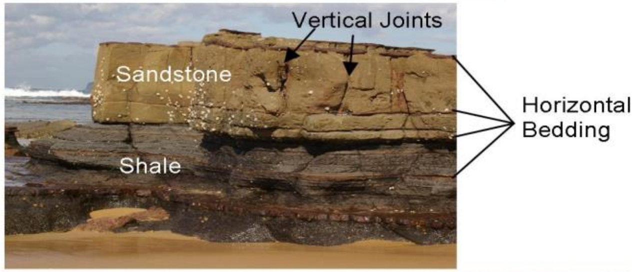
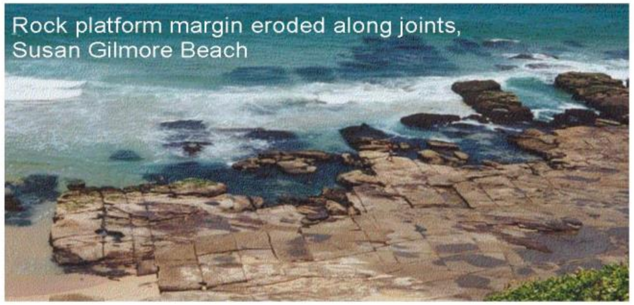
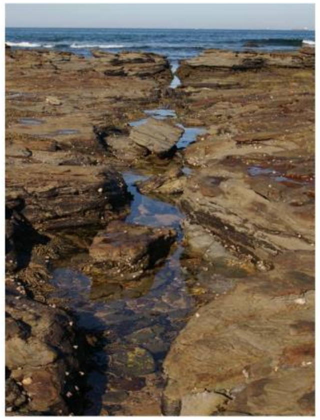
GEOLOGY OF ROCK PLATFORMS - NEWCASTLE COAST




Rock platform margin eroded along joints, Susan Gilmore Beach


Gutter and rock pools formed in vertical joint by wave erosion, north of Newcastle Ocean Baths.

Wave-cut rock platforms are expansive regions projecting seawards from the base of rocky headlands. Erosion by ocean waves has formed rock platforms in the zone between high tide and low tide levels, where waves are most active.

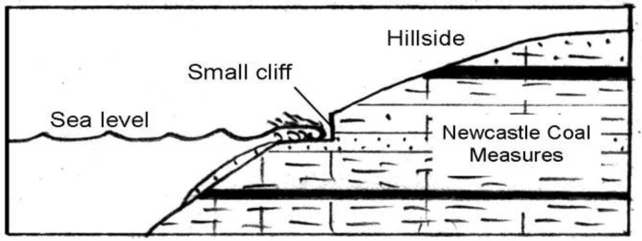
Newcastle's rocky coastline is made up of sedimentary rocks of the Newcastle Coal Measures. The layers of sandstone, conglomerate, shale, coal and tuff you can see today originated as river sands and gravels, floodplain muds, peat swamps and volcanic ash layers respectively. They were laid down during the Permian Period, some 250 million years ago.

The rock platforms are made principally of hard and resistant sandstone, with minor softer shale layers. Wave erosion along horizontal to gently dipping bedding planes (sedimentary layers) gives the flat to gently sloping platform surfaces typical of this area. Erosion also breaks off rectangular blocks of rock along intersecting vertical joints (cracks in rocks). This controls the shape and orientation of the platform margins.

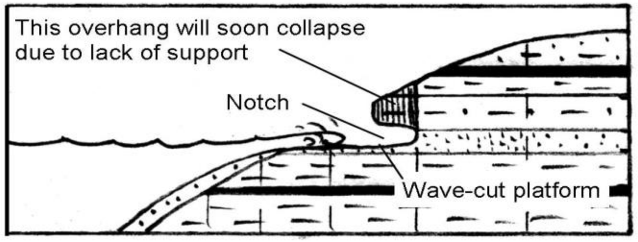
Origin of Rock Platforms Over the past 1.8 million years, sea level has risen and fallen many times in response to fluctuating global temperatures. During cold glacial periods huge ice sheets tied up water from the ocean, causing sea level to fall. Sea level rose again in warm interglacial periods when water from melted glaciers flowed back into the ocean.

At the peak of the last glaciation, 18,000 years ago, sea level fell to 120 m below its present level. Newcastle's coastline lay about 20 km farther east than it does today. Land now forming the present coast was a series of hills and valleys. River channels cut deeply into Permian bedrock and hills were rounded by erosion.

After the glacial peak the increasing global temperatures caused ice to melt and sea level to rise. The rising sea drowned river valleys and crept up against hillsides. Rock platforms began to form after the rising sea reached its present level, 6,500 years ago. At this stable sea level wave erosion cut a small cliff in the drowned hillside.



Waves cause erosion by hurling tonnes of water against rocks with great force. Compressed air in cracks explodes when waves retreat, widening cracks. Waves laden with broken rocks scour rock surfaces.



Over time, waves cut the small cliff back to form a notch, undercutting rocks above. Overhanging blocks of rock then collapse, resulting in cliff retreat. As the cliff becomes higher, the wave-cut platform widens.

The City of Newcastle
Hunter-Central Rivers CMA CATCHMENT MANAGEMENT AUTHORITY

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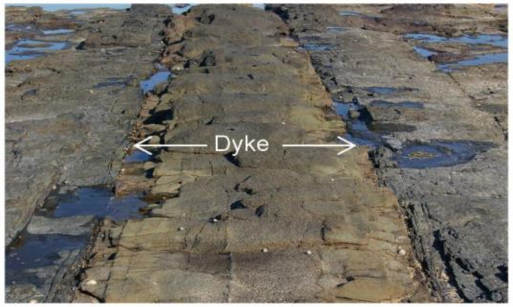
Honeycomb weathering develops on sandstone surfaces of rock platforms. Honeycombs are small, closely spaced depressions up to a few centimetres in diameter and depth.

Salt crystallization followed by wind erosion causes honeycombs. Growing salt crystals, due to evaporation after a soaking by sea water, dislodge sand particles in the rock. Wind then blows away the loose sand grains leaving small holes. Sand blasting by the wind swirls sand grains around in the holes, enlarging them.

Igneous Dyke On the rock platform north of Newcastle Ocean Baths a basalt dyke has intruded the sedimentary rocks along a joint. About 100 million years ago molten basalt from the Earth's mantle, at a depth of about 100 km, squirted upwards through cracks in the overlying rocks while the rocks were being stretched. The molten basalt solidified as a wall-like intrusion in a joint against the cooler sedimentary rocks. A chilled margin of finer grained basalt formed along its edges.

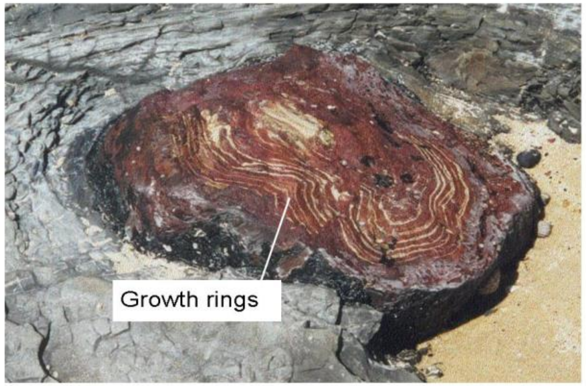


Iron Deposits Brown, orange, yellow and red coloured deposits in rocks are from the mineral limonite. Limonite is hydrated iron oxide (rust). It is commonly found in joints, along bedding planes, replacing plant material, and as concretions.

Limonite is generally more resistant to erosion than the host rock. Raised zones occur parallel to joints, resistant caps form on softer sedimentary beds, and petrified tree stumps and logs sit above the sandy/shaly platform surface.

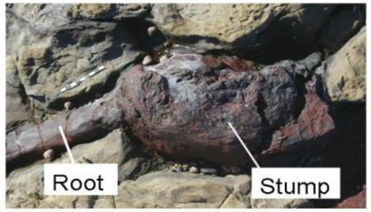
Limonite is a secondary mineral, deposited in the sediments after they were laid down.

Fossil Trees Rock platforms expose excellent examples of petrified tree stumps in their growing position. Annual growth rings and bark are preserved and some even have their roots visible. Fallen trunks and limbs lie along bedding planes.



Prepared by Roz Kerr 2007

The fossil tree remains are red-brown as they now consist mainly of limonite. The trees are plants of the *Glossopteris* flora that grew here 250 million years ago, before the time of dinosaurs. By observing the rocks in which the tree stumps are embedded, it is interpreted that the trees grew on a muddy floodplain. A flood of sandy water drowned and buried the trees. Broken tree limbs would have floated along in the river current before becoming waterlogged and sinking to the bottom.



Soon after they were buried, minerals replaced the wood tissues, turning wood into stone. Water squeezed out of the wet mud and sand moved through the sedimentary layers, carrying dissolved chemicals picked up along the way. Where the water encountered permeable wood buried in the sediments, it deposited minerals. The minerals replaced the wood tissues molecule by molecule, preserving detailed cell structure, growth rings and bark texture. In some cases the bark has been coalified instead. Later, uplift followed by erosion of the overlying layers exposured these fossils for us to see.


Fossil log

Isolated Sandstone Blocks resting on the rock platform have either tumbled down from nearby cliffs or been eroded from the edge of the platform and tossed up by storm waves.