

Tweed Volcano

The Tweed Valley is the erosion caldera of the **Mt Warning Shield Volcano**. The Tweed Valley, the caldera, is more than 1000 m deep and 40 km wide. This is larger than the Ngorongoro Crater in Tanzania. It is the biggest erosion caldera in the southern hemisphere, and among the largest calderas in the world. It is one of the few places in the world where erosion processes have revealed the sedimentary deposits and metamorphic rocks underlying the caldera. The volcano erupted when the earth passed over the East Australian Hotspot about 23 million years ago. The volcano erupted through the 250-200 million year old Brisbane Metamorphic Series, spreading out over the Clarence-Moreton Basin sedimentary floor that was deposited 135-200 million years ago.

By the time the eruptions ceased, the volcano had risen to a height of more than 2 km, ash and lava being deposited around it till the diameter of the volcano and its slopes was about 100 km. The volcano had spread out from Byron Bay in the southeast, Lismore in the southwest, to Mt Tamborine in Queensland to the north. Most of the volcanic material has been eroded away over the past 20 million years. Mt Warning and a system of ring dykes, which is believed to be the central magma plug, composed of very hard rocks, has resisted the forces of erosion to dominated the valley, especially around Murwillumbah.

A cap of very hard basaltic rock has protected the rim of the crater, resulting in a semicircle of vertical cliffs around the western side of Mt Warning, presently over 1100 m high, becoming known as Wollumbin, the [Aboriginal](#) name. The heights are protected by 5 national parks.

The Clarence Moreton Basin, composed of sedimentary and metamorphic rocks, stretches from north of Brisbane in Queensland to south of Grafton in New South Wales. The 500-250 million year old Brisbane Metamorphic Series, the oldest rock layers, outcrops on the eastern section of the Tweed Valley. In headlands from Byron Bay to Cabarita, outcrops of greywacks and phyllites of this series can be seen. They occur widely in the Condong Range and the Burringbar Range, and the east of Mt Warning, on the lower hill slopes of the Tweed Valley, and the hills of Murwillumbah.

Heavy, highly acid, red and yellow clay soils result from the weathering of these rocks. These soils support mainly eucalypt forests, but some patches of [rainforest](#) also occur in gullies and the sheltered southern slopes.

Included in the deposits in this basin are rocks of the Bundamba Group, Walloon coal measures and Kangaroo Sandstones comprised of sandstones and narrow coal seams. The sedimentary rocks weather into highly acid podzolic soils, sandier and poorer than the yellow earths. Eucalypt forests are the main vegetation type occurring on these soils, the largest stand occurring in the [Mebbin State Forest](#).

The Chillingham volcanics are a thin band of rocks separating the metamorphic and sedimentary rocks of the Clarence-Moreton Basin. They are highly weathered tuffs and rhyolites, about 200 million years old. As with the other rocks in the area, they dip at about 45° to the west. The Mt Warning extrusion interrupts the outcropping of the thin line of the Chillingham volcanics that can be seen in the hills of the Chillingham area.

About 23 million years ago the Mt Warning volcano began erupting, and over the next 3 million years rose into a large complex central volcano. Most of the volcanic material was erupted in many separate eruptions, punctuated by long periods of inactivity. Most material was erupted through the main vent at Mt Warning, but some erupted through a number of other vents.

The eruptions occurred in 3 phases, first the extrusion of basalt, then an explosive phase when mainly acid rhyolites were thrown out, then the final, quieter, basalt extrusion. The lava from the first phase, the Lismore Basalts, covered a very large area stretching from the Lismore district in the south to the Beechmont area in the north. This lava spread over a smaller area in the east-west direction as it was across the basin, so it didn't flow as easily. The Lismore basalts are present at Tweed Heads and Kyogle.

A weathered soil profile developed over the long periods of inactivity, the erosion of these soils allows the volcanics of these separate eruptions to be distinguished in the terraced landforms that resulted from the erosion. These terraces can be seen from the Numinbah tick gate, on the middle slopes of the southern side of Springbrook.

Lismore basalts form caps on the low hills (about 100 m) to the east at places such as Tewanin, Cudgen, Duranbah, Danorca Point, and Terranora. At sea level it is at Point Danger, Fingal Head, Cudgen Head and Cook Island. Below the cliffs they form the middle slopes at the Springbrook, Lamington and Nightcap Plateaux, where they are seen to be above the sedimentary rocks.

'Krasnozems' are relatively neutral, fertile, red loamy soils that form from basalt. Large stands of [Subtropical Rainforest](#) grew on these soils at places like the Big Scrub, most of which has been destroyed, first by timber cutters, then by clearing. There were many stands of red cedar in these forests.

In the 2nd phase of the eruptions, they became more violent, periodically expelling lava explosively. Among the rocks from this phase are tuffs, rhyolites, and agglomerates. The rhyolites, one type of volcanic glass, are very resistant to erosion in this environment. It is present in the cliffs of the plateaux that form part of the western rim of the caldera. Streams flowing into the Richmond valley and into Queensland have eroded deep gorges in the rhyolite, and waterfalls at the heads of these gorges are up to about 120 m high. Examples of these falls occur at Minyon, Turntable and Purlingbrook.

At places where the rhyolite of the cliffs overlays the softer tuff, caves and overhangs often form. A good example of this type of formation occurs at the head of the [Numinbah Valley](#), Bushrangers Caves.

The final phase of the eruptions was comparatively quiet, basaltic lava flows spread out from the volcano, called Blue Knob basalts, it is this that forms the cap rock on the high plateaux of [Springbrook](#), [Lamington](#), and the [Nightcap Range](#) and the Tweed Range. These rocks also weather to form fertile red soils that supported [Subtropical Rainforest](#). On some of the higher peaks are small relic patches of Temperate Rainforest, containing [Antarctic Beech](#), usually found from [Barrington Tops](#) to the **McPherson Ranges**. This is believed to be the most northerly extent of its range. It is believed that the rainforest around [Lamington area](#) is possibly its most northerly site in the world.

In the 20 million years since the volcano fell silent erosion carved up the original flat dome of the shield. The first streams ran down the sides of the dome in a radial pattern. Once they cut through the Blue Knob basalts they began forming gorges with waterfalls over the rhyolite rocks. The streams eventually formed into larger rivers such as the Richmond and the Nerang, that drained into the rivers of the floor of the valleys of the Clarence Moreton Basin. These flowed down steep beds so cut rapidly through the rocks. 3 plateaux, fringed by rhyolite cliffs, are now separated by large valleys. The Tweed River had the steepest gradient, as it flowed directly to the sea, so it cut the most rapidly of the rivers from the shield. In the process it formed the Tweed Valley, the erosion caldera of the volcano. As it cut through the rocks of the shield it beheaded a number of other streams that previously flowed to the north, west, and south, growing in volume in the process.

Among the results of this large-scale erosion was the exposure of the volcanic plug, now Mt Warning, and a series of ring dykes, now a chain of lower mountains surrounding Mt Warning, such as Mt Uki, The Sisters, and **Brummies Lookout**. The diorite, or micro-granite, of the magma chamber has also been exposed. It takes the form of tors, or rounded boulders, on the lower slopes of Mt Nullum beside the Uki Road. The Doon Doon Doughboy, Dinseys Rock, Egg Rock and the Pinnacles, originated as secondary vents and dykes.

As the rock of the shield was eroded away the load on the crust was reduced resulting in a series of uplifts by isostatic rebound. This increased the gradient of the river beds causing the river to cut deeper and leaving a series of low river terraces in the upper parts of the Tweed Valley. In the Dungay area one of these terraces is visible. The lower part of the Tweed Valley was submerged by the sea to form a ria (a drowned river valley) as the sea level rose at the end of the last glacial period. Sydney Harbour is also a ria. Many swamps formed on the flat, silted up lower part of the valley, that extends up the Rous River to Boat Harbour and to Byanuan on the Tweed. This section of the river has a muddy bed, but upstream it has a rocky bed. The flats have no river terraces and many swamps.

Because of the size and stage of dissection, the erosion caldera is said to be unique in the world.

[Timeline of Australian Volcanoes](#)

Links

1. [The Caldera of the Tweed Volcano](#)

2. [Volcanoes of Australia](#)
3. [List of Volcanoes in Australia](#)
4. https://en.wikipedia.org/wiki/Tweed_Volcano
5. http://austhrutime.com/tweed_volcano.htm

see also [Australian Volcanoes](#)

[Sources & Further reading](#)

1. Twidale, C.R. & Campbell, E.M., 2005, *Australian Landforms: Understanding a Low, Flat, Arid, and Old Landscape*, Rosenberg Publishing Pty Ltd
2. Mary E White, **Running Down, Water in a Changing Land**, Kangaroo Press, 2000

Author: M. H. Monroe

Email: admin@austhrutime.com

Last updated 22/06/2009