



kakadu™

NATIONAL PARK

Geology

Kakadu is an ancient landscape.

Kakadu's people describe how landscapes were created by the journeys and activities of creation beings. Geologists also describe how the landscapes were formed.



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140 million years ago Jim Jim Falls was part of a sea cliff shoreline above a shallow sea.

2

Sandstone outliers were separated from the Arnhem Land Plateau 500 to 140 million years ago when seas eroded older sandstone into sea cliffs (today's escarpment)

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Endemic to the Arnhem Land Plateau, this sandstone pandanus is adapted to the tough stone country conditions that new species cannot easily invade

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KAKADU HAS SOME OF THE OLDEST EXPOSED ROCKS IN THE WORLD.

The spectacular and diverse geology of Kakadu is recognised in the World Heritage Listing of the park.

For the geologist, the present is the key to the past. Follow the timeline for their history.



Australian Government



PARK NOTE

Timeline

4 500 million years ago (mya) the earth forms.

3 500 to 2 500 mya the first record of bacteria.

2 500 mya oldest known rocks of Kakadu form as granite intrusions in the earth's crust.

2 000 mya erosion of the crust exposes the granite. Faulting forms a wide shallow depression, a geosyncline.

1 870 to 2 000 mya oxygenated atmosphere evolves. High areas erode and are deposited as sediments in the geosyncline. Faults sag and layers of sediment 10 km thick collect in the basin.

1 860 mya the weight of sediments destabilises the earth's lower crust and mantle, leading to mountain building. Pressure and heat fold and metamorphose sediments to gneiss and schist rocks. New granites intrude.

Faults open up rift valleys in southern Kakadu and volcanoes fill them with lava. There is very rapid erosion by high-energy rivers.

1 650 mya micro algae evolve. Flash flooding of large braided rivers spread a one km thick layer of sand from an unknown land mass to north west.

This was followed by a long erosion period in an arid climate produces a flat, desert-like landscape with scattered low ridges and hills. Rocks are deeply leached.

1 000 mya sands consolidate to form the Kombolgie Sandstone Formation which now forms the Arnhem Land Plateau. The sandstone is often ripple-marked and cross-bedded and there is basalt lava near the top.

500 mya, the time of the first macro organisms. A long geologically stable period apart from crustal warping that forms faults

and joints in sandstone (now weathered to gorges and waterfalls).

500 - 140 mya is the time of the first land plants and age of the dinosaurs.

Mesozoic seas spread across the area, eroding older sandstone into sea cliffs (now the Arnhem Land escarpment) and islands (now outliers like Ubirr). Sandstone and siltstone containing fossils are deposited over lowlands.

100 mya Mesozoic seas receded and most of their sediments are eroded away. The major components of today's landscape are apparent.

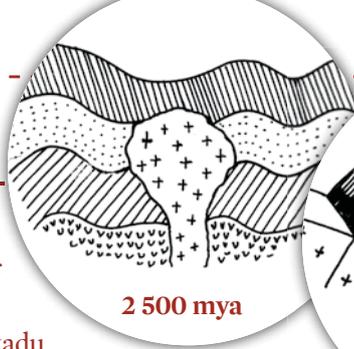
50 mya ancient faults in southern Kakadu move once more to form local depressions. Swampy sediments with fossil tree palms are laid down and preserved.

10 to one mya continued erosion of highlands and deposition of sand on lowlands. Rocks are deeply leached and laterite forms.

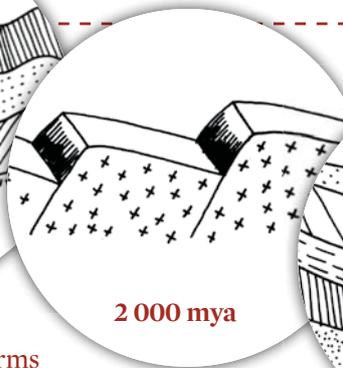
60 000 years ago the first humans arrive in Australia

10 000 years ago, in the Estuarine Period, the sea invades lowlands. Beach ridges show the sea advancing 20 to 30 cm a year.

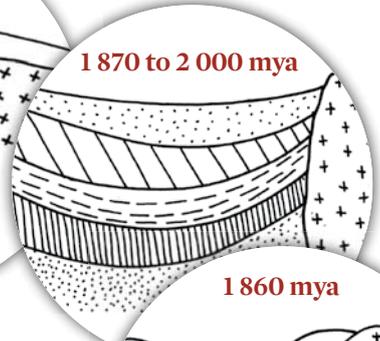
7 000 years ago the sea level drops and freshwater swamps form as the coastline advances.



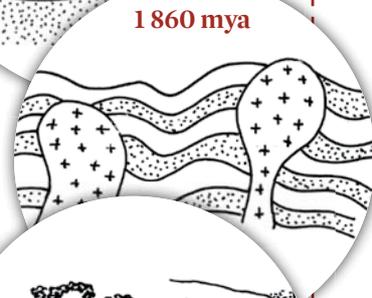
2 500 mya



2 000 mya



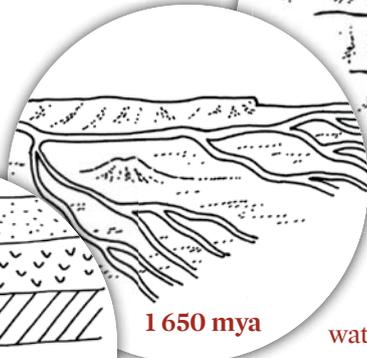
1 870 to 2 000 mya



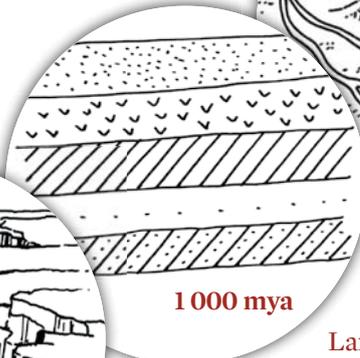
1 860 mya



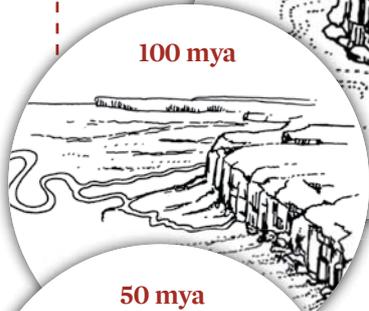
1 650 mya



1 000 mya



140 mya



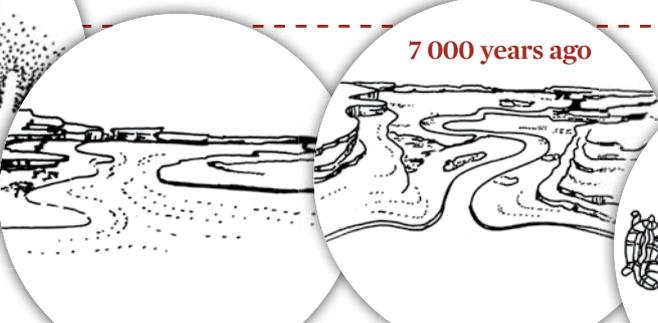
100 mya



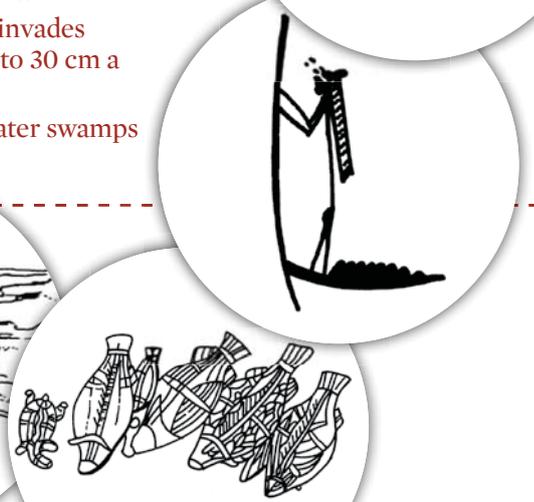
50 mya



60 000 years ago



7 000 years ago



Kakadu's geological attractions

Clues to the geological history of Kakadu are found throughout the park

ESCARPMENT

140 million years ago Kakadu was under a shallow sea. The sea cliffs forming the shoreline are now the dramatic escarpment wall that can be seen at Gunlom, Jim Jim, and Twin Falls and from the Gunwarde-warde Lookout at Nourlangie.

FLOODPLAINS

Vast floodplains stretch across Kakadu's lowlands. These dynamic environments are gradually built up by sand and silt eroding from rocks and being carried by wet season waters. You can see these relatively young landscapes at Yellow Water, Mamukala and from Ubirr.

UNCONFORMITY

An unconformity is where there has been a period of erosion between the formation of an older rock and the deposition of a younger rock. You can see an unconformity at the Budjmi walking track lookout near Twin Falls creek crossing. Here 1 800 million year old granite was exposed by erosion and then covered by the Kombolgie Sandstone formation. This unconformity represents a 100 million year break in time.

Another unconformity can be seen near the Ikoymarrwa Lookout, north of the Goy Marr Interpretive Centre at the Mary River Roadhouse. Here red weathered basalt sits under a lighter-coloured sandstone cap.



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At this unconformity the 1800 million year old granite (dark rock underneath) was exposed for 100 million years before Kombolgie sandstone was deposited on top of it 1650 million years ago

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The stone country of the Arnhem Land plateau was laid down 1650 million years ago

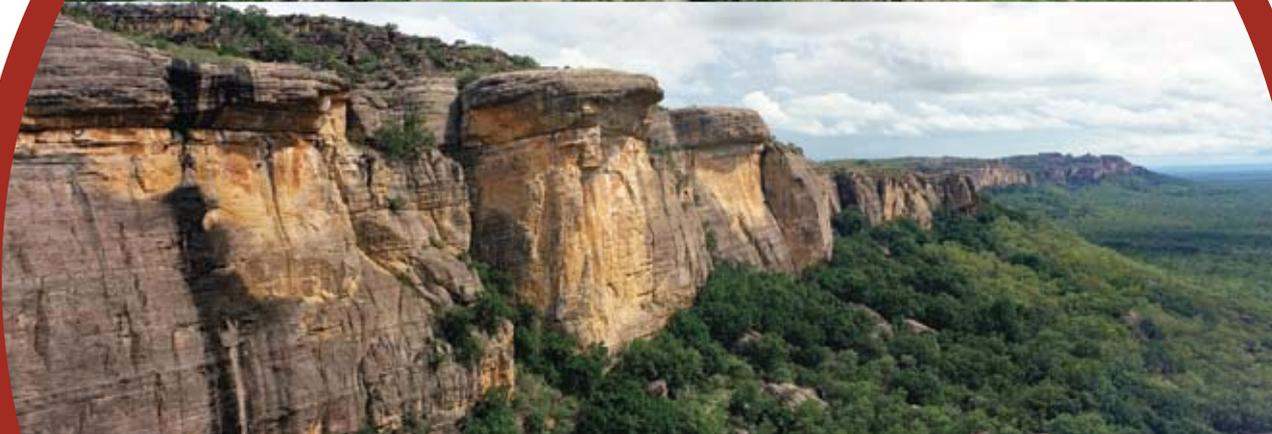
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Today's escarpment was sea cliffs 140 million years ago

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Forming within the last 2 000 to 1 500 years, freshwater floodplains are relatively new landscapes

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IGNEOUS INTRUSIONS

Molten rock forced up between cracks in surrounding rocks can solidify to become an igneous intrusion. These intrusions are more resistant to erosion than the softer surrounding rocks.

RIPPLE MARKS

Ripple marks were left by the currents of a huge river that deposited the Kombolgie sandstone formation 1 700 million years ago. Kombolgie sandstone was so named by geologists after the Kombolgie Creek in the south of the park.

CROSS BEDDING

Cross bedding occurs when there are changes in water flow while sediments are deposited. Cross beds are layers with different inclinations. For example, a horizontal layer develops during a quiet period with little water flow. Then, during faster water flow, the sediments deposit on a sloping surface.

CONGLOMERATES

Rivers and floods often carry rocks and deposit them where the water movement slows, resulting in rocks embedded in sandstone - conglomerate. The size of the embedded rocks indicates the rate of water flow, with larger rocks deposited in faster flowing water. The roundness of embedded rocks reflects how far they travelled, with rounder rocks having tumbled further.

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An igneous intrusion can be seen north of the Arnhem Highway on the South Alligator floodplain, 500 metres east of the South Alligator River Bridge

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On top of Ubirr you can see ripple marks in the sandstone

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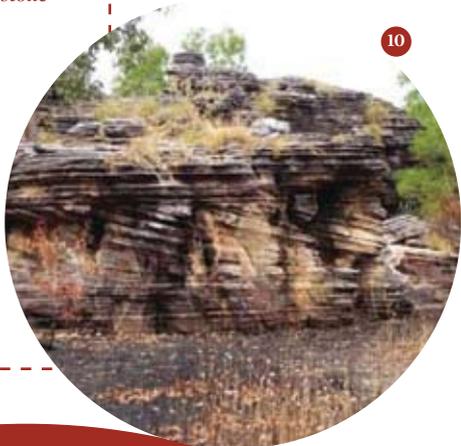
Bardedjildji near the East Alligator River is a good place to see cross bedding

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You can see conglomerate at Nourlangie, Nanguluwurr and on the way to the lookout at Ubirr



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