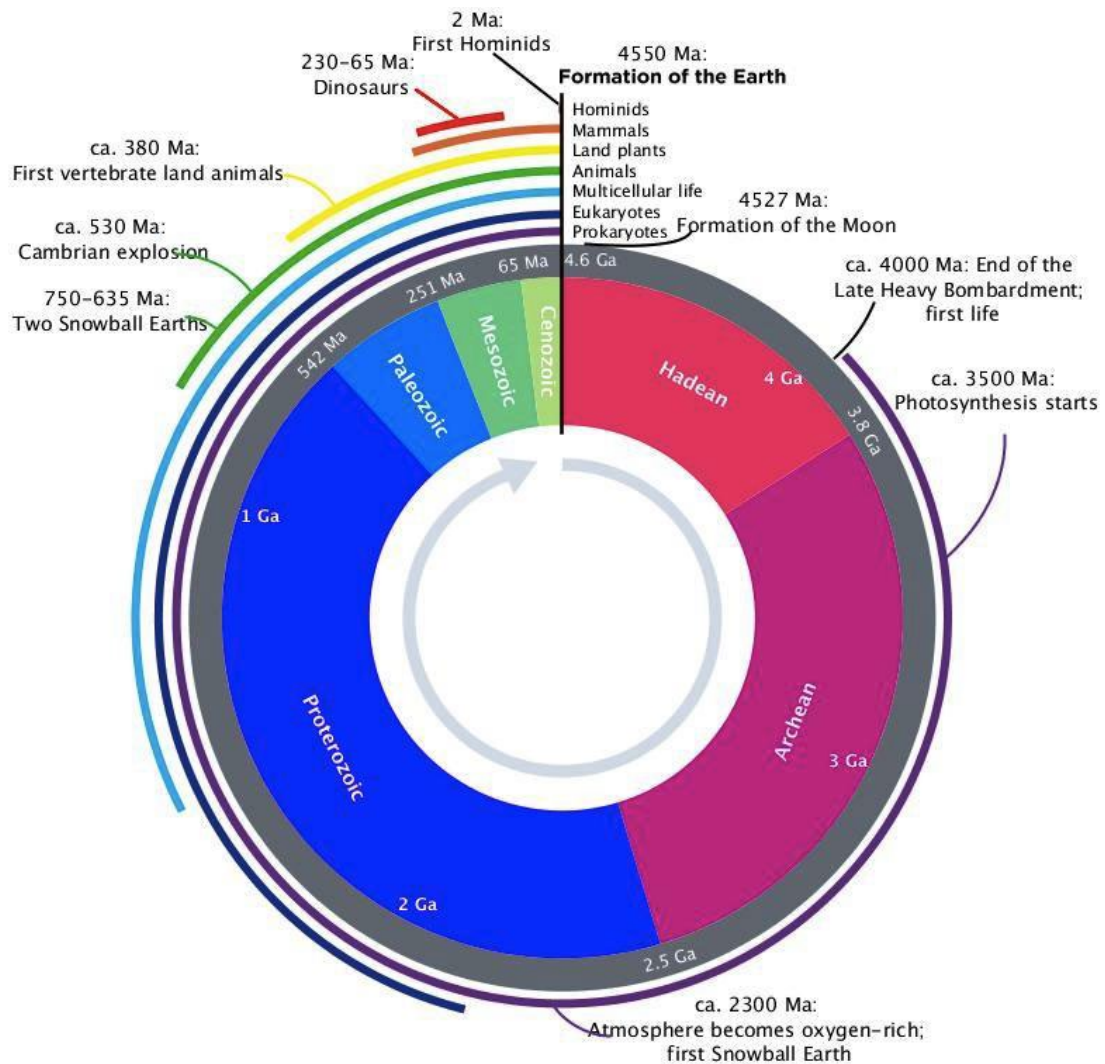
5. As recently as 80,000 years ago, Western Australia was home to many species of marsupial megafauna. Giant marsupials such as the Diprotodon (mega-wombat) and Thylacoleo (marsupial lion) lived in forests of soft leaved trees. The climate changed and became drier and harsher. The trees died and were replaced by hard leaved eucalypts and spinifex started to colonise the grasslands. The arrival of Aboriginal people with their fire stick farming about 60,000 years ago coincided with the last of these amazing creatures. The change in vegetation changed the landscape.
6. The arrival of Europeans with their different agricultural techniques, ability to drill for water and dig for minerals and their vastly increased numbers has also caused change. In particular the increased frequency and intensity of fires have further impacted on the natural vegetation and changed the landscape.

Our planet formed about 4.6 billion years ago. Natural landscapes have changed significantly over geological time. Indeed, the major geological time units have been named and divided by these major changes in landscape which resulted in changes of animal life and plant life. About 66 million years ago, massive volcanic outpourings of lava, coinciding with a major meteorite impact, built mountains and were major contributors to the K/T (also known as the K/Pg) extinction event that caused the death of 75% of animals on Earth including the dinosaurs. All life on our planet at present evolved from the survivors of this event. After this, the great supercontinent of Gondwana broke up releasing the Australian tectonic plate to travel south round the pole to its present position. The different climatic zones it travelled through created different landscapes.





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History of Earth ([wikipedia](https://en.wikipedia.org/wiki/History_of_Earth))

**Natural landscapes and features** are those that have only been slightly affected by humans. It is difficult to find truly natural landscapes in Western Australia as most accessible areas have roads.

**Managed landscapes** have been partly modified by humans to suit their purposes. Farming land and parkland are reasonable examples.

**Constructed landscapes** have been built by humans.





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### Dog and Landscape - Student Activity (with pictures)

**Changes in natural features** in a landscape are created by

- Long term geological activity
- Shorter term weathering agents such as rain, wind, flowing water, ice and heat from the Sun
- Long- and short-term changes in climate



*Millie the dog in granite rocks with lichens, grasses, herbs and running water*

Natural landscape features are those that **already existed before the advent of humans and still exist now**. These tend to be geographic features such as mountains, rivers, plains, volcanoes, oceans, beaches and forests.

**Managed features** are changes made by humans to natural features so that they can more easily access and control Earth's resources such as pathways in national parks, toilets in nature reserves, grassed playing fields in schools and drainage channels across areas liable to flood. Managed features can also be seen where one type of vegetation has

been replaced by another such as when acacia scrub has been replaced by planting wheat or canola for farming or when one kind of animal is replaced by another such as cows grazing where kangaroos and emus used to.



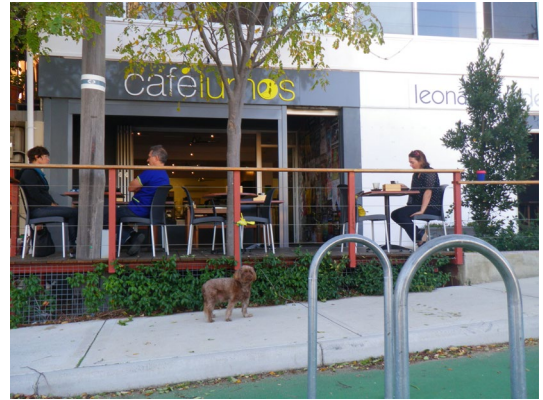


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**Constructed features** are features built by people such as houses, schools, roads, railways, airports, dams, irrigation ditches, sewers, power stations, mines and ports.

### Materials

- 12 or more laminated pictures of different landscapes or project the photographs included in this package onto a Smart Board or screen.
- 4 different coloured whiteboard markers



*Rory the dog on pavement outside a café with railings, bicycle parking bars and non-native vegetation.*

### Method

Almost every picture included has a dog, cat, or fox in it to engage interest, excepting of course those taken in national parks or nature reserves where non-native animals are not permitted. These pictures may be expanded to A3 size, printed and laminated so a student or group can mark them with water-soluble felt pens to highlight the location of the dog, any built features and natural features.

If the pictures are printed and laminated, then they can be cleaned and used in subsequent years. Students are issued with a picture and first find the dog (or not) and then give three good reasons why their picture is of a natural, managed or built landscape. They both identify and describe the features in the picture.

Alternatively, students can annotate the pictures projected onto a whiteboard.

### Extension

Take your students for a walk round your local environment and ask them to identify the natural, managed and built features.





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### Aboriginal Dreaming – Classroom Discussion

Some Aboriginal cultures believe that a giant rainbow serpent (known by many different names by different Aboriginal peoples) is associated with creating the landscape and freshwater sources. In The Dreaming stories of the Noongar people of Western Australia, a large snake or serpent called The Wagyl, shaped the landscape where its body moved over the unformed land. It pushed up mountains and created valleys and rivers where it moved over the land. Spots where it stopped to rest at night later became good meeting places for Aboriginal groups. Where its body squirmed, it left low hollows away from the wind where good fresh water collected. Some believe that the Wagyl makes the thunder and lightning and that it lives deep underground in freshwater springs. There are many depictions of this spiritual being in Australian rock art and paintings.

Walkways and tracks through Western Australia are often marked with a snake image.



In the Dreamtime stories from country that lie north and inland from Kalgoorlie, a similar serpent is said to be responsible for chewing Gnamma holes out of the rock. These collect and store freshwater after rain. Aboriginal people would cover them with more rock or brush to stop animals contaminating them and defended them as a precious resource in hard country. This gnamma hole (above) at Barlangi rock near Sandstone has lost its cap and has filled in. It is over 1m deep.





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Concentric circles carved into rock or painted onto rock often mark the location of a good water source. Perhaps the petroglyph represented circular ripples spreading from a stone dropped into water. Groups would fight over water resources and the game which collected round them. The rock pictured on the left is near Puunu waterhole near Mt.

Newman in W.A.

Aboriginal people believed that the landscape was created in the Dreaming before the world, as we know it, began.

Geologists and geographers believe that earth forces such as weathering, erosion, mountain building, faulting and other tectonic forces are continually shaping and reshaping the surface of our planet.

### Sandpit Landscapes - Classroom Discussion

Raindrops quickly change the shape of unconsolidated material but have little short-term effect on rocks. Ideally the sandpit should be bordered by rock. If not, please have several pieces of rock (road gravel is fine) or concrete handy.

If you do not have plastic droppers like Pasteur pipettes, a straw can be used. The straw is held vertically, and half immersed in water. A finger is used to seal the upper opening of the straw and it can be raised out of the



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water still retaining water. It can be taken (still sealed by the finger) to where it is needed and water drops "milked" out by the other hand.

### Materials

- Sandpit and rocks (or cement).
- Hands, buckets & spades.
- Four containers of water (ice cream containers are an ideal size).
- A straw, dropper or a Pasteur pipette for each student.

### Method

1. Take students to sandpit and ask them to quickly landscape the sand into mountains.
2. Demonstrate to the students how to use the straw to make a water dropper.
3. Students drop 30 raindrops on one part of their mountain landscape and observe any changes.
4. Repeat, dropping all the water from a container at once on another part of the mountain range to represent the flow of a river.
5. Repeat the last two activities to see the effect of rain and a river on the rock.



### Questions for discussion

1. Does rain have a short-term effect on soil and sand? **Yes.**
2. Does rain have a short-term effect on rock? **No**

Over millions of years rain and running water and others forms of weathering and erosion eventually wears away mountains.



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### Suggested Activities

Dick Roughsey's book - The Rainbow Serpent

This beautifully illustrated book explains how our landscape was formed and how rainbow lorikeets got their colours.

Students may wish to draw or paint the serpent.

Local elders may be invited to discuss the importance of Country and of local landscape features.

