

The Dandenong Ranges

Exploring a Volcanic Landscape

Karen Phillips



**Mt Evelyn History Group respectfully acknowledges
the traditional owners of the Dandenong Ranges,
the Wurundjeri and Bunurong peoples of the Kulin Nation.**

We pay tribute to the Elders, past, present and emerging.

Acknowledgments

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Cover painting: The Dandenongs by Charles Frederick Lang, oil on canvas, 1958.

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A Neglected Asset

The Dandenong Ranges dominate the skyline to Melbourne's east. A shared resource for Aboriginal people for thousands of years, the ranges are famous for their Mountain Ash forests, fern gullies and lyrebirds, the charming villages and gardens. Among so many attractions, one that receives scant attention is their geology. Even heritage listings have little to say about geological significance. Yet the Dandenongs represent an ancient and fascinating volcanic landscape within a compact area.

This paper draws together various threads of information – from scientific papers, local histories, Council and Parks publications, bushwalking and geocaching blogs. The part of the Dandenongs within the Yarra Ranges LGA is the main focus, but neighbouring parts of Knox (The Basin and Lysterfield) and Cardinia (Menzies Creek, Emerald and Gembrook) are included.

I refer to the main range as 'the Dandenongs'. The hills between Lilydale, Coldstream, Wandin and Mt Evelyn north of Olinda Creek are referred to here as 'the Lilydale hills'. 'The granite country' is the area south and southeast of the main range, with the Puffing Billy railway marking the approximate boundary between them. The emphasis is on geological features that can be recognised and accessed. 'Places to visit' are suggested at the end of each section, with Melway (M) and GPS co-ordinates. Please note that the GPS readings were taken from Satellite View, not on site.

Please consult the Geological Survey Map 'Ringwood' 1981 for distribution of rock types:

<http://earthresources.efirst.com.au/product.asp?pid=384&cid=33>

Karen Phillips
Mt Evelyn History Group, 2024

Older than the Hills

The area where the Dandenong Ranges now stand was once covered by sediments laid down under the sea during the Silurian period (444-419 million years ago). The later part of this period, the Upper Silurian, is called the Yeringian, after the Parish of Yering in which Lilydale is situated. 'The Yeringian are marine deposits, whose character varies with distance from the old Silurian shore line.'¹ They include conglomerates, sandstones, quartzites, mudstones, shales, and the limestone deposits of Cave Hill.

The original cave at Cave Hill had a shaft 120 feet deep.² Called *Bukker Tillibul* in Woi wurrung legend, it was said to be a bottomless chasm created by a shooting star.³ The limestone contains fossils of marine organisms, including hydrozoa, brachiopoda (lamp shells), crinoids (sea lilies) and corals. At least four species have been named *lilydalensis* after their place of discovery.

Corals grow in tropical and sub-tropical waters, up to 30° south or north of the Equator. They are not found along the Victorian coast. Either the climate was warmer in the Silurian period, or the Cave Hill corals belonged to a now-extinct species, able to tolerate cooler water.⁴

***Fossil shell in limestone 'Fly Rock'
at the entrance to the Cave Hill Estate.***

It's strange to realise that the fragile life forms preserved in the Cave Hill limestone are older than the mountains.⁵



Places to visit

- **Cave Hill quarry and lime kilns, Kinley (former Cave Hill Estate), Melba Avenue Lilydale. Not open to the public at the time of writing, but tours are available. M 38 C6, GPS -37.7660893, 145.3428928.**
- **'Bukker Tillibul' sculpture with Cave Hill boulder, Chris Booth 2002, former Swinburne campus, Lilydale, M 38 D7, GPS -37.7653332,145.3482894.⁶**

¹ Morris Morris 1914, 'On the Geology and Petrology of the District between Lilydale and Mount Dandenong', *Proceedings of the Royal Society of Victoria* 26 (N.S.) Pt 2II, ART XXII, p.334,
<https://www.biodiversitylibrary.org/page/8511398#page/410/mode/1up>

² 'Excursion to Cave Hill', *The Victorian Naturalist* 26, pp.7-8, 1908.

S. Wiencke 1984, *When the Wattles Bloom Again*, The Author, Woori Yallock, p.102.

⁴ C. Laseron 1969, *Ancient Australia*, Halstead, Sydney, pp.85-86.

⁵ See the Yarra Ranges Regional Museum catalogue for Cave Hill fossils in their collection,

<http://ww1.yrrmuseumcollection.com/Presto/home/home.aspx>

⁶ <https://chrisbooth.co.nz/works/bukker-tillibul-2002/>

The Dandenongs Caldera

The Devonian period (419-359 million years ago) saw an upsurge in volcanic activity. The Dandenongs, Mt Macedon, and the ranges between Warburton, Healesville and Eildon all formed during this period. In the late Devonian period the layers of sedimentary rocks folded, erupting in gigantic explosions that tore the landscape apart. The whole of the Dandenong Ranges was a huge volcanic caldera (cauldron) that saw four eruption phases, each producing a different type of rock.⁷

Most of the volcanic rocks from the 'biggest volcanoes' did not flow as a hot liquid, or lava. Instead, nearly all the magma exploded into small fragments in the volcano's vent, blasting huge clouds of very hot particles into the atmosphere. The smaller particles were carried highest, eventually cooling and falling down as dust and ash around the volcano, or being carried away by the winds. The bigger and heavier particles quickly fell back quickly, and were caught up in red hot, glowing clouds of volcanic gasses which 'flowed' like avalanches down the slopes away from the vent.⁸

The ash from the first phase of eruptions flowed north, forming the rock known as Coldstream Toscanite. Lilydale is located on the edge of the Toscanite flow. The second, the Mt Evelyn Rhyodacite, spread along the western side of the range from Mt Evelyn to Ferntree Gully. The third, the Kalorama Rhyodacite, appears on the surface as a narrow band running northeast to southwest. The final stage of eruptions produced a thick layer of lava called the Ferny Creek Rhyodacite, which reached from Kalorama to Upper Ferntree Gully and Emerald. This is the most extensive rock type, covering the greater part of the caldera.⁹

View from Five Ways, Kalorama, over the interior of the Dandenongs caldera, with Silvan Reservoir on its 'floor'.



The shape of the caldera resembled a triangle, squashed in on its eastern side, and extending from Mt Evelyn in the north to Ferntree Gully in the south-west and Emerald in the south-east. As the eruption phase neared its end, the accumulated ash and lava, hundreds of metres thick, fractured

⁷ The rock types were sequenced by Morris in 1914, as: Upper and Lower Toscanite, Upper, Middle and Lower Dacite. Morris's Upper and Lower Toscanite appear on the 1981 Geological Survey map as Coldstream Rhyolite and the Lower, Middle and Upper Rhyodacite as Mt Evelyn, Kalorama and Ferny Creek Rhyodacite respectively.

⁸ Bill Birch 1994, *Volcanoes in Victoria*, Royal Society of Victoria, pp.8-9.

⁹ Jack Lundy-Clarke 1976, *The Dandenong Volcano*, Lilydale & District Historical Society, p.3.

along the southern and eastern sides of the caldera and across the centre, collapsing into the magma chamber. The gentle eastern slope of the range is the result of this subsidence. Magma continued to move up into the faults in the rock, flowing out as lava.

The range we see today is a monadnock formed by the plug of hard volcanic ash and lava that remained after the softer Silurian sediments around it eroded away.¹⁰

***Enclosed in the caldera:
a view over Harmony Vale.***



The first permanent settlement within the caldera was at Kalorama. Three families, Richardson, Child and Jeeves, settled in the area in 1855, initially posing as miners. Later they were able to take up selections, which ran from the ridge top down to Olinda Creek. Jabez Richardson called his property 'Harmony Vale', and the name came to apply to the little settlement as a whole.¹¹ The farmland can be seen from Olinda Creek Road.

Places to visit

- **Five Ways, Kalorama, has a view over the interior of the caldera and Silvan Reservoir. M 52 J9, GPS -37.814799, 145.3687031**
- **Silvan Reservoir Park M 120 H11, GPS -37.8258577, 145.4064686.**

¹⁰ A Dandy Volcano, https://www.geocaching.com/geocache/GC5K6A9_a-dandy-volcano?guid=538996a3-5d88-4e15-9d5c-0b5c8ac1951f

¹¹ Jack Lundy-Clarke 1976, p.6.

Eruption Sites and Lava Flows

'Where's the crater?' people ask. There is no 'Dandenongs crater' as such, because the whole of the caldera was the eruption site during the huge early explosions. The eruption points that can be identified today belong to the later eruptions of lava.

The mouth-like formation of Lookout Rock identifies it as a site of upwelling lava.

There must have been an eruption point on the ridge above the Trig Track, Kalorama. Others can be found on Mt Corhanwarrabul. The hang-gliding ramp is built on a lava flow, which must have had its source just above. Lava formations can be seen in the bush near the ramp, both above and below the Kyeema Track. One source can be found in the bush south of the ramp.



Lookout Rock, off Chalet Road Olinda, has 'lips' at its centre, identifying it as a lava dome that has welled out of the earth.

Most eruption sites on the eastern side of the caldera would have been obliterated by the collapse of the ash plug, or by later basalt flows. The presence of hornfels (a kind of metamorphic rock) in the creek bank of Olinda Creek, near the boundary of the Recreation Reserve and YMCA Camp, Mt Evelyn led to this being identified as one possible eruption point.¹²

A lava eruption site in the bush above the Kyeema Track, south of the hang-gliding ramp.



¹² M. Morris 1914, p.343.

Some lava features appear to have formed on the present surface, such as the two lava flows that cross the Trig Track from Five Ways, Kalorama.

A surprisingly fresh-looking lava flow crosses the Trig Track, Kalorama.

Griffith Falls at Ferny Creek/ The Basin flow over a sloping 'pavement' that appears to be the edge of another lava flow. Located on 'Ferndale', the property established by James Griffith of Griffith Teas in the late 1880s, the waterfall was also known as Ferndale Falls



or The Basin Falls, and was a popular picnic spot. The falls are on Griffith Creek in 'The Ravine'. This steep-sided gully cuts obliquely across a slope and appears to follow a rift that the creek has deepened. The Ravine and the Falls can be reached via the Inverness Track from the Mountain Highway (reasonable fitness required).¹³



Another lava pavement that resembles a cobbled road can be found on the Glasgow Track (Fire Trail). Serious fitness is required for this one – the climb is nearly vertical.

Dandenong Ranges. Griffith Falls. A.J. Campbell, c.1890. MM 69970, Museums Victoria. Creative Commons.¹⁴

Settler Thomas Hand wrote of 'The old dray track over the Stoney Rises to Mr Richardson's 19th selection' (between Silvan and Kalorama, now Olinda Creek Road).¹⁵ A hill in the Chalet Road/ Woolrich Road area was called 'Stony Rise',¹⁶ and there is a Stony Rise Walk in Tremont. Stony rises, like those near Colac, are rocky hummocks formed from the collapsed skin of lava sheets. The local 'stony rise' names may refer to the smooth-sided tumuli (lava blisters) near Olinda Creek Road. One of these can be found among the undergrowth near the foot of the Bartlett Track.

¹³ DVN61, <https://dvn61.blogspot.com/2015/12/in-search-of-falls.html>.

¹⁴ Museums Victoria, <https://collections.museumsvictoria.com.au/items/794403>

For recent photos of Griffith Falls, see: <https://dvn61.blogspot.com/2015/12/in-search-of-falls.html> and https://australia247.info/explore/victoria/knox_city/the_basin/griffiths_falls.html

¹⁵ *The Age*, 29/12/1874.

¹⁶ *The Reporter* (Box Hill), 3/12/1915.

Places to visit

- Lava formations, Griffith Falls M 65 K10, GPS -37.8645916, 145.3279266
- Lava pavement, Glasgow Track¹⁷
- Lava source south of the hang-gliding ramp above the Kyeema Track, M 66 D2, GPS -37.8367517, 145.346285
- Lookout Rock, via Golf Course Track off Chalet Road Olinda, M 122 B7, GPS -37.8526786, 145.3799797
- Lava blister, Olinda Creek Road/ Bartlett Track, M 120 C12, GPS -37.8296424, 145.3856588,669.

¹⁷ For photo and detailed directions, see 'Explore the Dandenongs', <https://exploredandenongs.com.au/fire-trail-mount-dandenong/>

Granite Country

Immediately after the dacite eruptions ceased, two great plumes of magma intruded into the sedimentary rocks south and southeast of the Dandenongs, forming granodiorite batholiths (rock domes) underground.¹⁸

The northern edge of the granite country runs approximately along the Puffing Billy railway. The southern boundary follows a line between Dandenong and Pakenham. The granodiorite masses have eroded into the rock formations and freestanding boulders in the Lysterfield hills and in the region east of Gembrook.¹⁹ There are tors in Lysterfield Park, especially at the summit of the Granite Track, beside the Boys' Farm Track, and at 'The Rock Garden' further west.

Bald Hill north of Cardinia Reservoir was a sacred site, where no hunting was permitted. Rituals were performed at certain rock formations to ensure an abundance of kangaroos.

The Ceremonial Rocks were natural outcrops, the sacred spot lying on the east slope of Bald Hill, a round eminence rising 500 feet or so above a tributary of Karrdinnyar [Cardinia] Creek. It is one of the areas of sandy soil outcropping in the otherwise red soil district of ancient volcanic upheaval.

On a lower slope was a large conic rock about five feet high, of granite. This rock was used for ceremonial purposes by the Ngaruk people. Capped with an extra piece of stone in natural formation, the whole resembled a cottage loaf in shape; the outcrop was ringed by smaller stones of differing size and shape. ...²⁰

The cone-shaped rock stood about 200 metres from the summit of Bald Hill.²¹ Three slabs of stone closer to the hilltop were associated with Bunurong and Woi wurrung legends of the origin of fire. Most versions of the Fire legend include the Creator Bunjil the Eagle, Waa the trickster Crow, and Bunjil's two sons or 'young men', Djurt-Djurt the Nankeen Kestrel and Thara the Quail Hawk.

While the central and largest [rock] is just a slab of stone, the two smaller could ... pass for two bodies lying on their backs. This illusion is emphasised by each having a protuberance at one extremity which looks like a roughly hewn face The two smaller rocks represent Djurt-Dhurt and Thara, and the third and largest their campfire.²²

¹⁸ B. Birch, 'Gems in the Forest' in Tom Griffiths 2001, *Forests of Ash*, Cambridge University Press, p.74.

¹⁹ B. Birch 2001, pp.74-75.

²⁰ M. McGivern 1972, *Aboriginal of the Dandenong Mountain*, The Author, p.104.

²¹ M Tansley 1978, *Sites Structures and Areas of Historical and Archaeological Significance*.Vol.1, Upper Yarra Valley and Dandenong Ranges Authority Report.

²² A. Massola, 'Sacred Rocks of the Aborigines', *The Victorian Naturalist*, Vol. 78, No.4, pp.106-110, August 1961, <https://archive.org/details/VictorianNatura78Fiel/page/108/mode/2up> The Indigenous name for Bald Hill is *Munnio*, meaning 'Ashes'.

The sacred site is on Melbourne Water property, and is not open to the public. Winzenried states that the rocks were submerged when the reservoir filled in the early 1970s, but they may reappear when the water level is low.²³

Elephant Rock, Cardinia Reservoir Park.

With the Bald Hill formations no longer accessible, attention has shifted to Elephant Rock. Located south of the reservoir, Elephant Rock has become a ‘folk art’ site and is continually being redecorated.²⁴ Split Rock in Beaconsfield Upper is a spherical boulder of Tynong Granite approximately three metres in diameter.²⁵



Further east, Ship Rock is located north of Gembrook, Egg Rock and the Four Brothers Rocks in the Bunyip State Park.

The granite country is a maze of small hills and intermittent creeks. The creeks that rise on the main range mostly avoid traversing the granite. Menzies Creek rises north of the township of the same name and takes a loop to the southeast.

Menzies Creek is of interest in that, rising in a series of small south-flowing creeks, it turns south-east along the margin of the range proper, to its south-eastern corner, and then turns north to join the Woori Yallock Creek.²⁶

Monbulk Creek and Ferny Creek flow westwards to join Corhanwarrabul Creek, a tributary of the Dandenong. The exception is Cardinia Creek. Flowing into, and out of, Aura Vale Lake and Cardinia Reservoir, and augmented by its tributary Muddy Creek, the Cardinia continues southwards to enter Western Port Bay near Tooradin.

The creeks help to define the boundary between Wurundjeri and Bunurong Countries.

In large part, these traditional Countries were defined by natural and environmental features, significantly by water. The direction of water flow provides a clear indication of the

²³ A. Winzenried 1988, *The Hills of Home*, The Author, p.16.

²⁴ <https://www.weekendnotes.com/elephant-rock-emerald-victoria/>

²⁵ Victorian Resources Online,

https://vro.agriculture.vic.gov.au/dpi/vro/portregn.nsf/pages/port>If_sig_sites_beaconsfield

²⁶ A.B. Edwards 1956, ‘The Rhyolite-Dacite-Granodiorite Association of the Dandenong Ranges’, *Proceedings of the Royal Society of Victoria*, New Series, Vol. 68, p.114.

<https://archive.org/details/proceedingsroya68roya/page/n145/mode/2up>

*shape of Country and reflects the cultural understanding of the Bunurong as “salt-water People” and the Wurundjeri Woi-wurrung People as the “people of the Birrarung” (Yarra River).*²⁷

The boundary between Bunurong and Wurundjeri Countries passes through Lysterfield, Belgrave South, Menzies Creek and Emerald.²⁸ The two Bunurong clans with estates in the granite country were the Ngaruk willam balluk, ‘Rock country people’, and the Yallock willam balluk, ‘River country people’, referring to the Bass River.²⁹

Places to visit

- **Formations on the Granite Track, Lysterfield, M 83 G4, GPS -37.9329159, 145.3110823**
- **Elephant Rock, Beaconsfield-Emerald Road Emerald, M 211 F6, GPS -37.9796661, 145.4434373**
- **Split Rock, Split Rock Road, Beaconsfield Upper, M 211 D11, GPS -38.0017591,145.4334257**
- **Ship Rock, Ship Rock Picnic Ground, Gembrook-Launching Place Road, Hoddles Creek, M page 14 R 10, GPS -37.8842265, 145.5975512.**

²⁷ Knox City Council: <https://www.knox.vic.gov.au/whats-happening/news/new-traditional-owner-boundary-now-place>

²⁸ Interactive map of Country boundaries: achris.vic.gov.au/weave/wca.html

²⁹ *Ngaruk*: rocky; *yallock*: creek or river; *willam*: country, place or camp; *balluk*: people. Jim Poulter, ‘Wurundjeri, Woi wurrung, What’s in a name?’ *Warrandyte Diary*, 6/2/2023, <https://warrandytediary.com.au/wurundjeri-woi-wurrung-whats-in-a-name/>

The Evelyn Fault

The Evelyn Fault was named by Morris in 1914.³⁰ He describes the fault as passing about half a mile to the east of Evelyn (Mt Evelyn) township and continuing south to Olinda Creek. There it is displaced about 250 yards to the east, but resumes its original alignment further south.³¹

The fault then follows a deep and narrow gully, crosses a low watershed, and follows a broader valley that faces the upper part of the Olinda Creek catchment. Morris calls these valleys, combined, the Evelyn Fault Valley.³² Silvan is the southern limit of Morris's study area, but he notes that the fault appears to continue beyond Monbulk.

Another fault running through the Montrose hills, almost parallel to the Evelyn Fault, also extends southwards. This Montrose Fault may be continuous with the Selwyn Fault, which extends to the Mornington Peninsula. Morris posits a third fault, which he calls the Olinda Fault, intersecting with the Evelyn Fault and causing the eastwards displacement of the latter where the two meet at Olinda Creek. He argues that the block between the Montrose, Evelyn and Olinda Faults has tilted, rising at the Mornington Peninsula end and sinking in the northern Dandenongs.³³

Edwards agrees with Morris about the faulting and subsidence, though he prefers to call the features 'monoclines' rather than 'faults'. He describes the course of the Evelyn Fault:

*The Evelyn Fault of Morris (1914) can be traced from about half a mile north of the Evelyn State School, southwards across the Olinda Creek and the north-eastern spur of the Dandenong Ranges, to where it again intersects with the Olinda Creek.*³⁴

The Evelyn Fault is not shown on the Geological Survey map of 1981, but it appears with a query as 'Mt Evelyn Fault?' between Lyrebird Creek and Silvan Reservoir in a cross-section on the map sheet.³⁵ Whether the question mark is meant to query the path of the fault, or its name, or even its existence, is not specified.

³⁰ M. Morris 1914, p.331.

³¹ M. Morris 1914, p.358; map Plate XXXI.

³² M. Morris 1914, p.350, p.358.

³³ M. Morris 1914, pp.359-360.

³⁴ A.B. Edwards 1956, 'The Rhyolite-Dacite-Granodiorite Association of the Dandenong Ranges', *Proceedings of the Royal Society of Victoria*, New Series, Vol 68, p.142.

<https://archive.org/details/proceedingsroya68roya/page/n145/mode/2up>

³⁵ <http://earthresources.efirst.com.au/product.asp?pid=384&cid=33>. 'Ringwood' Geographical Survey of Victoria 1981. The 'Explanatory Notes on the Ringwood Geological Map' Department Minerals & Energy Geological Survey Report 1971, pp.7-12 cite both Morris and Edwards, but do not give a reason for excluding the Evelyn Fault from the map.

The Evelyn Fault (if we agree to call it a fault) is most easily seen near its northern end, as the almost-dry gully that runs along the rear of Mt Evelyn Primary School, intersects with Clegg Road and the Warburton Rail Trail, and continues close to the straight section of The Crescent. The creek, when it flows, is a tributary of the Little Stringybark.

Places to visit

- **Northern end of the Evelyn Fault Valley, rear of Mt Evelyn Primary School and crossing Clegg Road, M 120 1D, GPS -37.7895153, 145.3901005.**

Old Red Basalt

In the Oligocene Era, 33.9 to 23 million years ago, and more than 300 million years after the eruptions that formed the Dandenongs, another round of volcanic activity occurred in Victoria. The volcanoes of this era are known, rather confusingly, as the Older Volcanics.

The main area of these eruptions around the Dandenongs is at Silvan, where the lava field extends about 5 km west to east, encroaching on the ancient caldera and taking in parts of Monbulk, Mt Evelyn and Wandin. Lewis Hill at Silvan is one likely source for the lava. Another is the hill on Monbulk Road, opposite the Wridgeway. There are in addition about twenty small isolated volcanic deposits as far north-east as Seville and as far south as Emerald and Mt Morton. Another patch is located north-west of the range, between Mooroolbark and Lilydale. There was a deposit of Older Volcanics columnar basalt at Narre Warren.³⁶

Monbulk Road Mt Evelyn cuts through a hilltop that might have been an Older Volcanics crater.



The lava produced by the Older Volcanics was mainly basalt. The most commonly occurring volcanic rock, basalt is often blue-black ('bluestone') but can be light grey, brown or red. The basalt around the Dandenongs is a bright orangey-red, and is the source of the fertile red soils of Wandin, McKillop/Mt Evelyn, Silvan, Monbulk and Mooroolbark.

The Older Volcanics may have shared some characteristics of the Newer Volcanics (from 6 million to 5,000 years ago).

Victoria and South Australia do host an active volcanic field, called the Newer Volcanics Province (NVP). This is not a single volcano with a large single chamber of molten rock (magma) — the common image of a volcano — but a widespread field of multiple small volcanoes, each with a small volume of magma. ... NVP volcanoes are largely monogenetic — that is, each only erupts once or over a restricted period of time.³⁷

³⁶ The township of Emerald stands on an extinct volcano. The columnar basalt deposit at Narre Warren was destroyed in the 1960s, Casey-Cardinia Links to Our Past, 16/4/2019, <https://caseycardinalinkstoourpast.blogspot.com/2019/04/columnar-basalt-at-narre-warren-north.html>

³⁷ H. Handley, J. von Otterloo & R. Cas, 'There's a volcanic system slumbering beneath Melbourne', SBS News, <https://www.sbs.com.au/news/article/theres-a-volcanic-system-slumbering-beneath-melbourne/y8acc9rgc>

The Older Volcanics show up on the Geological Survey map as orange splodges, each with its hilltop. Probably each hill had its moment of glory as a volcano but, if they were like the Newer Volcanics, each would have erupted only once, or for a limited time. Under every splodge of basalt, a lost landscape of hills, gullies, forests and swamps lies buried.

*At Cave Hill it [the basalt] occupies an old river channel, whose sands lie between it and the limestone. Here it is limited by the quartzites, which evidently formed the eastern boundary of this channel.*³⁸

The lava blocked the old valley of Stringybark Creek, diverting its headwaters (see 'Was Olinda a Pirate?').

Columnar basalt deposit at Narre Warren North

Buried trees were found under the Older Volcanics

basalt in 1906 at Parson Jack's Gully, which joins Emerald Creek near Cavey Road Monbulk.

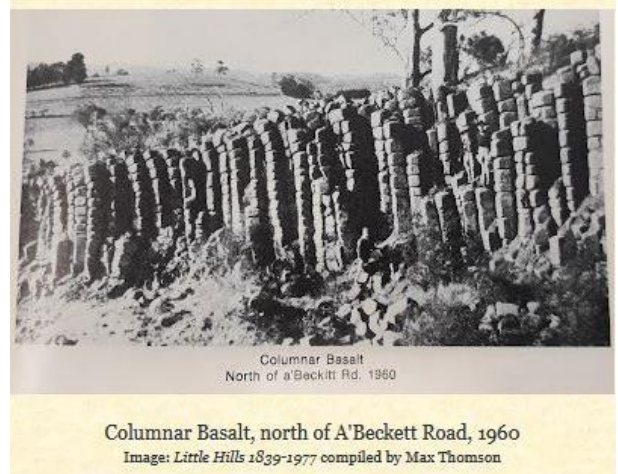
The geological character of the place is noteworthy. At a depth of 25 feet the wash lies upon a great [belt] of "blackleather" containing huge pine trees buried thousands of years ago.

*The "black leather", really metamorphosed timber and vegetation, is almost in the state of brown coal and burns when [dry]. The first 25 feet consists of the red [layer] of the older basalt lying upon 28 feet of [peat?] and the wash of an old stream bed.*³⁹

The 'blackleather' at Monbulk may date from around the same period as the brown coal deposits of the Latrobe Valley, which contain large logs of Kauri Pine *Agathis robusta*.⁴⁰

Places to visit

- Road cuttings on Maroondah Highway Lilydale/Mooroolbark, M 38 A6, GPS -37.7609891, 145.3324802
- Road cuttings on Monbulk Road Mt Evelyn, M 120 F6, GPS -37.8042575, 145.3993586. Both sites show the tuffaceous red basalt and the soil derived from it.



³⁸ M. Morris 1914, p.360.

³⁹ 'Monbulk', *Lilydale Express* 20/4/1906, p.2, <https://trove.nla.gov.au/newspaper/article/258346394>

⁴⁰ Museums Victoria Collections, <https://collections.museumsvictoria.com.au/articles/16933>

See also <https://www.mineland.vic.gov.au/news/how-brown-coal-formed-in-the-latrobe-valley/>

Was Olinda a Pirate?

There's something strange about the course of Olinda Creek, which winds round three sides of the mountain, though it has had to carve a deep gorge along the way. The main branch rises on a reserve below Monash Avenue Olinda, flows over impressive lava formations at the Upper and Lower Falls, and cascades down the gully. Below Hunter Road it enters the gorge.

Deputy Surveyor-General Clement Hodgkinson included this gorge in his 1855 map, though it was outside his immediate survey area. 'Glen containing copious Springs and luxuriant vegetation of Sassafras, Mountain Ash, Musk, Tree Ferns etc.' He noted that the Running Creek (as the Olinda was then called) was a perennial stream, deriving from springs in the tree fern ravines on the east side of the ranges, and discharging about 2000 gallons of water per minute in summer.

***The Lower Falls on Olinda Creek flow over lava formations.
Photo courtesy Bronwyn Hanna.***



East of the caldera rim is the source of the Stringybark Creek, which rises in the Silvan hills from a rather stunted catchment, and carries less water than its shorter tributary, the Little Stringybark.

When speaking of his theory that the Dandenongs have subsided along their northern edge, Morris writes:

Above the Evelyn Fault, the Olinda Creek valley is very young. It is marked by rapids and waterfalls, the latter having receded more than one mile above the fault. ... This rejuvenation of the stream has probably resulted in its capturing much of the headwaters of Stringy Bark Creek.⁴¹

Edwards agrees with Morris on the existence of the Evelyn and Olinda faults and the subsidence of the northern Dandenongs. He gives a fuller explanation for the course of the creek.

Olinda Creek ... flows from south-east to north-west through the hills, but has its source and headwaters several miles to the south, on the eastern slopes of the Dandenong Ranges, and more or less on the line of Stringy Bark Creek. This upper part of Olinda Creek originated as the western lateral to the basalt flow extending southwards from Mt Evelyn township.

⁴¹ M. Morris 1914, p.360.

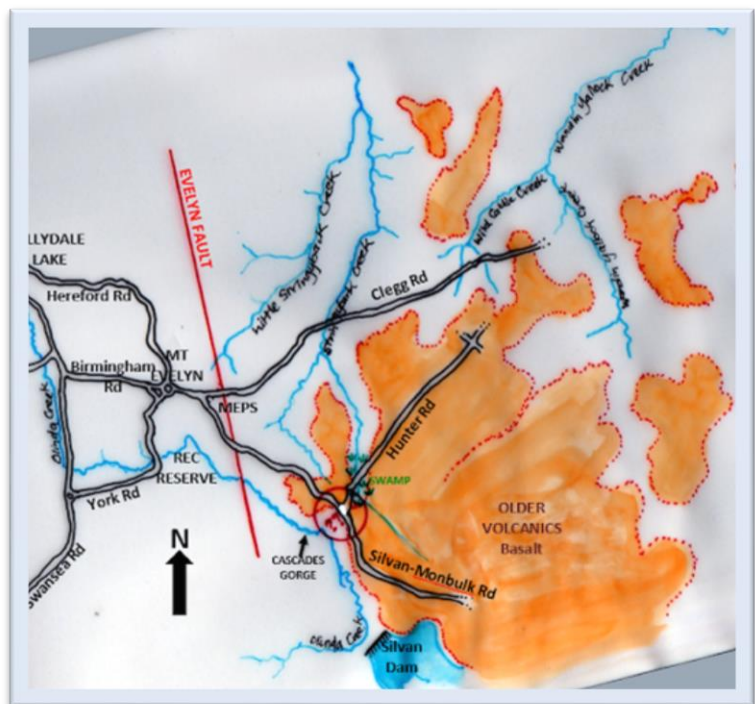
In pre-basaltic times its water flowed along the eastern side of the Lilydale Hills, as the pre-basaltic continuation of Stringy Bark Creek, but the basalt, in filling this section of the old valley, diverted the water across the hills, so that it linked up with Olinda Creek.⁴²

Edwards had written in an earlier paper,

It seems possible that this residual [of basalt near Silvan] represents ... a local “extensive” lava field, infilling the valleys of several streams which rose in the Dandenong ranges and trended eastwards or north-eastwards, and also covering the interfluves between them. Some of these streams, like Emerald Creek and Sassafras Creek, subsequently crossed and breached the basalt, and joined its eastern lateral, Woori Yallock Creek. Others, like Lyre Bird Creek and Olinda Creek [i.e. its headwaters, formerly of the Stringybark], were ponded into a lake behind the lava flows, and found an escape over a low divide south-east of Evelyn, being thus enabled to form a western lateral to the basalt as the present Olinda Creek.⁴³

The Olinda Creek valley. The creek capture zone was in the circled area. Originally the headwaters probably joined the Stringybark Creek at the Hunter Road swamp. Map by Paula Herlihy.

A ‘young’ or ‘rejuvenated’ creek flows swiftly, and rapidly erodes its bed. If the northern Dandenongs have subsided, as Morris argues, the tilting would have rejuvenated Olinda Creek by giving it a steeper slope. That could have enabled the creek to cut its gorge through the watershed and release the waters ‘ponded’ behind it.



The terms ‘creek capture’ and ‘creek piracy’ refer to a stream that erodes through into the course of another, and so diverts its waters. Morris implies that Olinda Creek cut through the watershed and captured the ‘ponded’ waters. Edwards seems to say that the waters banked up till they overflowed

⁴² A.B. Edwards 1956, ‘The Rhyolite-Dacite-Granodiorite Association of the Dandenong Ranges’, *Proceedings of the Royal Society of Victoria*, New Series, Vol. 68, p.113.

<https://archive.org/details/proceedingsroya68roya/page/n145/mode/2up>

⁴³ A.B. Edwards 1939, ‘The Physiography of the Woori Yallock Basin’, *Proceedings of the Royal Society of Victoria*, p.341, <https://www.biodiversitylibrary.org/page/55004110#page/348/mode/1up> Silvan Reservoir may recreate an ancient crater lake (or rather ‘caldera lake’).

into the Olinda. Was Olinda a 'pirate creek', or an innocent inheritor of the Stringybark's former headwaters?

Morris and Edwards do not use the term 'creek piracy', but they agree that Olinda Creek has 'captured' part of the Stringybark's original flow. The present course of the Olinda was determined by a combination of faulting, subsidence, erosion, and eruptions of Older Volcanics basalt. One way or another, Stringybark's loss was Olinda's gain.

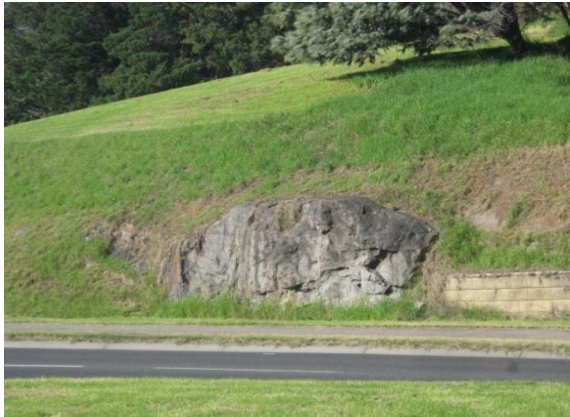
Places to visit

- **Olinda Creek can be followed from the Falls Picnic Ground on Falls Road Olinda M 66 K2 GPS -37.8341493, 145.3708034, via Falls Track – Cascade Track – Barbers Road – Olinda Creek Road – Olinda Creek Track, interweaving with Track 10, to Mt Evelyn Recreation Reserve, York Road Mt Evelyn, M 120 C3, GPS -37.7954661, 145.3822618. The walk includes the Upper and Lower Falls, the Upper Cascades, and the view down into the Olinda Creek gorge.**

Every Cutting Tells a Story

Every roadside and railway cutting is a gift to anyone with an interest in geology (except when engineers insist on concreting over the rock faces).

The impressive cuttings along the Mt Dandenong Tourist Road between Montrose and Kalorama tell the story of successive eruptions of the different types of rhyodacite.⁴⁴ Travelling up from Montrose,



the first of the cuttings displays the Mt Evelyn Rhyodacite. The second has Mt Evelyn overlaid with Kalorama Rhyodacite, and the third has Kalorama overlaid with Ferny Creek Rhyodacite.

Volcanic rock in the bank above the Hereford/Swansea Road roundabout.

The bluey-grey rock in the bank at the Hereford/Swansea Road roundabout looks like the cross-section of a tongue of lava. It seems to be a deposit of Coldstream Toscanite, which was ejected from the volcano in the first series of eruptions, and was later overlaid by Mt Evelyn Rhyodacite.⁴⁵

A dyke (the dark-coloured rock) in the Rail Trail cutting at Hereford Road.

Dykes are intrusions of magma through older rock strata. Morris maps two of these features in cuttings on the Warburton railway line (Rail Trail). One is in the cutting north of the Hereford Road tunnel, the other just south of Old Gippsland Road.

Morris refers to another dyke at Wandin, with a fourth further northeast on the same alignment. These last two belong to the same feature, the Wandin Dyke. This is the only one he distinguishes by name.



⁴⁴ A.H.M. Vandenberg, *Geological Survey Report, 1971/1 Explanatory Notes on the Ringwood 1: 63 360 Geological Map*, p.8.

⁴⁵ J. Lundy-Clarke 1976, *The Dandenong volcano*, Lilydale & District Historical Society, p.3.

The Wandin Dyke – This dyke lies about 1¼ miles due west of Wandin (Allot. 33a and 3) It outcrops sporadically for 1½ miles, and with an average width of about 45 to 50 feet. ... This is a granitic-looking rock, with numerous phenocrysts of feldspar and dark biotite, set in a fine ground mass.⁴⁶

Disappointingly, the Wandin Dyke could not be located on the ground or in cuttings; it is probably too overgrown to be visible.

Places to visit

- **Three cuttings on the Mt Dandenong Tourist Road, between 2 km and 3 km from Montrose, display the three layers of rhyodacite emitted by the volcano. Between M 52 G8 and M 120 B7.**
- **Toscanite in cutting at Swansea Road roundabout M 38 G6, GPS -37.7645854, 145.3596903**
- **Dyke in the Warburton Rail Trail/Hereford Road cutting M 38 K8, GPS -37.7674639, 145.3717525**
- **Can you find the Wandin Dyke? It should be located on the former alignment of Old Gippsland Road south of Victoria Road, between Comilio Drive and the Little Stringybark Creek, M 118 K8, approximately GPS -37.7678147, 145.4148748.**

⁴⁶ M. Morris 1914, p.350.

Gold, Gems, Mines and Quarries

The discovery of gold in 1851 brought prospectors to the Dandenongs. The main gold-mining areas were on tributaries of the Woori Yallock Creek.

The various mining camps were known collectively as the Emerald Diggings. ... Kidd's Bridge was the old centre of the Emerald goldfield and is believed to have been the site of the first gold find (1851) in the area. Kidd's Bridge is at the bottom of David Hill Road where it crosses the Woori Yallock Creek and meets Emerald-Monbulk Road. Kidd's property was where the store was in the Emerald Diggings. The miners' huts were mainly concentrated around Kidd's Bridge on the Sassafras Creek, with some along the Emerald Creek.⁴⁷

Surveyor Clement Hodgkinson visited the diggings in 1859 and found about 200 miners at work.

These gold workings are situated on one of the fine permanent streams ... which combine to form the western branch of the Woori Yallock River. ... Near the junction of the auriferous creek with another larger creek, four temporary stores have been constructed of calico, and the main encampment of the miners formed.

The stream of the auriferous creek above the junction just alluded to has been diverted from its bed for a considerable distance, and used for sluicing the quartzose gravel and soft blue shale dug out from the claims in the bed of the creek. These claims, for a short distance on up the creek, appear to be highly remunerative

Ordinary sinking beyond the bed of the creek has been tried in a few instances without success. Several rumours were, however, current of favourable prospects at other sites, and also of parties working secretly with satisfactory results, in secluded ravines not known to the miners generally.⁴⁸

A newspaper report from 1895 mentions mining on Monbulk Creek, about three miles from Ferntree Gully railway station.⁴⁹ There is some evidence for gold mining in the Olinda Creek Valley, in particular a tunnel near Olinda Creek Road Kalorama. Mining expert Agnes Stagg identified it as a probable gold mine that might have been dug by Chinese miners in the 19th century.⁵⁰ There was

⁴⁷ Jill A'Vard, email. For the naming of Emerald Creek and Emerald township, see Dorothy Williams 25/20/2019, 'The Skull in the Mountain Stream', <https://www.dorothywilliams.com.au/the-skull-in-the-mountain-stream/> The creek names can be confusing. Emerald Creek does not flow through Emerald and Monbulk Creek does not flow through Monbulk;

⁴⁸ Clement Hodgkinson, 'The Dandenong Gold Fields' (Report of a visit to the new gold workings beyond the Dandenong Ranges), *The Age*, 23/2/ 1859 <https://trove.nla.gov.au/newspaper/article/154839492> The 'auriferous creek' was Menzies Creek.

⁴⁹ 'Mining in the Dandenong Ranges', *Bendigo Advertiser*, 4 April 1895: <https://trove.nla.gov.au/newspaper/article/88951802>

⁵⁰ A. Stagg, 'Chinese Mine Near Olinda Creek', *Things Past* #105. The tunnel is not accessible to the public.

said to be a gold mine on the site of Silvan Reservoir in the 1920s. The mine was not profitable and ceased operation when the land was set aside for the reservoir.⁵¹

Inside the tunnel near Olinda Creek Road, looking back towards the entrance. Photo courtesy John Keane.



Periodic attempts were made to revive gold mining, especially during the depressions of the 1890s and 1930s. A promising lead was discovered in Parson Jack's Gully in 1906 and was found to continue west much further than expected.⁵²

Gold was not the only precious mineral sought in the Dandenongs. In the 1850s and 1860s, Victoria was regarded as potentially one of the world's premier gemstone regions. Birch calls the quest for gems one of the best-kept secrets of the mountain forests.

During the cooling of the eastern granite mass ... pockets of hot watery fluids had accumulated amidst the crystal mush. In the ultimately solid granite, these pockets became cavities lined by perfectly formed crystals of quartz and feldspar. Scattered among them were black tourmaline crystals, and even some colourless to pale blue topaz crystals. In places, there were veins of black crystals of tin oxide, or cassiterite. ... Erosion eventually removed the overlying rocks and exposed the crystal cavities to the weather.

About 20 million years ago, volcanoes began erupting in the region again ... giving rise to basalt lava. Some of the earliest eruptions released billowing clouds of crystal-laden ash. Among the crystals were small sapphires and zircons, which fell to earth to be quickly carried into nearby streams Sapphires, zircons and agate from the young volcanic rocks were added to colourless, smokey brown and amethystine quartz, topaz and tourmaline from the old granite.⁵³

Gemstone discoveries declined along with the decline in alluvial gold mining. The quest for gems lives on in the place name 'Gembrook', and has been revived in recent decades by lapidary enthusiasts.

⁵¹ Ray Tarr, personal communication to Paula Herlihy.

⁵² 'Monbulk', *Lilydale Express* 20/4/1906, p.2, <https://trove.nla.gov.au/newspaper/article/258346394> Parson Jack's Creek is located in the Cavey Road area. Mine shafts, cart wheel tracks and a water race have been found there and mapped.

⁵³ B. Birch 2001, 'Gems in the Forest', in Tom Griffiths, *Forests of Ash*, Cambridge University Press, p.74.

The rocks themselves are a valuable resource. The three main quarries in the Dandenongs are located at Coldstream, Montrose and Lysterfield. All three are quarried for aggregate (crushed stone). From 1879 David Mitchell quarried and burned great quantities of Cave Hill limestone to produce lime.

The Montrose Firebrick Company made bricks from red porous clay and white kaolin clay unique to its location on the corner of Montrose and Cambridge Roads.⁵⁴ The site is preserved as the Montrose Brickworks Flora Reserve. A few brickmaking relics remain, but the clay pit has been filled in.



Agate from the Woori Yallock catchment.

Most disused quarries are filled in for environmental and safety reasons. Ferntree Gully, on the other hand, tends to recycle its quarries. One is preserved as a lake at the Ferntree Gully Quarry Recreation Reserve.⁵⁵ The Aldi store on Burwood Highway/ Newton Street is located in another old quarry. A number of small quarries along the Tourist Road and in residential areas probably produced stone for roadmaking.

Places to visit

- **Sites of mining camps at Emerald Diggings/Butterfield Reserve M 125 E6, GPS -37.8941995, 145.440577 and A'Vard Reserve M 125 E12, GPS -37.9150414, 145.4373915.**
- **Walk between the reserves via the Menzies Creek Track. Historic track to the goldfields; alluvial gold workings and water race (the 'sluice' mentioned by Hodgkinson).⁵⁶**
- **Blacks Siding on Yarra Valley Rail Trail, historical signage re Blacks Quarry M 280 H11, GPS -37.736709, 145.3631292**
- **Ferntree Gully Quarry Recreation Reserve loop, Quarry Road Ferntree Gully, M 74 D5, GPS -37.8879213, 145.3009126**
- **Cave Hill Quarry, see under 'Older than the Hills'.**

⁵⁴ J. McLennan 1987, *Montrose, Settlement in the Foothills*, Shire of Lillydale, pp.71-74.

⁵⁵ <https://walkingmaps.com.au/walk/5114>

⁵⁶ See also 'Eastern Dandenong Ranges Walking Trails': <https://easterndandenongranges.com.au/walking-trails/>

Landslide!

Landslides usually occur when the ground is saturated by heavy rain, or are sometimes triggered by earth tremors. They are natural phenomena but can be aggravated by human activity such as land clearing, roadmaking and poor drainage.

The Dandenongs have always been prone to landslides, especially on the steep western face around Montrose. A 1993 study by the former Shire of Lillydale identified sites of twelve major landslides that had occurred in the previous 150 years, and many smaller ones. The great landslide of 1891 still stands out as a spectacular example.

A terrifying spectacle was witnessed at about 2 o'clock on Sunday afternoon by the people residing on one of the plateaus of the Dandenong Ranges, near South Mooroolbark, where a huge mass of earth and trees slipped from the face of the mountain and dropped several hundreds of yards down the slope. ...

The rain had been falling heavily all the previous day and night, and the loosened earth began to move about a quarter of a mile from the top of the mountain, and once started, it rushed downward with fearful force, rocks and trees crashing together as the avalanche roared down the slope. Giant trees were snapped and splintered by contact with rocks as large as houses. The area of the slip was about 50 acres, from which a ponderous mass was shifted bodily into the valley, where it came to a standstill.⁵⁷

Two people, William Jeeves and Mrs Herschell, were caught in the debris flow and were lucky to escape with their lives. The landslide was estimated at 30,000 cubic metres of debris, moving at a speed of 40 km per hour, and covered an area 1.4 km long.⁵⁸ It flowed north to Heathfield Creek, surged up the opposite side of the gully, sank back, and then followed the gully north-east as far as The Boulevard, where the debris can still be seen.

Lantern slide – Landslip, Dandenongs, Victoria, July 1891 [BA 1657]. Photographer A.J. Campbell, Museums Victoria, Public Domain. Creative Commons.⁵⁹

The scar from the 1891 landslide remained visible on the hillside for many years. The 1993 study describes the site as a scarp located about 350 metres west of the junction of Ridge Road and Falls Road, Mt Dandenong. Further landslides followed in 1904 and 1924.⁶⁰



⁵⁷ *The Age*, 14/7/1891, <https://trove.nla.gov.au/newspaper/article/190628791> 'South Mooroolbark' was an old name for Montrose.

⁵⁸ 'Development in Areas of Possible Slope Instability', Shire of Lillydale 1993, pp.43-45.

https://www.planning.vic.gov.au/_data/assets/pdf_file/0022/401755/mann-NPS1-Development-in-Areas-of-Possible-Slope-Instability-Resident-Information-Guide,-Shire-of-Lillydale,-November-1993.PDF

⁵⁹ <https://collections.museumsvictoria.com.au/items/791422>

⁶⁰ *The Reporter*, 27/4/1904; *The Age*, 16/10/1923.

In December 1934, after 13½ inches of rain were recorded in 30 hours, a ‘slow-motion’ landslide breached the aqueduct between Silvan and Mt Evelyn.

*The storm water caused several huge fissures to develop in the hillside, which eventually shifted on a face of about 150 yards wide, for a depth of 16 chains, completely blocking the foundation and causing the cement casing to collapse. ... The whole surface of the hillside appears to be sliding downward, carrying huge trees, fencing, and Mr Henderson’s raspberry patch intact towards the watercourse.*⁶¹

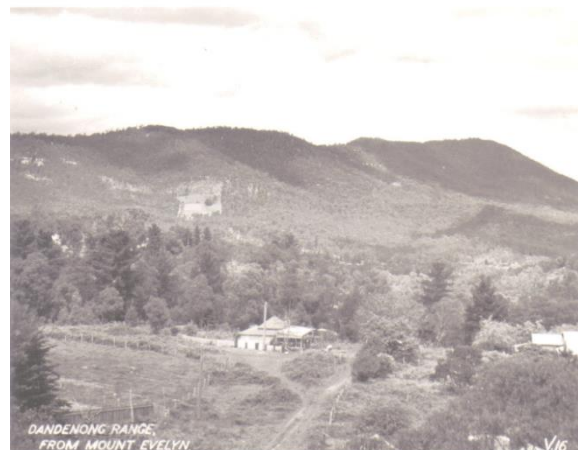


Workmen clearing the aqueduct after the 1934 landslide. Louise Hordern collection.

Another landslip occurred above the Tourist Road after the 1962 bushfires, blocking the road for several days. The parking area at the ‘Welcome to the Dandenong Ranges’ sign was made from the rubble that came down.⁶² The tourist road was

blocked again at Ferny Creek/Tremont in January 2024 by a landslide that followed heavy rain.

Mark of a landslip on the mountain side. View from former fire tower, Wray Crescent, Mt Evelyn. Rose Series Postcard, undated.



The Puffing Billy railway line has suffered several landslides. In 1953 a major landslide between Selby and Menzies Creek forced the closure of the line, which did not reopen till 1962.⁶³ The debris was never

fully cleared but the track was re-laid on a different alignment. The train now slows to a walking pace to squeeze round the tight curve in the Muddy Creek gully.

Places to visit

- **1891 Montrose landslide site, Mt Dandenong, on the mountain side below the Trig Track. Steep slope, no direct track access. M 52 G11 (approx.)**
- **The Puffing Billy landslide site can be seen from the train between Selby and Menzies Creek stations, M 124 D12, GPS -37.9162737, 145.3890769.**

⁶¹ Healesville & Yarra Glen Guardian, 15/12/1934.

⁶² John Keane, *Things Past* #127.

⁶³ Puffing Billy Railway, <https://puffingbilly.com.au/about/history-heritage/landslide2/>

The Mountains Speak

Finally, the Dandenongs may speak for themselves. They are said to groan, roar, call, growl, and bellow.

*The area of the Ngaruk was strange. Unusual sounds smote the air – uncanny calls. ... A growling sound had come faintly to him, then a far-away bellow. Tooroodun the Bunyip?*⁶⁴

A strange phenomenon was recorded in 1850 by the Reverend James Clow of Tirhatuan (Rowville). Settlers were puzzled by a roaring sound that continued for a night and part of the next day. Mrs Clow thought it came from underground. Two workmen mistook it for an approaching bushfire. There had been two earth tremors a few years earlier. At times a swathe of damage would be found along a narrow belt through the forest, as if produced by a tornado. Whether the noise originated with an earthquake, a localised strong wind, or some other cause, was never proved.⁶⁵

These vocalisations were not limited to the southern Dandenongs. A former resident of Olinda maintained that the Dandenongs ‘groaned’. She remembered hearing an unidentified noise like a train approaching from west of the mountain in the 1980s.⁶⁶

⁶⁴ M. McGivern 1972, p.89.

⁶⁵ From the late Ron Hateley, author of *The Victorian bush: its ‘original and natural’ condition*, 2010.

⁶⁶ Gil Bosaid, personal communication.

Glossary

Agate	A semi-precious quartz mineral.
Aggregate	Rock used in crushed form, e.g. gravel.
Alluvial	Related to silt etc., deposited by running water.
Auriferous	Gold-bearing.
Basalt	Fine-grained igneous rock formed from lava cooling rapidly on the surface.
Batholith	Mass of igneous rock formed from magma that intrudes into the earth's crust but does not reach the surface.
Biotite	A silicate mineral.
Blackleather	Buried ancient vegetation at a stage between peat and brown coal.
Caldera eruption.	Large hollow depression formed when a magma chamber is emptied by an explosive eruption.
Cassiterite	Crystals of tin oxide.
Crater	Depression left by a volcanic eruption.
Creek capture, creek piracy	One creek erodes through into the course of another at a higher level, diverting the flow into its own.
Dacite	A fine-grained volcanic rock.
Dyke	Slab of rock that forms in a fracture of existing rock.
Fault	A fracture in the earth's crust. Blocks may move vertically or horizontally along the fault. They may move suddenly in an earthquake, or 'creep' imperceptibly.
Feldspar	Aluminosilicate mineral.
Fossil	The remains or imprint of a living thing from an earlier geological age, preserved in rock.
Geological time scale	Geological time is divided into Eons, Eras, Periods, Epochs and Ages. They are identified by their geological and fossil record, not by equal time periods. ⁶⁷
Granite	An igneous rock formed from the crystallisation of magma below the surface. The grains are large enough to be seen with the naked eye.
Granodiorite	An intrusive igneous rock similar to granite.
Hornfels	A fine-grained metamorphic rock subjected to contact metamorphism at a shallow depth by heat conducted from a nearby magma chamber or lava flow. ⁶⁸
Igneous rock	Rock formed either by emission from a volcano or from magma below the surface.
Interfluve	Ridge between two watercourses in the same catchment.
Lava	Molten rock (magma) expelled onto the earth's surface in liquid form.
Lava dome	Mound formed from lava that is too viscous to flow away.
Lava blister, tumulus	Lava mound that forms like a bubble on the surface of a lava flow.

⁶⁷ Australian Museum, <https://australian.museum/learn/australia-over-time/evolving-landscape/the-geological-time-scale/>

⁶⁸ Geology.com, <https://geology.com/rocks/hornfels.shtml>

Limestone	A sedimentary rock formed from the remains of living organisms.
Magma	Extremely hot liquid rock beneath the earth's surface.
Monadnock countryside.	An isolated hill of bedrock standing conspicuously above the surrounding
Monocline	A geological fold, one limb of which dips steeply, the other more gently. A monocline is formed when a reverse fault thrusts sediments upwards without breaking them.
Mudstone	A sedimentary rock formed from clay or mud.
Newer Volcanics	Victorian volcanoes dating from 4.5 million to 5,000 years ago.
Older Volcanics	Victorian volcanoes from the Oligocene epoch, 33.9 to 23 million years ago. 'Older' is misleading; they are much younger than the Dandenongs volcano.
Phenocryst	A large and conspicuous crystal in an igneous rock.
Pyroclastic flow	Dense, fast-moving flow of volcanic ash and hot gases.
Quartz	(adj. quartzose) Crystalline mineral composed of silica.
Quartzite	Sandstone that has been converted into a solid quartz rock. ⁶⁹
Rhyodacite	A fine-grained, extrusive, igneous rock intermediate in composition between dacite and rhyolite, formed from rapid cooling of lava rich in silica.
Rhyolite	Igneous rock with a similar chemical composition to granite, usually occurring as lava flows.
Sedimentary rocks	Rocks formed from the accumulated wastage of earlier rocks.
Shale	A fine-grained sedimentary rock formed from compressed silt and clay.
Stony rises	Rocky hummocks formed from the collapsed skin of lava sheets.
Tectonic plates	Slabs of the earth's crust and upper mantle that move slowly around in relation to each other.
Toscanite	An older, little-used term for Rhyodacite, applied initially to Rhyodacite from Tuscany, Italy.
Tuff (pronounced 'toof', adj. tuffaceous)	Rock formed from compacted volcanic fragments.
Tumulus	see Lava blister.
Zircon	A zirconium silicate mineral that can be of gem quality.

⁶⁹ Encyclopedia Britannica online.

Heritage Listed Landscapes

National Trust

Upper Yarra Valley & Dandenong Ranges

Dandenong Ranges

Main Ridge, Dandenong Ranges

Western Slope, Dandenong Ranges

Northern Slopes, Dandenong Ranges

Eastern Streams Region

Emerald Creek

Menzies Creek Valley

Cotswold Valley, Sherbrooke

Sassafras, Perrins & Ti-tree Creeks

The Patch

Silvan Olinda Forest Landscape

Nathania Springs, Monbulk. Natural springs, considered by Aboriginal people to have healing properties.

Puffing Billy Railway Reserve and Environs

Victorian Heritage Register

Cave Hill Limestone Quarry, Lilydale

Yarra Ranges Council

Menzies Creek Gold Diggings and A'Vard Reserve, Emerald

Butterfield Reserve, Emerald Diggings Picnic Ground, Emerald

Sherbrooke Forest

One Tree Hill and Thousand Steps, Tremont

Mt Morton Reserve, Belgrave South

Birdsland Reserve, Lysterfield

Brickworks Reserve, Montrose

Quinn Reserve, Mt Evelyn.⁷⁰

⁷⁰ Victorian Heritage Database, <https://vhd.heritagecouncil.vic.gov.au/>