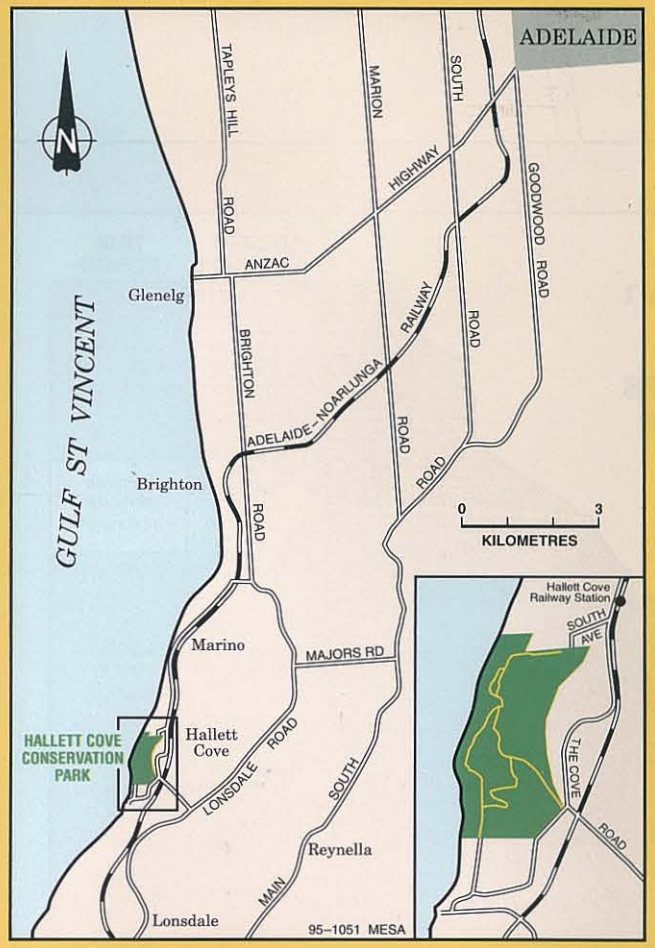
Access

Hallett Cove Conservation Park is located in metropolitan Adelaide, 17 km south of the city centre. The north, south and east entrances can be reached from The Cove Road. The geological trail is about 2 km long, and is best started from the south entrance.

All plants and animals are protected in the park. Geological features can be inspected but samples must not be removed. Pets and firearms are not permitted in the park.



FRONT COVER: *Wave-cut platform and eroded cliffs in folded Precambrian siltstone and sandstone overlain by Permian glacial sediments.* *(Photo 42595)*

HALLETT COVE

Geological Trail

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MINES and ENERGY
SOUTH AUSTRALIA

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Introduction

Hallett Cove is one of the best known geological sites in Australia, mainly because of evidence of an ancient glaciation discovered in 1877 by Professor Ralph Tate of the University of Adelaide. The polished and striated glacial pavements, and sediments associated with the glaciation, are known throughout the world. The area has been declared a Geological Monument because of its significance for educational and scientific purposes.

Conservation of land to protect the glacial pavements commenced in 1960 with acquisition of a strip of coastline, known as Sandison Reserve, by the National Trust. In 1965, when subdivision for housing threatened the site, the State Government purchased adjoining land which was dedicated as Hallett Cove Conservation Park in 1975.

Geology

Many of the significant events in the geological history of South Australia over the past 600 million years can be observed at Hallett Cove.

The oldest rocks here were formed about 600 million years ago on tidal flats within a large depression known as the Adelaide Geosyncline. These siltstones and sandstones were folded during a period of mountain building about 500 million years ago. For the next 220 million years, this ancient mountain range was planed down by erosion.

Fold patterns in siltstone, viewed from Black Cliff. (Photo 42596)

About 280 million years ago, the area was covered by a northwesterly moving ice sheet which polished the exposed bedrock surface. At the same time, rock fragments embedded in the ice left distinctive scratches. Glacial pavements showing these striations can be clearly seen along the cliff tops north from Black Cliff. As the ice sheet began to melt, glacial sediments were deposited in a lake dammed against the ice margin, and larger boulders were dropped from icebergs. At the time of this ice age, Australia formed part of a huge single continent called Gondwana, which included Antarctica, Africa, India and South America. This land mass was centred over the South Pole and was covered by an ice sheet similar to present day Antarctica.

Polished and striated glacial pavement, Black Cliff. (Photo 42597)

The ice age lasted up to several million years and was followed by another long period of erosion which probably removed most of the glacial sediments. About 160 million years ago, Australia began to separate from Antarctica and, by 100 million years ago, a narrow sea had formed between the two continents. About 45 million years ago, ancient fault lines in the Adelaide area became active and caused some areas to subside and become inundated by shallow seas. The present Mount Lofty Ranges were, by contrast, above sea level as uplifted fault blocks.

Hallett Cove remained near sea level until about four million years ago when renewed block faulting submerged the area. A thin layer of white fossiliferous sandstone was formed in the warm shallow sea, covering the ancient glacial sediments. This sea eventually retreated and the area was again exposed.

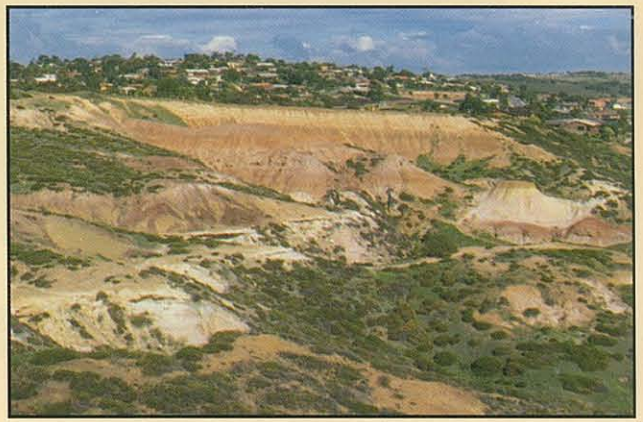
Ancient glacial lake sediments. (Photo 42598)

Fossiliferous sandstone. (Photo 42599)

During the last few million years, rivers which flowed from the uplifted Mount Lofty Ranges deposited a thick layer of alluvial clay over the area. This sequence is best exposed in the Amphitheatre and is capped by recent soil.

The Hallett Cove area was elevated to its present level during the last few thousand years, causing renewed erosion. This has produced the present cliffs, wave-cut platform, beach, and badlands landscape of the Amphitheatre.

The Sugarloaf and Amphitheatre, comprised of soft glacial and alluvial sediments. (Photo 42600)



Hallett Cove Geological Trail

Hallett Cove contains rocks and sediment ranging in age from about 600 million years to present day, and which formed within four major time periods (see cross-section below). These rocks are piled on top of each other like a gigantic layer cake.

Allow up to two hours to walk the trail. Interpretive signs will help you unravel the clues to past landscapes and climates.

1. From sea bed to mountain range

The chocolate-coloured rocks of Black Cliff were originally deposited as sand and silt on tidal flats about 600 million years ago. They display fold structures formed during a period of mountain building about 500 million years ago, which produced the first Mount Lofty Ranges. These folds are best seen from the top of Black Cliff.

2. An ancient ice age

The polished and striated rock surface along the cliff tops was caused by a moving ice sheet about 280 million years ago.

3. An ancient glacial lake

Multi-coloured silt, clay and sand were deposited near the end of an ice age, about 280 million years ago, in a lake dammed against the ice margin.

4. Erratic rocks

These two large boulders of quartzite, known as erratics, were dumped by the melting ice sheet. Erratics of granite, which can be seen on Hallett Cove beach, came from the Victor Harbor area.

5. A gap in time

The contact between dark, folded rocks and soft, pale glacial sediments is well exposed along Waterfall Creek. The contact represents a break in time of about 320 million years and is known as an unconformity.

6. Wave-cut platform

The level shore platform has been carved by wave action across the rocky coastline during the past few thousand years. Small-scale folds and faults are common on the platform.

7. The last invasion by the sea

A thin layer of white fossiliferous sandstone was deposited in a warm, shallow sea which covered the area about four million years ago. The impressions of various shelly creatures can be seen.

8. The Amphitheatre

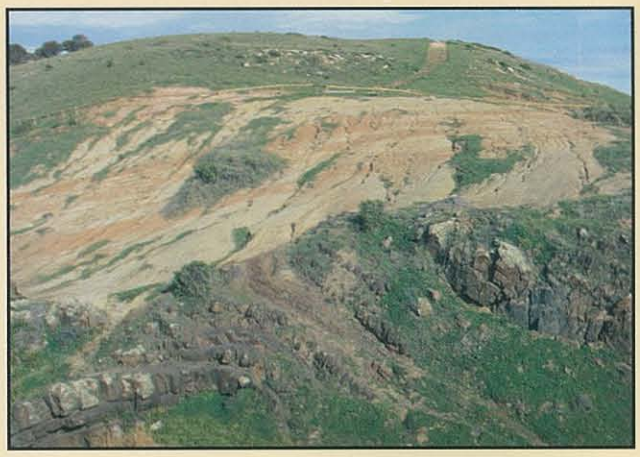
The upper part of the Amphitheatre consists of alluvial silt and clay deposited on a flood plain one to two million years ago. Uplift of the area in the last few thousand years resulted in erosion which has produced the amphitheatre landscape.

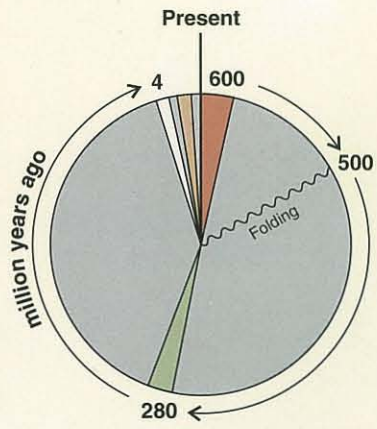
This area also contains a variety of local native plants including native peach (*Santalum acuminatum*), native apricot (*Pittosporum phyllitaedes*), black tea-tree (*Melaleuca lanceolata*), wattle (*Acacia rotundifolia*), blue Dampiera (*Dampiera rosmarinifolia*) and yellow Goodenia (*Goodenia pinnatifida*).

9. The Sugarloaf

This cone-shaped structure is composed of sediments deposited in a lake formed as the ice sheet melted about 280 million years ago. The base of the sugarloaf is composed of reddish clay which is overlain by white sand. It is capped by a thin layer of brown alluvial clay deposited one to two million years ago.

Unconformity exposed along Waterfall Creek. The truncated surface of dark, folded, 600 million-year-old rocks is overlain by light coloured shallow-dipping 280 million-year-old glacial sediments. (42601)





The Time Chart

The geological history at Hallett Cove can be represented on a 600 million year time chart. The coloured areas indicate events at Hallett Cove.

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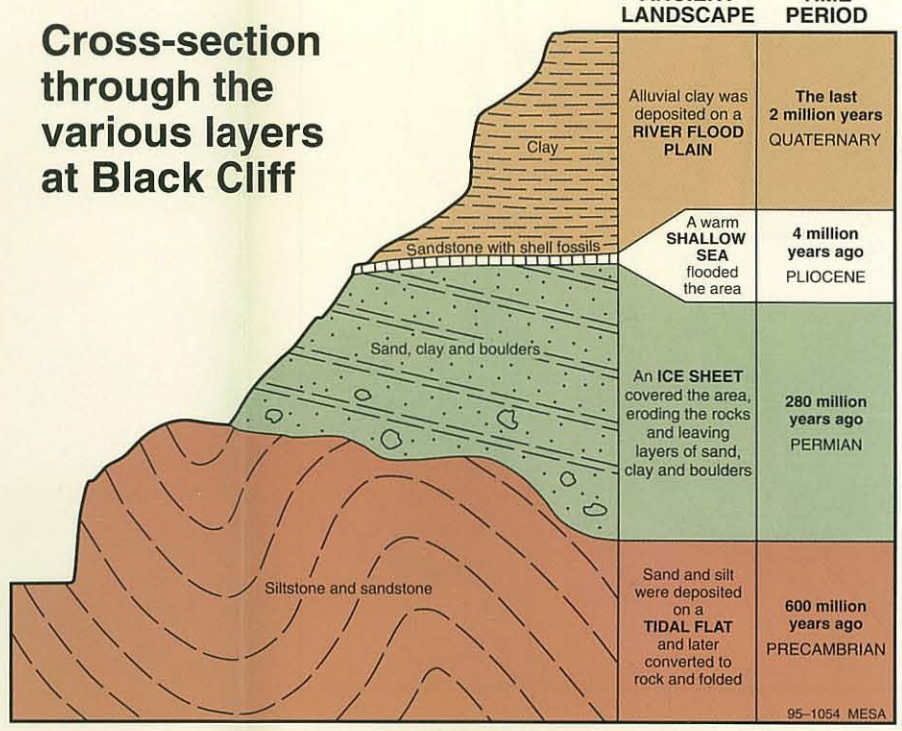
Cross-section through the various layers at Black Cliff



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