

4. Geology and landforms of the Grampians

Links to Section 2

This resource sheet can be used for Earth Science studies, as pre-visit information, and to help students investigate influences on the natural communities within the park.

Use a contour map to locate these landform features in Grampians National Park.

The Australian Heritage Commission has identified the entire Grampians National Park as being of high geological significance at the national level.

The Grampians sediments are thousands of metres in depth. They are often reddish in colour, and are mainly fine to coarse sandstones with some finer, more easily eroded mudstones and siltstones.

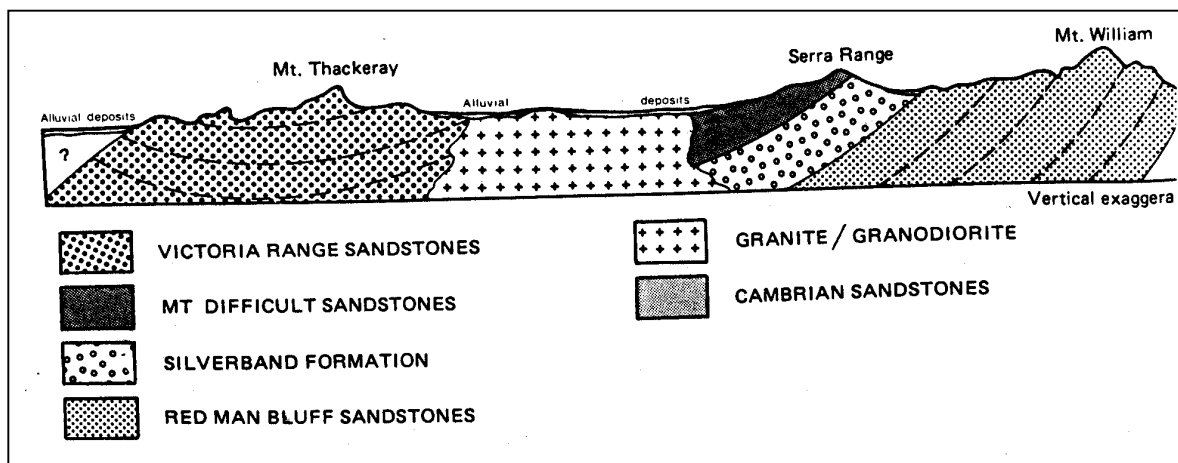
The sandstones of the Grampians fall into four main groups, as is shown in simplified diagram below.

Redman Bluff sandstones - the oldest deposit. These massive sandstone strata are quite resistant to erosion and so outcrop as a mountain range, forming the Mount William Range and the Mount Zero - Mount Stapylton area.

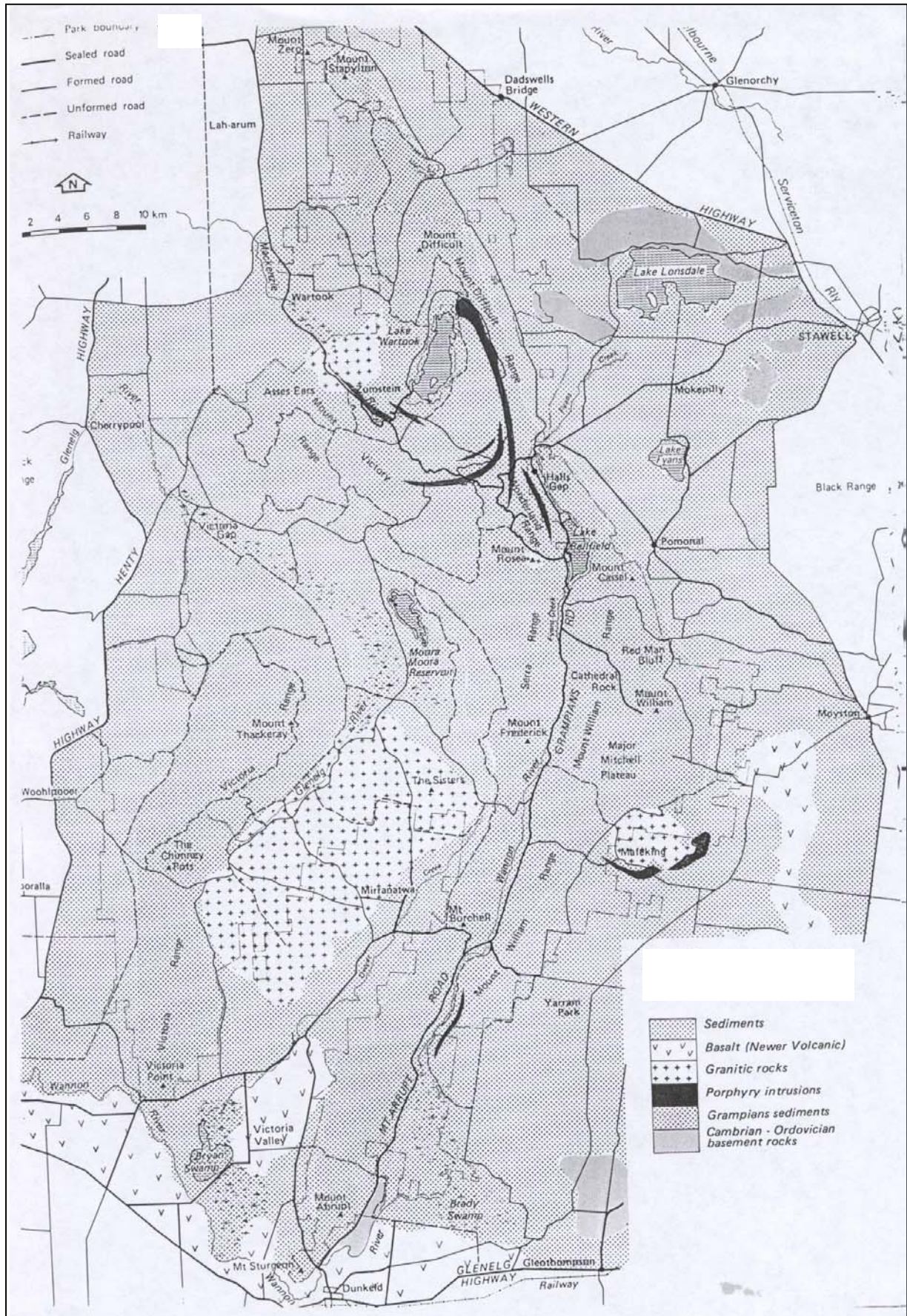
Silverband formation - a relatively thin, softer rock type which has been extensively eroded and now forms some valley floors and the lower slopes of the eastern Serra Range, western Mount Difficult and the Mount Victory Ranges. It is protected by a 'capping' of the more resistant Mount Difficult sandstones. Fyans Creek has carved its bed through this softer rock.

Mount Difficult sandstones - hard, coarse sandstones which form most of the Mount Difficult and Mount Victory Ranges and the western slopes and ridge of the Serra Range. The junction between this formation and the underlying Silverband formation can be seen as a sharp line along the Serra Range.

Victoria Range sandstones - the youngest deposit. This formation is often covered by eroded scree and sand. As its name suggests, this sandstone forms most of the Victoria Range.



Geological section through Mt William and Mt Thackeray



Geology of the Grampians

Landforms

As described earlier, the Grampians encompass a series of roughly north-south oriented parallel ranges of tilted sandstone. They rise abruptly from the plains to approximately 1,000 metres. The highest peak is Mount William at 1,168 m above sea level while the surrounding plains range from 200 - 300 metres above sea level.

Cuestas

The most common and dominant landform feature in the Park is the cuesta. The cuesta is a distinctive landform in which a long gentle upward slope ends in an abrupt escarpment. It develops in gently dipping sedimentary rocks where hard, resistant beds overly softer beds. These softer beds (often of mudstones, siltstones and fine grained quartzose sandstones) are more easily eroded, leaving the harder beds (often of coarser quartzose sandstones and quartzites) exposed.

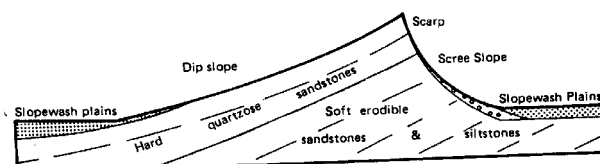
Cuestas are made up of:

Dip slopes, which approximately follow the slope of the resistant sandstone beds. These usually face west in the Grampians.

Escarpmnts are the most visual element of the Grampians as they are often almost vertical.

Scree slopes develop below the escarpments, and are composed of the material eroded from the escarpment. Most escarpments and scree slopes are on east-facing slopes in the Grampians.

Slopewash plains are extensive sheets of silica rich sands which form on both sides of each range as the sandstone erodes.



Cuesta landform

Alluvial plains

These are found in the Victoria Valley, the Wannon Valley (where the river leaves the Grampians), south of the Tea Tree Creek area, and as elongated strips along some valley floors. Areas of permanent swamp are found on this landform.

Granitic hills and plains

These are an extensive feature of the central Victoria Valley. They also occur at Mafeking, Zumstein and Stony Creek.

Sills and dykes

Igneous intrusions of porphyrites are a significant landform feature of the Grampians and many have led to waterfalls. The intrusions are in the form of sills (which intrude between the sandstone strata) and dykes (which intrude along fissures which occur across the sandstone strata).

It was a gold-bearing dyke associated with a quartz vein that was the original source of approximately 700 kilograms of alluvial gold extracted from Mafeking during the gold rush in the early 20th century.

Waterfalls have formed where streams cut across a porphyrite intrusion. In most cases the weathered porphyrite is easily eroded leaving the resistant metamorphosed sandstones as the drop of the waterfall.

Due to the deep weathering of the porphyrites they tend to be eroded and create a ledge along the cliff faces along which the intrusion is exposed. Many of these exposed ledges have been used for walking tracks. Deeply weathered porphyrites are pink, buff, yellow or red in colour whereas the unweathered rock is grey to greenish-black.

For more information

The Grampians – a noble range.
Jane Calder. Victorian National Parks Association. 1987.

4a. Viewing geological features near Halls Gap

Cuestas can easily be recognised in the Wonderland area and from the road up Mt William.

- The Pinnacle gives a panoramic view from the top of a **scarp**.
- From Sundial peak, the views include the **dip slope** on the western side of Mt William and the **scarp and scree** slope on the eastern side of Mt. Rosea.
- Excellent views of **cuesta formations** may be seen from Mt William.

All of these walks require reasonable fitness levels as there are steep and/or rocky sections.

Other geological features that can be seen are the system of rectangular cracks occurring in the sandstone. This **rectangular jointing pattern** occurred in the rock where huge pressure from overlying rocks was slowly released during erosion. This explains for example the 'stack of pancakes' appearance of rocks in Grand Canyon in the Wonderland area. Cracks and joints are the result of natural shrinkage and settling of the sediments, and also of the stresses caused by earth movements in rock layers that have already hardened. As the sandstone weathers, the debris from the erosion collects in crevices and the sandy particles continue to erode the surrounding rocks as they are subjected to sun, wind and water. Further weathering along these joints has led to many of the unusual formations that can be seen along the Wonderland trail.

A large **dyke**, marked by thick vegetation, forms a sloping ridge up the escarpment of Mt. Rosea. This can be seen from the walking track to Sundial Peak just below the summit.

A **sill** forms much of the track running between Relph and Mackey's Peaks. This sill can easily be seen on the Wonderland trail as a pinkish rock at the base of Bridal Veil Falls, just beyond the Cool Chamber.

The rock faces exposed during the construction of Bellfield Dam show a number of different **rock layers** which can be inspected for their relative hardness and resistance to erosion. Some show ripple marks; these were caused by gentle wave action when the rocks were formed and tell us that these sediments were originally laid down in shallow, slow-flowing water.

Evidence of earth movements can be seen at the Bellfield excavation where the strata has been tilted to near vertical, and in the Halls Gap/Boronia Peak area where earth movements have overturned the strata.

