

Cape Bridgewater

SW Victoria.

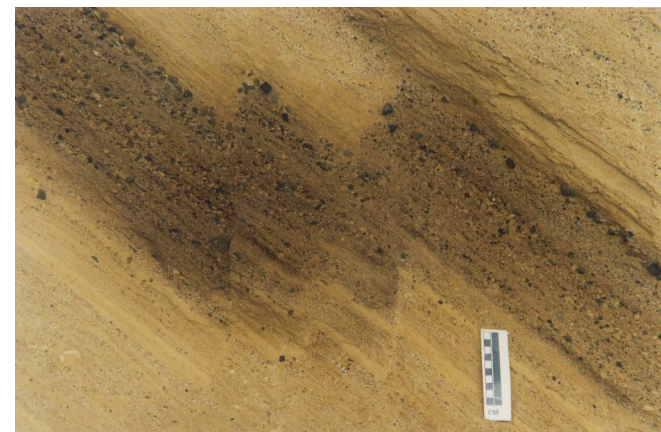
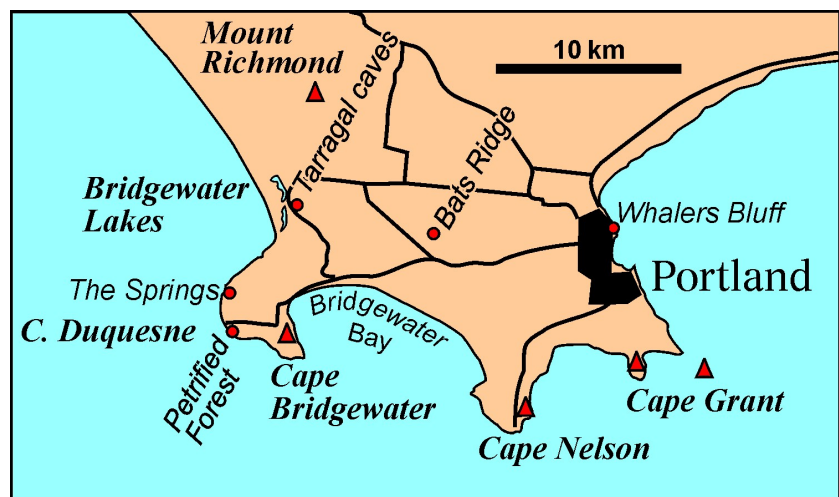
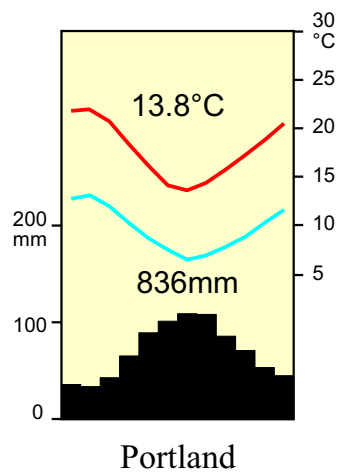
Syngentic Karst, with volcanic, coastal and other scenic values

Ken G. Grimes, 2-2009 v 1.4

Summary: The Cape Bridgewater area is a diverse and scenic area of syngentic karst and some pseudokarst (sea caves), with additional non-karst significance from volcanic rocks and landforms, coastal landforms and a seal colony.

Location: Southwest Victoria, 20 km west of Portland. I use the term in the broad sense, for an area of about 16 sq km, including the whole peninsula from the Bridgewater Lakes in the NW to Bridgewater Bay in the SE. A narrow strip along the coast is Coastal Park, the remainder is private land: farming or coastal residential subdivisions.

Climate: The climate is "Mediterranean" and windy, with an annual rainfall of 836mm. Monthly mean maximum and minimum temperatures and rainfall are shown for Portland, 20 km to the East.



← Faulted, steep-dipping volcanic tuff.



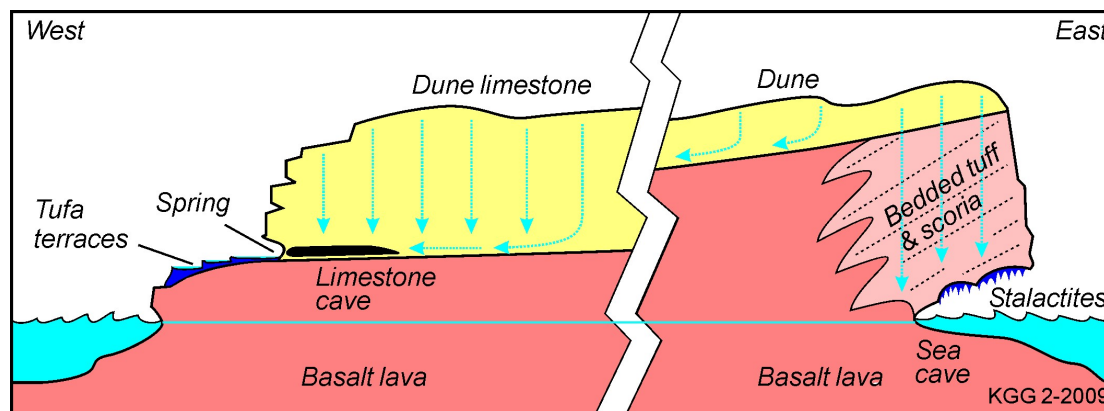
↓ Sea cliffs expose dipping tuff and scoria of the Bridgewater volcano.



↑ View to SE from the Tarragal Caves. The scarp on the left side was the old cliffed Pleistocene coastline. The lakes are younger – dammed by Holocene coastal dunes over the last few thousand years. Cape Duquesne is in the distance.



↑ The Tarragal Caves may be flank-margin caves truncated by an old sea cliff, or may be uplifted sea caves.



↑ Schematic sections of the west and east sides of the Cape. Showing geology and hydrology. Blue arrows are water flow.

Geology: Quaternary dune limestone (the Bridgewater Group) overlies a Pliocene basaltic volcano (lava, scoria and steep-dipping ash beds) which is exposed in cross-section by the cliffs of Cape Bridgewater. The contact with the overlying limestone slopes away from the summit of the volcano near Cape Bridgewater itself. Some geologists argue that Bridgewater Bay to the east is a flooded volcanic caldera. Good views of both the limestones and the volcanic rocks and their structures can be seen in the coastal cliffs. At Whalers Bluff, Portland, there is a Pliocene palaeokarst at the unconformity at the top of the Miocene Port Campbell Limestone.



↓ Possible gas vent (8m across) in lava flow.



↑ *The "Petrified Forest" is a field of solution pipes with cemented rims.*

Geomorphology: The dune limestone has a broad range of syngenetic karst features. There are excellent exposures (possibly the best in Australia) of solution pipes with cemented rims exposed in three dimensions at the "Petrified Forest". There are also good examples of rhizomorphs and paleosoils, one example of a seldom-seen shallow caprock cave (on private land), and one example of a (small) linear stream cave following the basal contact with the volcanics. This cave has unusual cave blisters. Coastal phytokarst (karren) occurs in the spray zone. Many small springs occur at the contact, with associated tufa terraces and cascades. The Tarragal Caves overlook the Bridgewater Lakes, which are coastal lagoons dammed behind the Holocene dune-ridges. They are either sea-caves, or flank-margin caves truncated by a tectonically raised late Pleistocene sea cliff and have good examples of entrance-zone, biogenic, speleothems. Some of the modern sea caves in the volcanic cliffs have calcite speleothems derived from the overlying limestone. Syngenetic caves also occur at Bats Ridge, to the east.

Hydrology: The springs and the small stream cave demonstrate the underground drainage – rain water seeps down through the porous dune limestone (dissolving vertical solution pipes as it goes) and then moves horizontally along the contact with the less permeable volcanics to emerge as springs at the base of the limestone cliffs where it precipitates its dissolved lime to form the tufa terraces. The small stream cave is a result of this lateral movement – it has an accessible abandoned level, and an inaccessible active level about 1 m below that. The speleothems in the sea caves also demonstrate the hydro-chemistry.

↓ *Partly overgrown stream channel in a tufa slope. Colours are from algal growth.*



↑ *A small stream cave just above the limestone/basalt contact.*



↑ *Cave blisters - formed behind a calcite crust by water seeping out of the porous dune limestone. 10 cm scale.*



↑ *Spring-fed tufa terraces and ponds at The Springs. Note also coastal karren.*

Further Readings:

There has been some controversy about the origin of the "Petrified Forest": Boutakoff (1963) argued that it was just that – a forest buried by advancing dunes, but others (e.g. Grimes, 2004a) argue that the features are solution pipes. Otherwise, Boutakoff's report is detailed and well-illustrated.

Boutakoff, N., 1963: The geology and geomorphology of the Portland area. *Geological Survey of Victoria, Memoir 22*. 117 pp.

Cas, R., Simpson, C., & Sato, H., 1993: Excursion guide, Newer Volcanics Province - Processes and products of phreatomagmatic activity. *Australian Geological Survey Organisation, Record 1993/64*.

Grimes, K.G., 2004a: Solution pipes or petrified forests: Drifting sands and drifting opinions! *The Victorian Naturalist*, **121(1)**: 14-22.

Grimes, K.G. (editor), 2004b: Field Guidebook to Karst and Volcanic Features of the Limestone Coast, southeast South Australia and western Victoria. *Limestone Coast 2004 (workshop of IGCP 448 - Global Karst Correlation) Regolith Mapping*, Hamilton. 42 pp