

Geology, Rocks & Soils – Urban Wildlife Gardens – 21st February
Phillip Moran

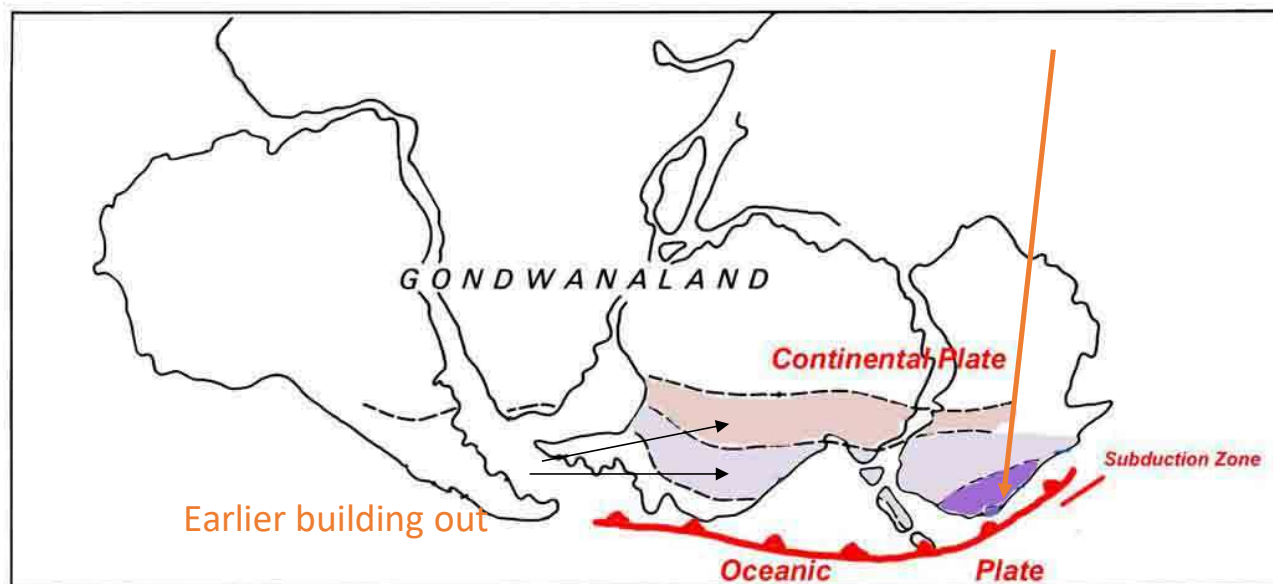


There are 7 major events that mould our current landforms...

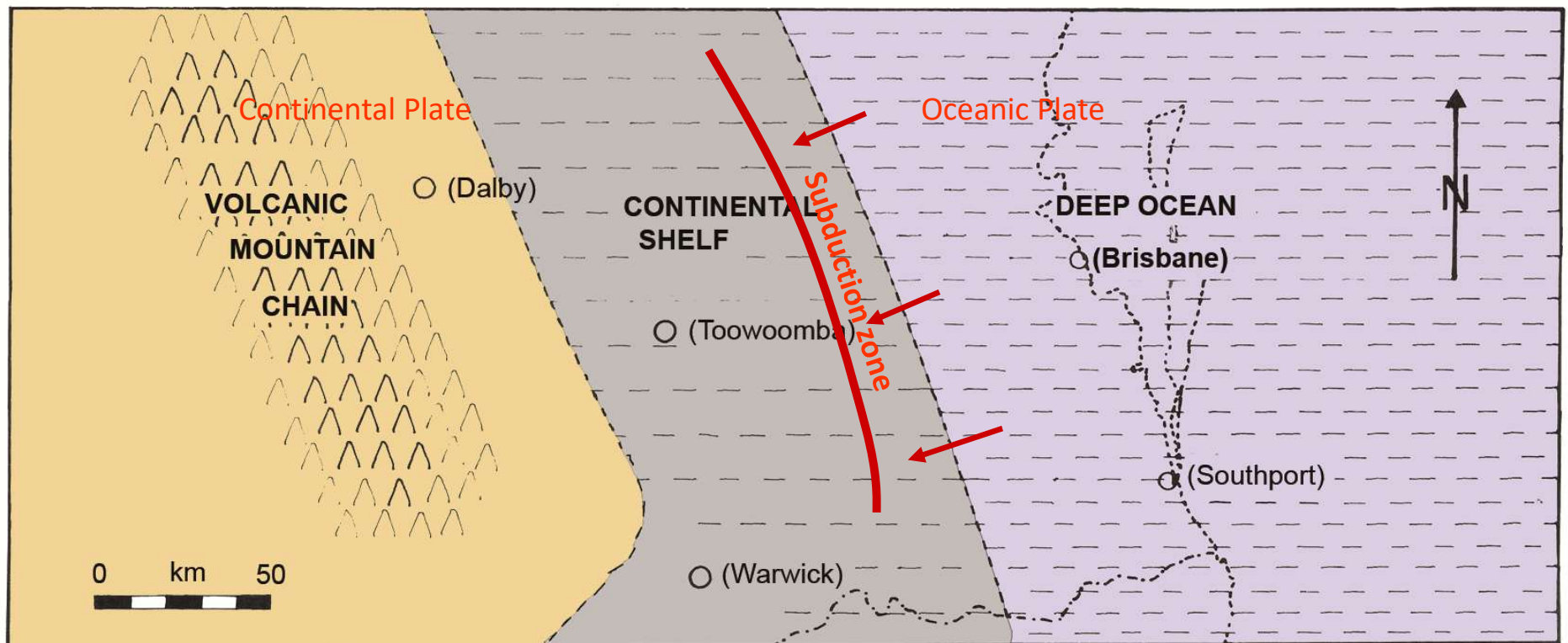
1. **Building out the edge of the ancient continent in two stages**
2. **Stretching and stabilising the edge**
3. **Gradual sagging of the edge and areas to the west**
4. **Later tension and intrusion of small bodies of granite**
5. **Later sagging of small basin**
6. **Eruption of a large basalt volcano**
7. **Erosion & accumulation of coastal sediments**

1a. Building out the edge of the ancient continent

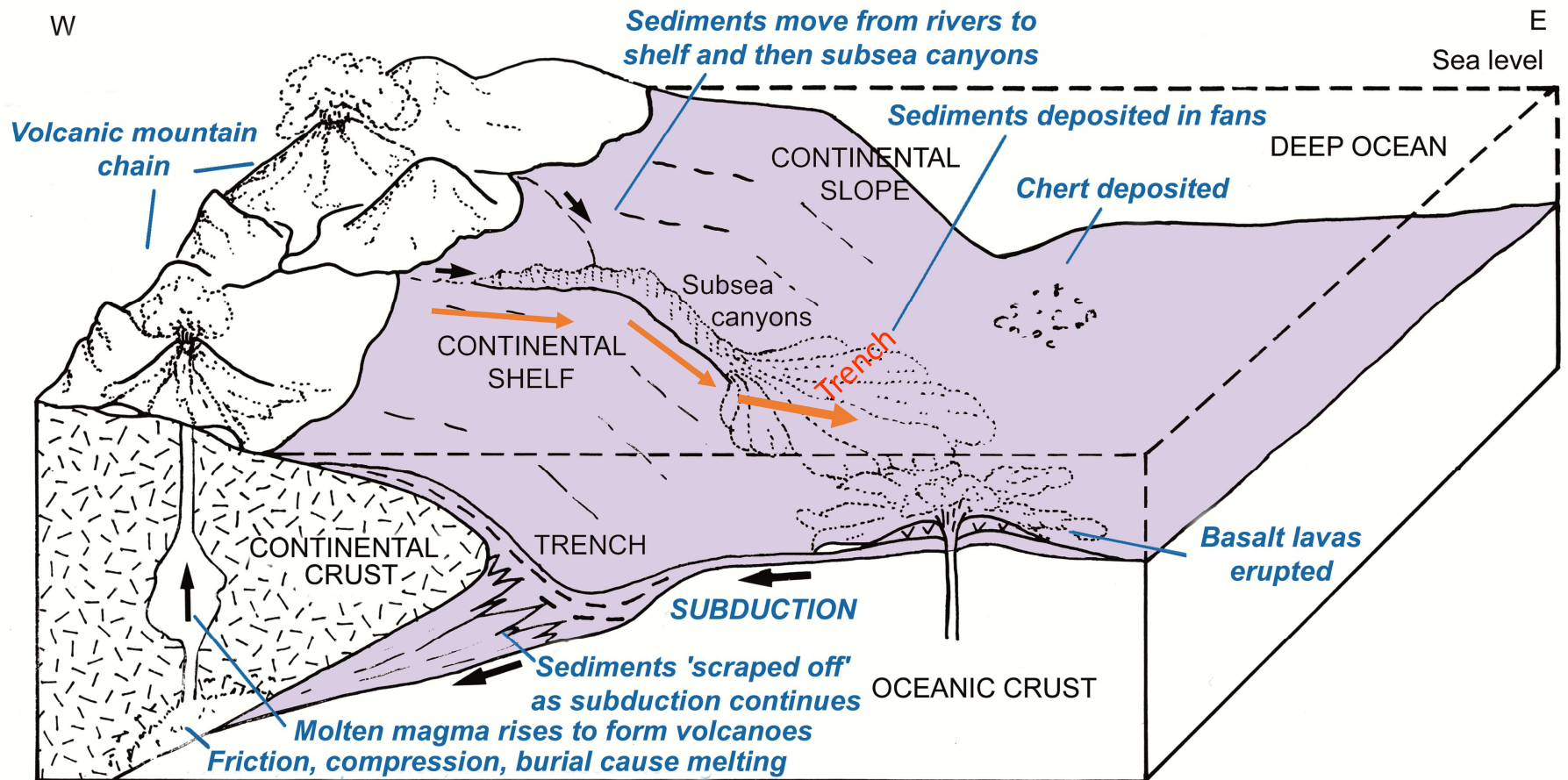
- 'Eastern' side of continent was previously much further west, when the geography was very different
- It has since been built out in a number of phases
- Around here the building out began about 375 – 325 million years ago, in the Devonian and Carboniferous periods



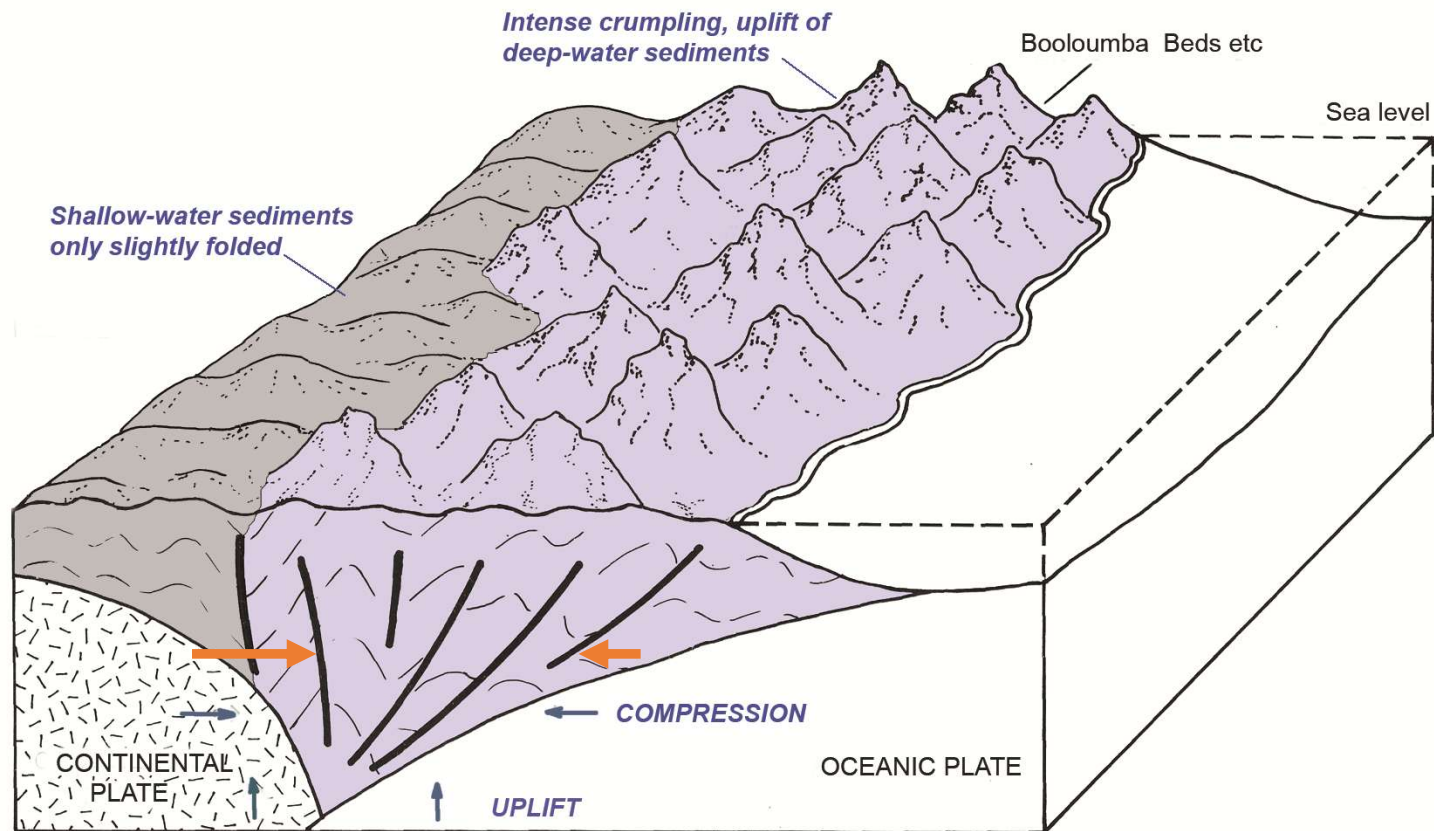
- 'Subduction' occurred at the junction of two crustal plates
- Resulted in a volcanic mountain chain, continental shelf and deep trench along the 'eastern' edge of the continent

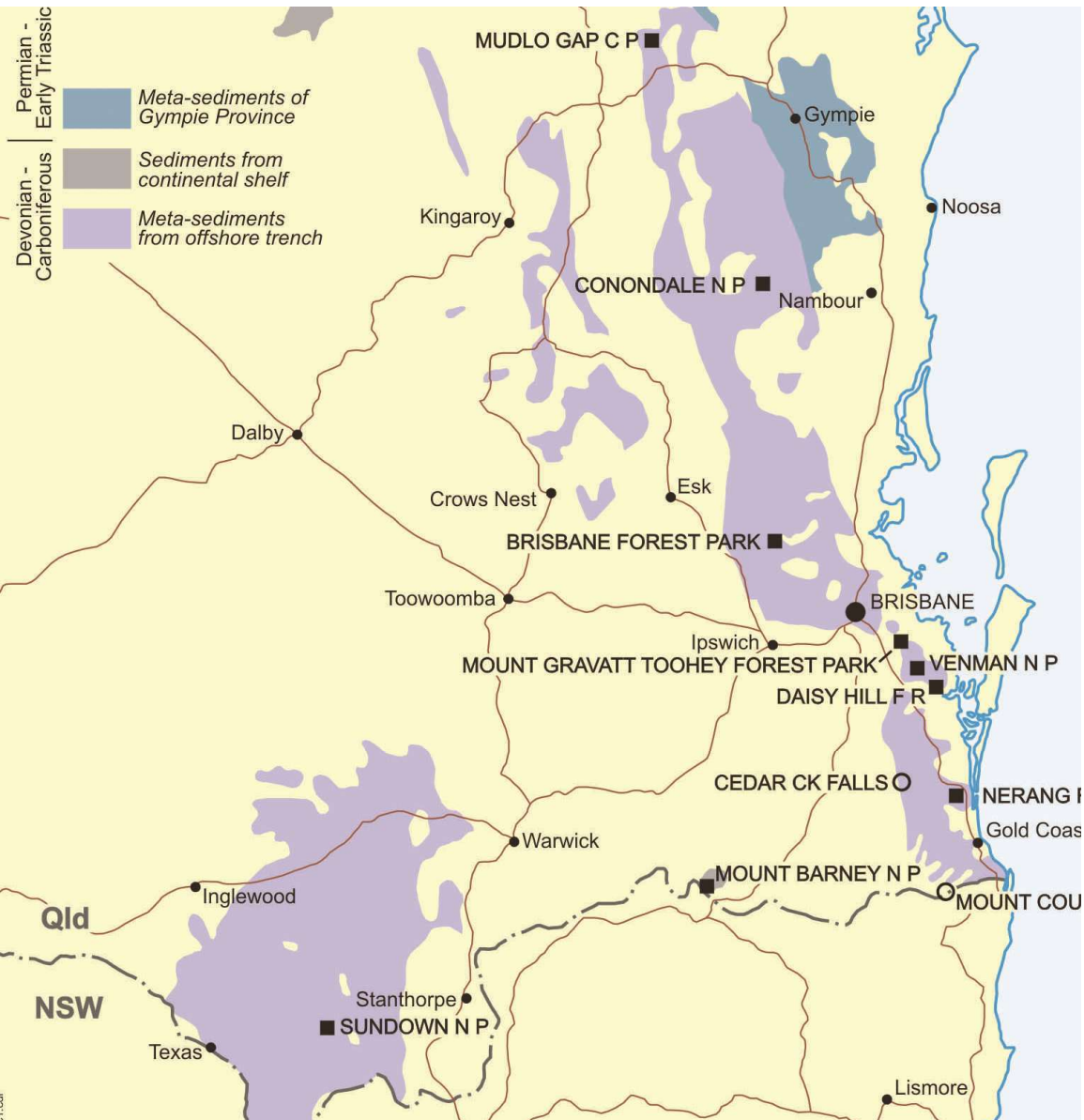


- Volcanic chain shed sediments onto continental shelf, from where some slumped down canyons into deep trench offshore



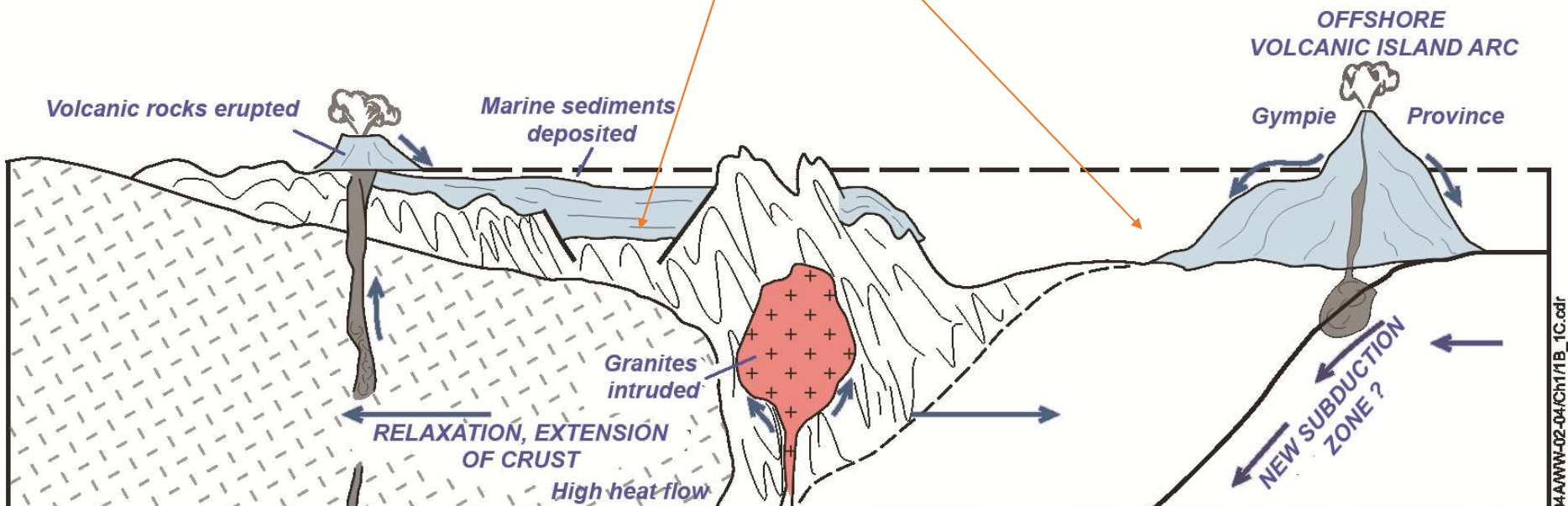
- About 310-300 million years ago, subduction ceased
- Sediments were compressed, deformed, hardened, stood on end, to form new mountainous terrain



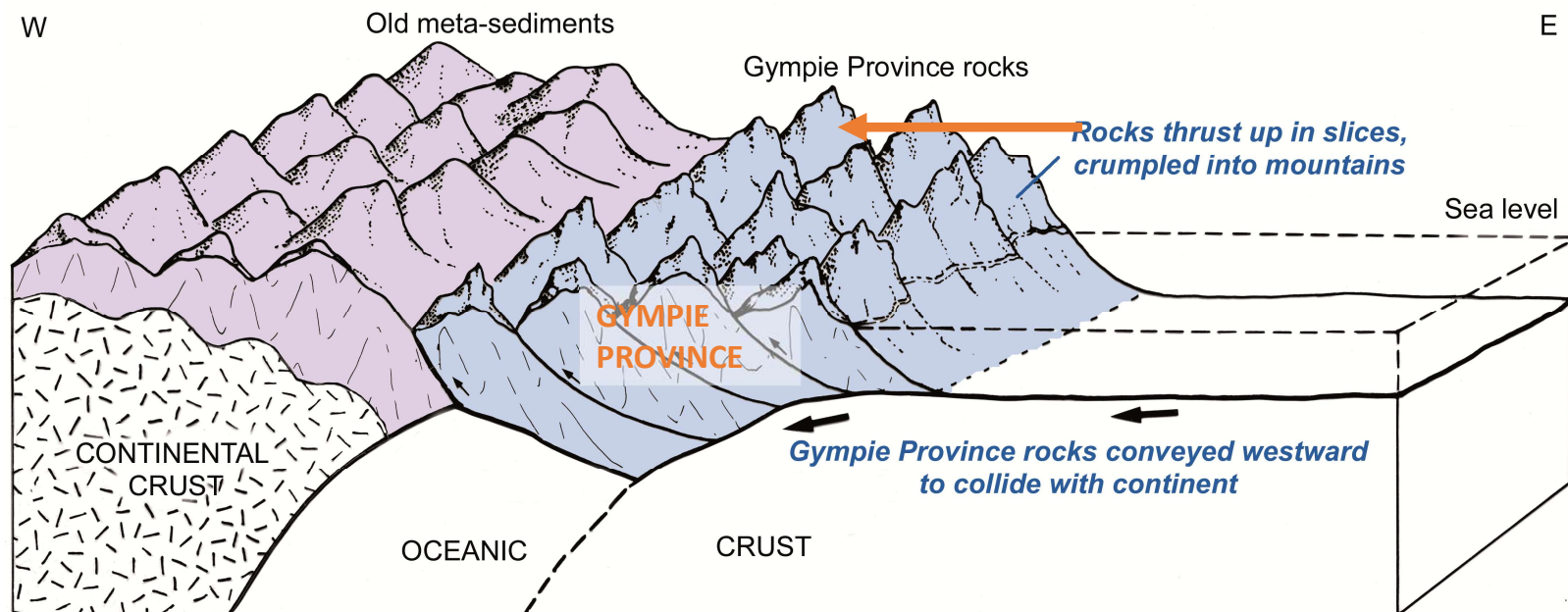


- Broader picture of the extent of the meta-sediments in SE Qld

1. Shallow seas spread across the eastern continent, and sediments were deposited and volcanic rocks erupted in small basins and rift valleys (285 to 265 million years ago in the Permian)
2. At the same time a new volcanic island arc formed offshore – the Gympie Province



1. Subsequent periodic compression (from renewed subduction?) compressed and hardened the new rocks (265 to 235 million years ago, Permian to Triassic), The new island arc of the Gympie Province moved westward to collide with the continent.
2. Between pulses of compression, parts of the crust melted to form more bodies of molten granite, which rose upwards, to slowly cool and solidify beneath the surface

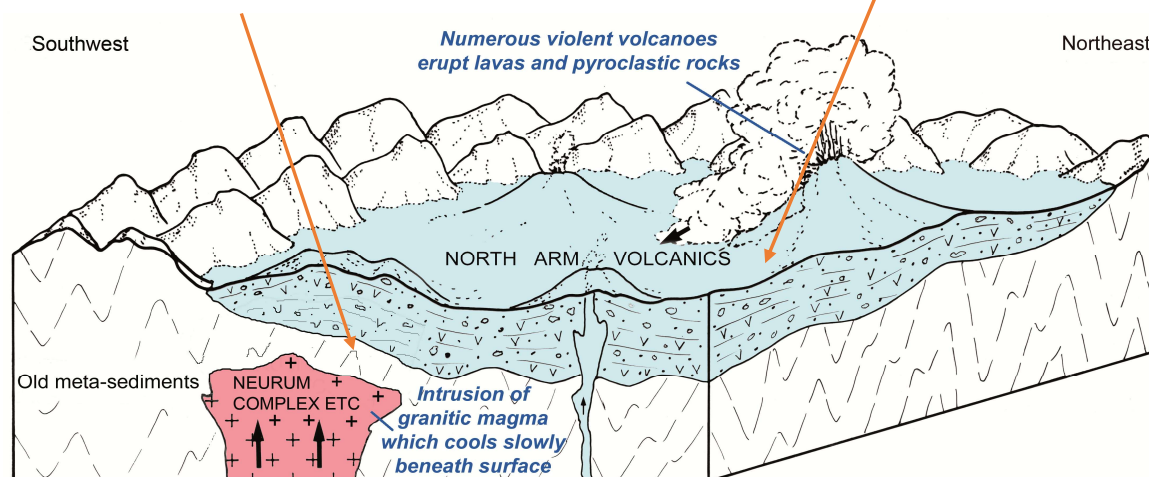


- Phyllite of Kin Kin Beds weathers to hilly terrain with shallow soils of moderate fertility
- In higher rainfall areas can give rise to dry rainforest (the Kin Kin Scrubs)



2. Stretching and stabilising the continental edge

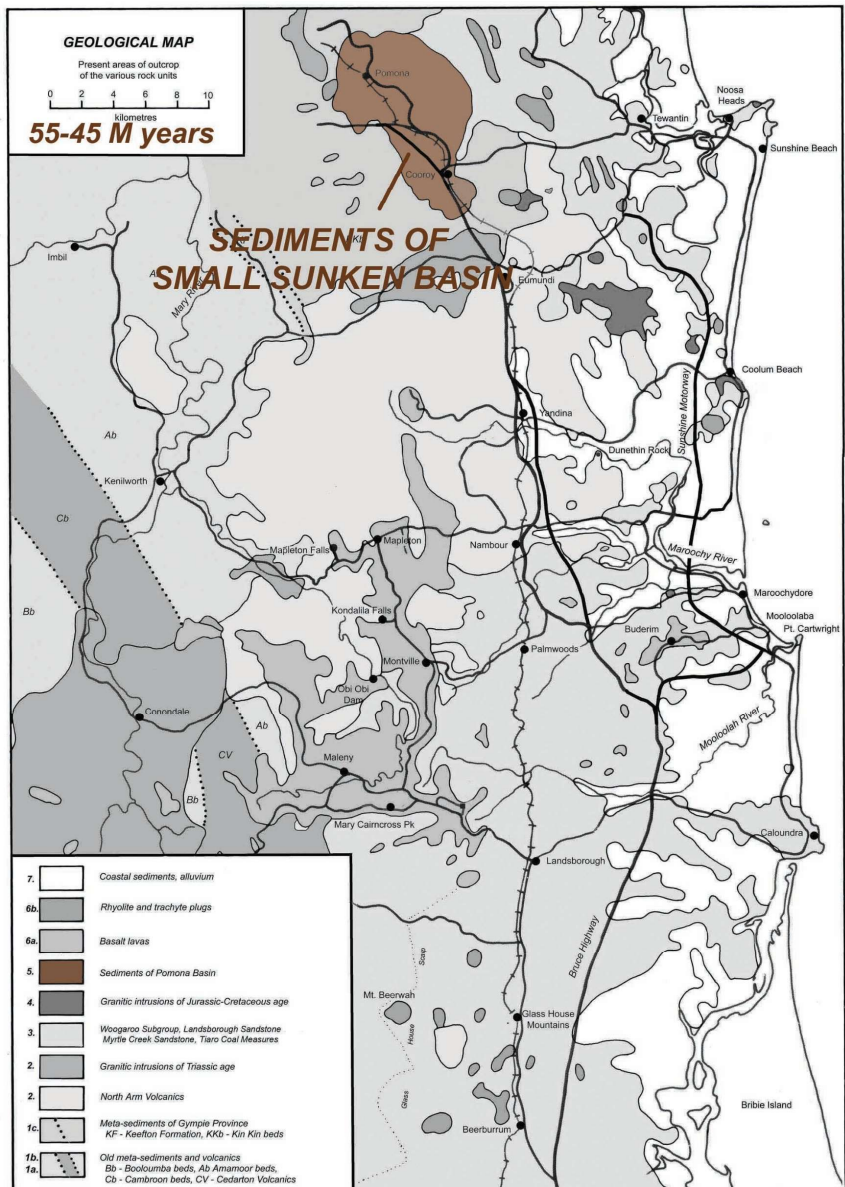
- In the Late Triassic, from 235 to 210 million years ago, the continental edge again relaxed and stretched.
- The reduced pressure but continuing heat at depth again caused volcanic rocks to be erupted. There were violent eruptions of rhyolite and andesite. Because of the tension in the crust, some great calderas collapsed.
- More granite bodies also rose up.



Jumping ahead a bit...

5. Later sagging of small basins

- About 55-45 million years ago in the early 'Tertiary' period, there was tension in the crust as the Coral Sea began to open up to the east.
- Several small basins subsided down the length of southern Queensland.
- Filled by silts and muds, which still remain relatively soft and unconsolidated.
- Some basalt lavas erupted in some basins.

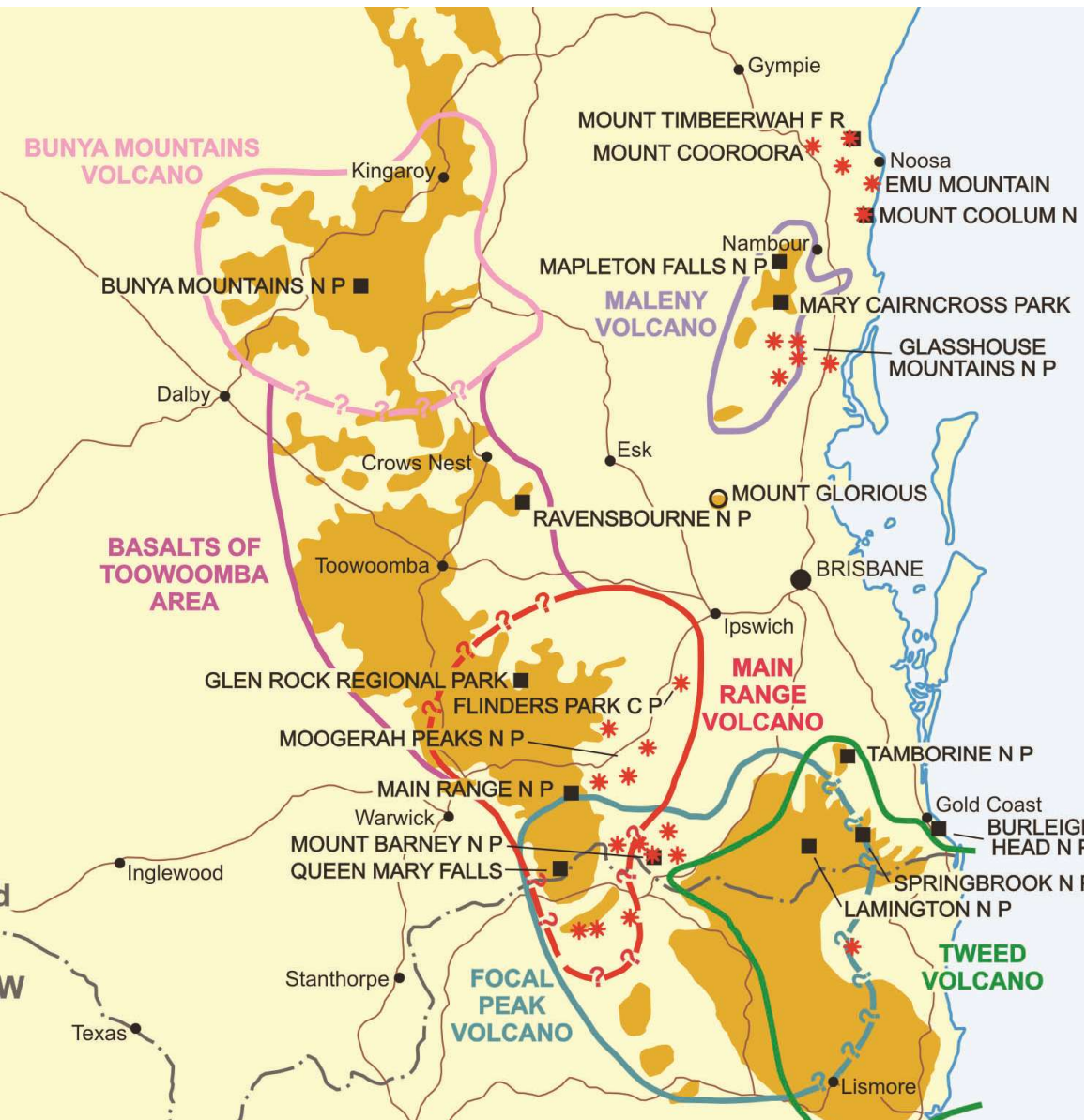


- Such sediments outcrop around Pomona
- Give low terrain with clayey soils of moderate fertility. Mainly cleared.

6. Eruption of large basalt volcano

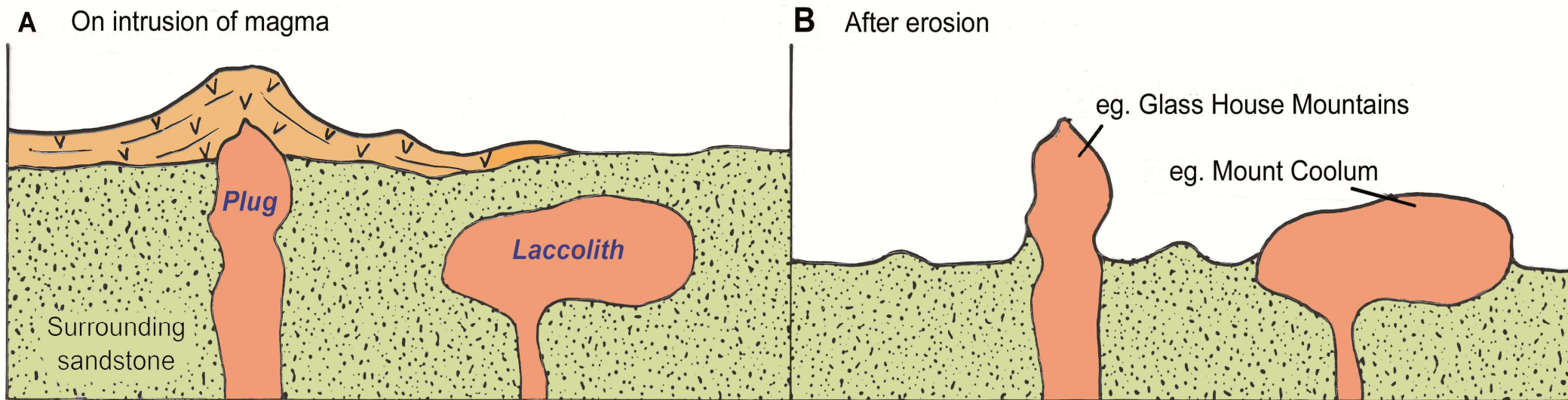
- Between 30 and 23 million years ago in the later Tertiary period, the SE Qld part of the Australian continent drifted over a **'hot-spot'** deep below the Earth's crust
- Basalt lavas were periodically generated and erupted in several successive, broad overlapping volcanoes
- The remnants of these cover a sizeable part of the region, where they still dominate the landscape

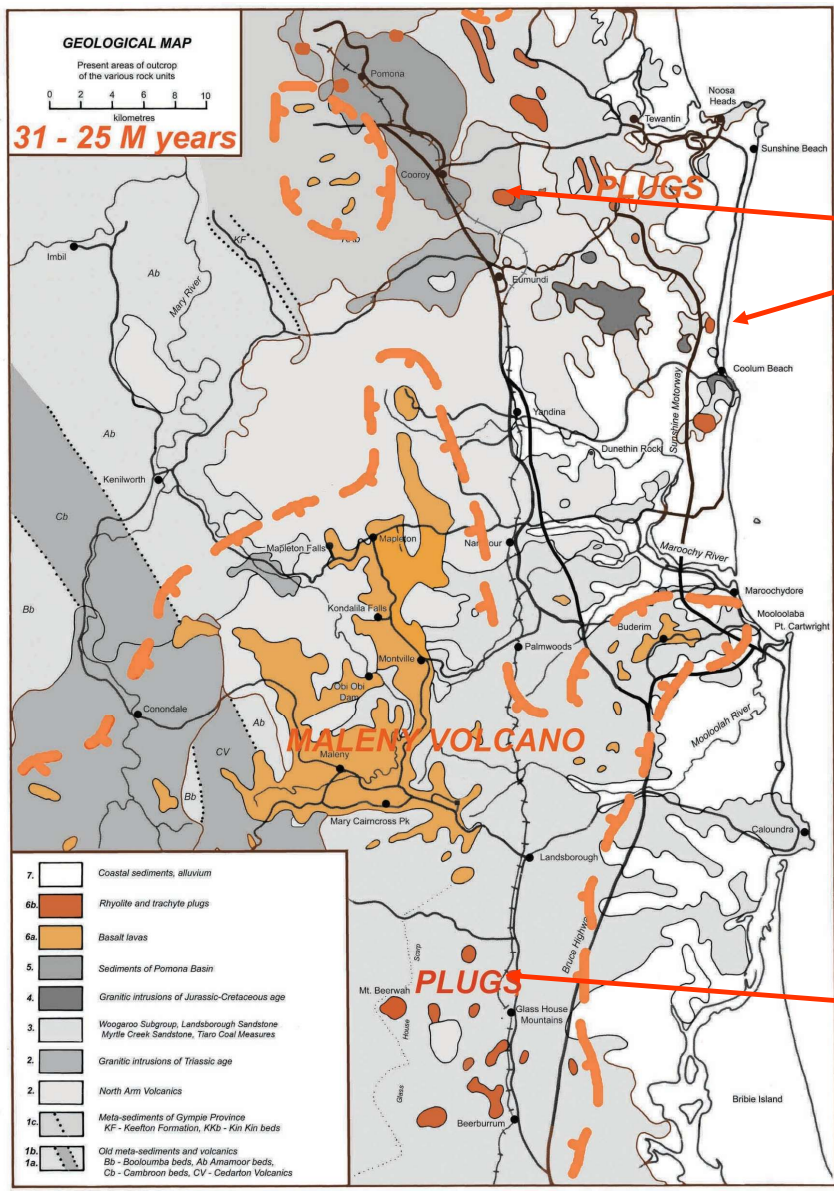
PM to explain 'hot spot' theory



Plugs

- Towards the end of the Maleny Volcano, about 26-25 M years ago, subsidiary vents on its sides were filled with plugs of rhyolite or trachyte magma.
- These are more resistant to erosion than surrounding basalts or older rocks, and after erosion remain as prominent peaks



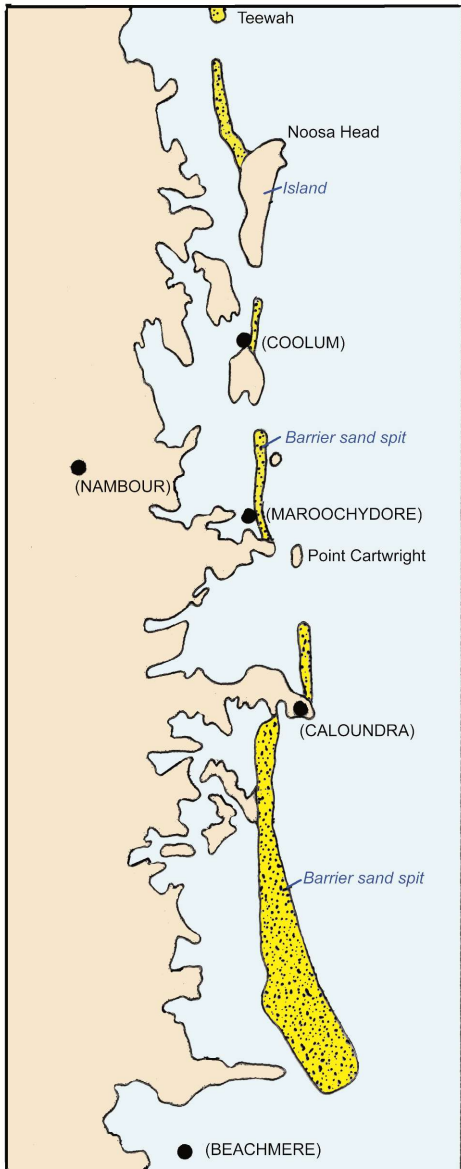


Plugs

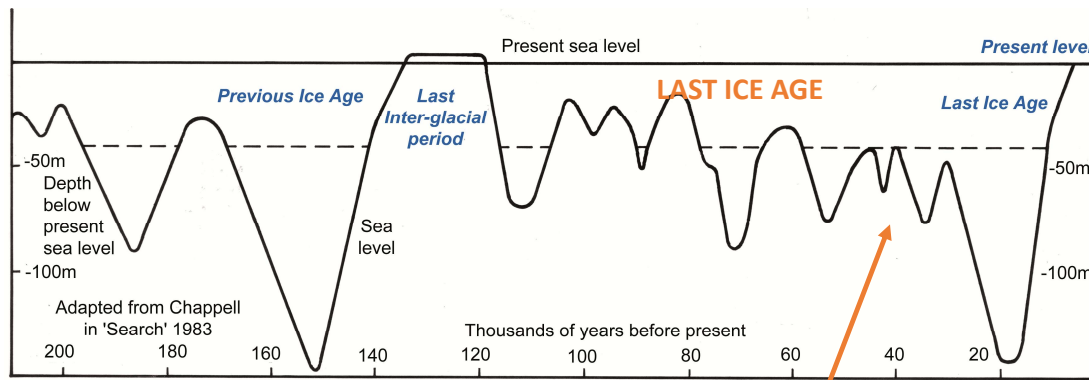
On the Sunshine Coast the Maleny Volcano erupted about 30 million years ago

covered the older rocks with a pile of basalt lavas

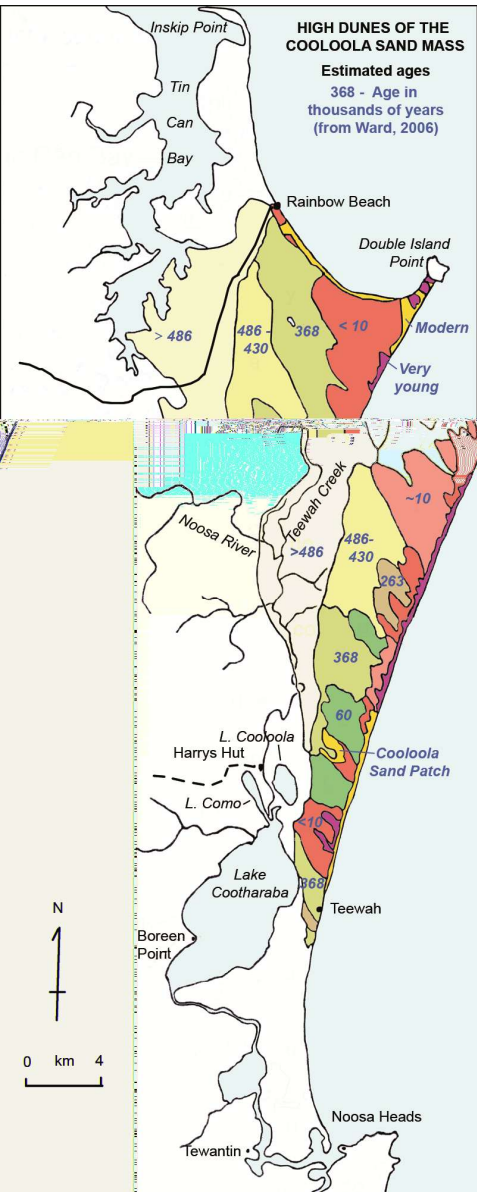
Three plugs of the Glass House Mtns



- Prior to the last Ice age, about 120 000 years ago, sea level was slightly higher, and the sea extended further inland.
- A series of broad bays was filled with fine quartz sand washed in from the ocean (in 'tidal deltas'), and by muds deposited in quieter back-waters
- Some sand ridges and dunes existed from previous high sea levels, and new sand spits built up



- During the last Ice Age (peak about 20 000 years ago), the sea level fell some 120 m, and the coastline was ~30 km off-shore
- When it rose again, it reached a little above the present level ~7000 years ago, and then fell to its present level by 6000 years ago
- It didn't fully cover the older coastal sediments (except in the Noosa lakes) and these sediments have remained exposed in the flat 'Wallum Country' behind the coast



- High dunes have been built up over several sea-level fluctuations
- Most build up thought to have occurred during dry windy times after an Ice Age when the sea was rising and rolling much sand landward from the continental shelf

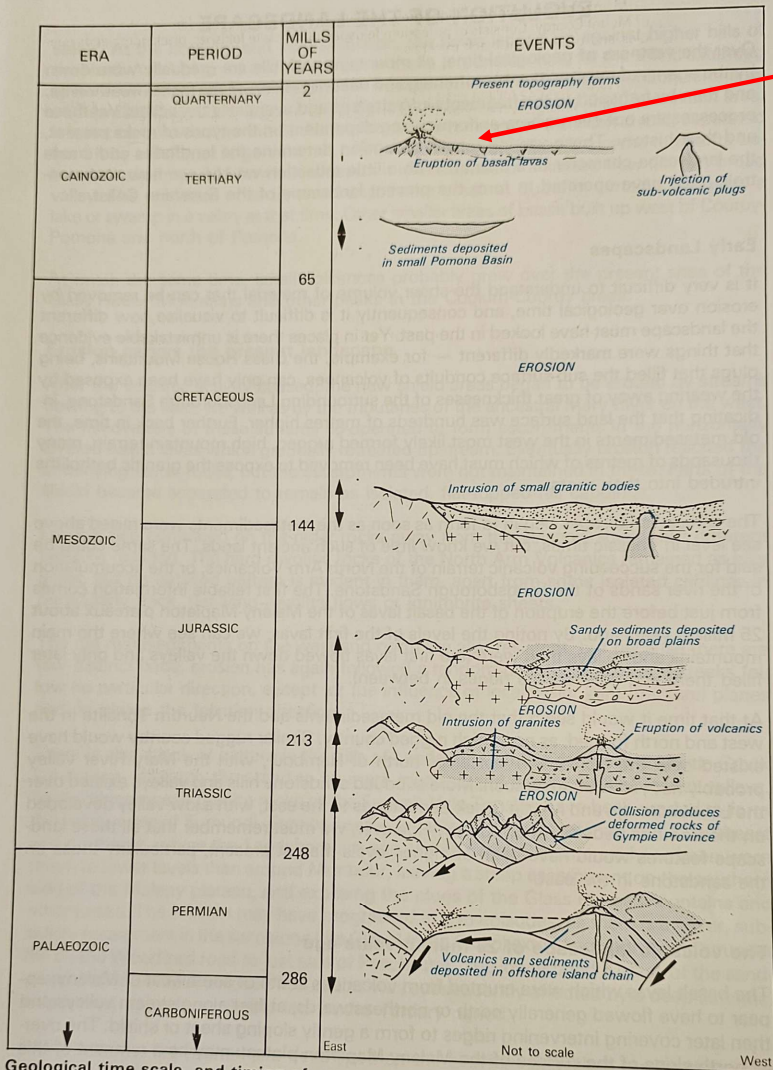




Now. The story continues...

- Very slowly, almost imperceptibly-
- But we now are all part of it

South from Mt Ninderry,
with settlement encroaching on
the coastal sediments in the
distance

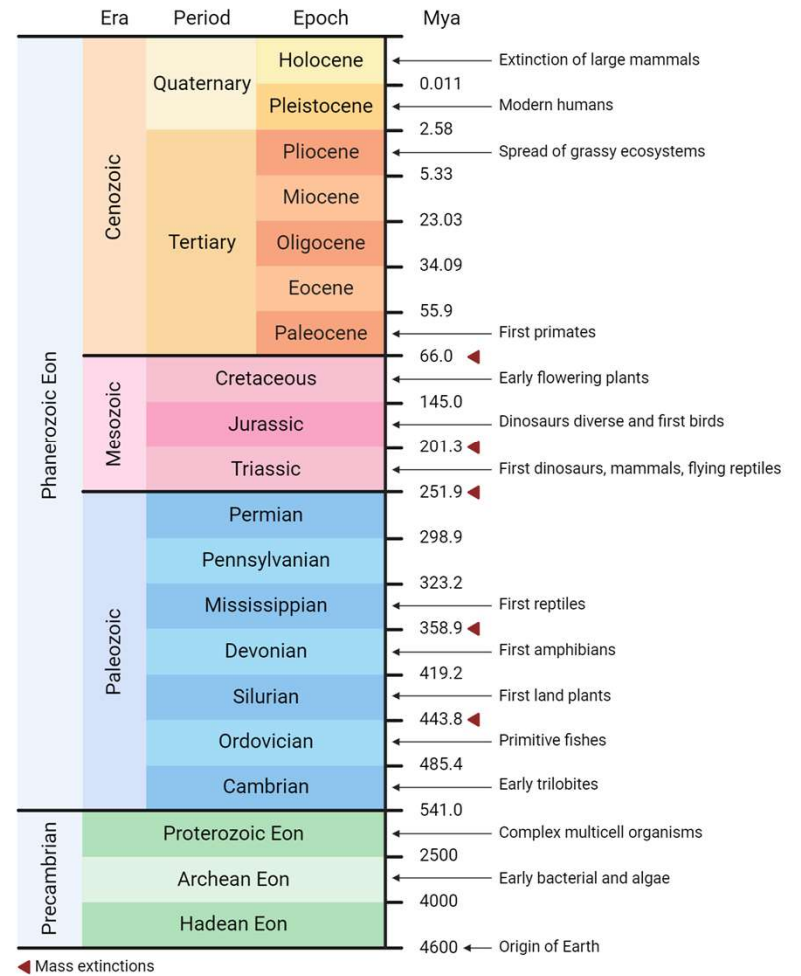


25 million years ago

Dinosaurs extinct 66 million years ago

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Geologic Time Scale



Geological time scale, and timing of events on the Sunshine Coast.

Mt. Cooroora

Kin Kin beds

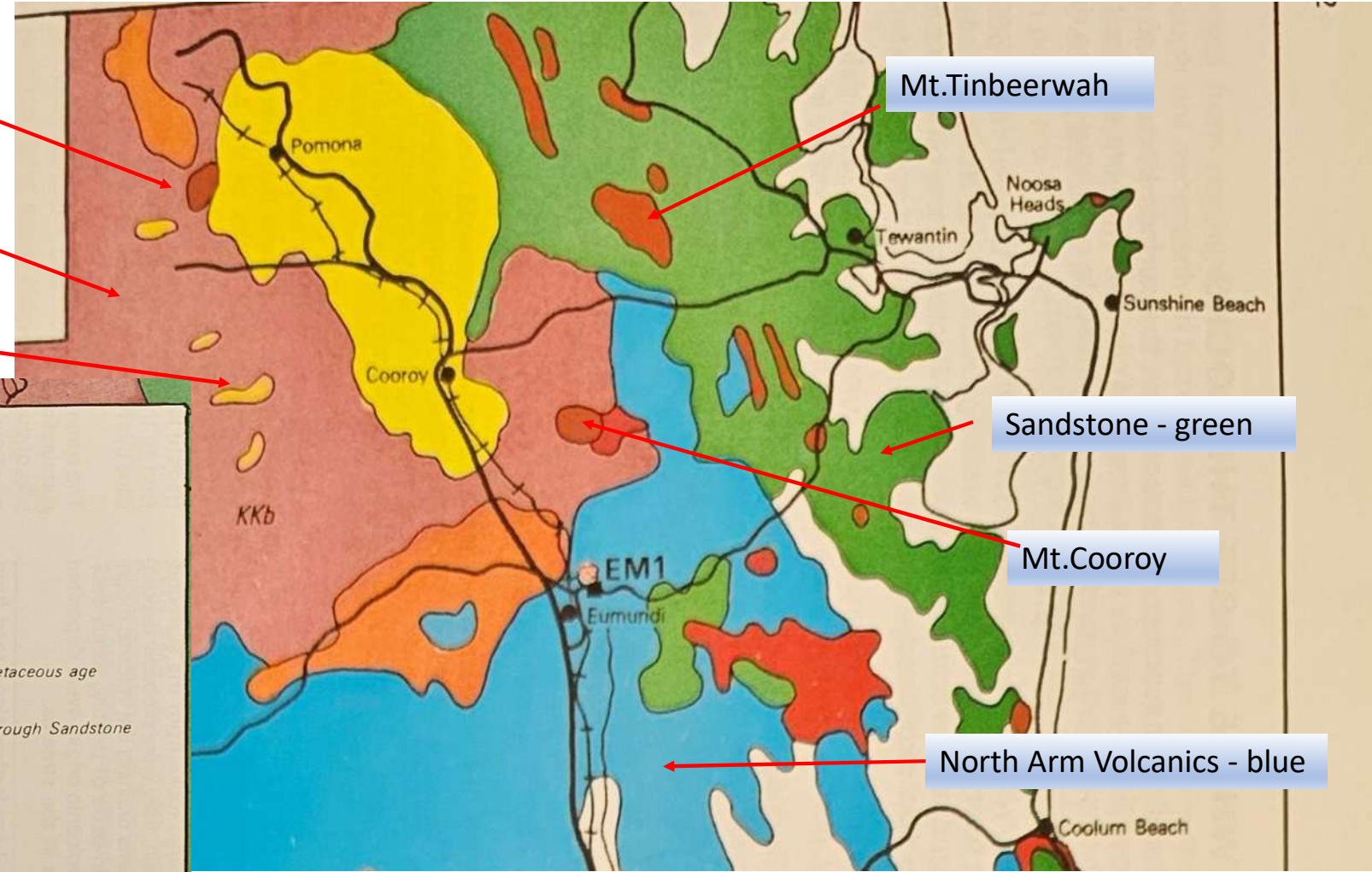
Black Mountain

Mt. Tinbeerwah

Sandstone - green

Mt. Cooroy

North Arm Volcanics - blue



	Coastal sediments, alluvium
	Intrusive plugs
	Basalt lavas
	Pomona beds
	Granitic intrusions of Jurassic - Cretaceous age
	Myrtle Creek Sandstone, Landsborough Sandstone
	North Arm Volcanics
	Granitic intrusions of Triassic age
	Old metasediments of Gympie Province Bb - Booloumba beds, Ab - Amamoor beds GG - Gympie Group, KF - Keefton Formation KKb - Kin Kin beds



Your soil....properties
And management

Parent rock/material

All soils come from parent materials. Therefore the type of soil in an area depends on the parent rock.

The condition of the soil is highly dependent on the type of bedrock.

Example:

- Soils formed from granite would be acidic ($\text{pH} < 7$)
- Soils from Limestone would be basic.

Drainage depends on the underlying rock.

However...



Parent Rock

- The rock from which the soil was made from
- Determines the type of soil
 - Transported Soil
 - Came from somewhere else; different composition than bedrock its on
 - Residual Soil
 - Rests on top of its parent rock; same composition as bedrock its on

It is better to have some cover rather than this!



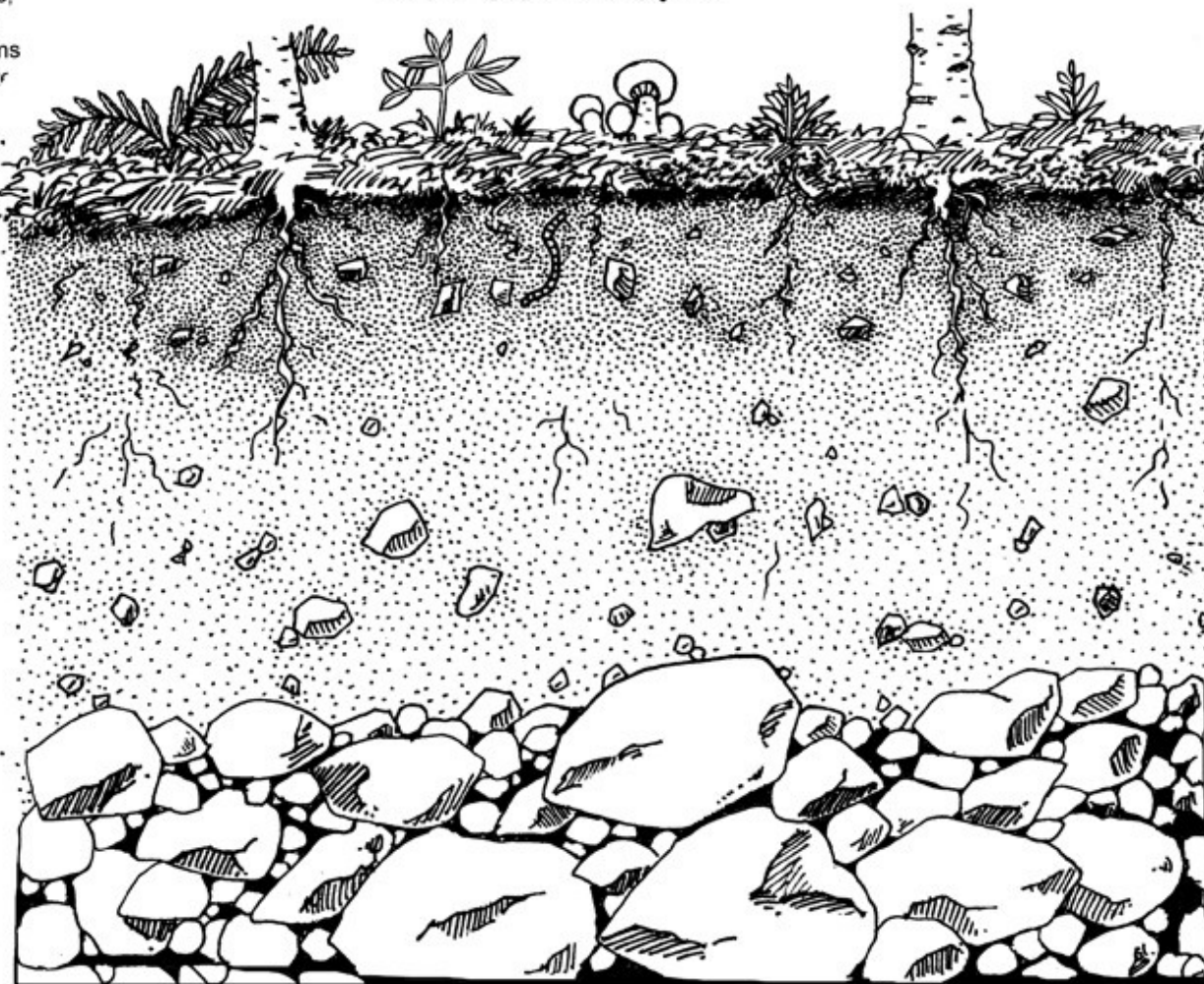
The Soil Profile

Surface Litter
leaves, branches,
animal scats &
bodies, mushrooms
other rotting matter

**Topsoil Layer
(or humus)**
rotting organic
matter from litter
layer and
minerals from
weathering rocks

Subsoil
crumbling rock,
sand, clay, gravel
and silt

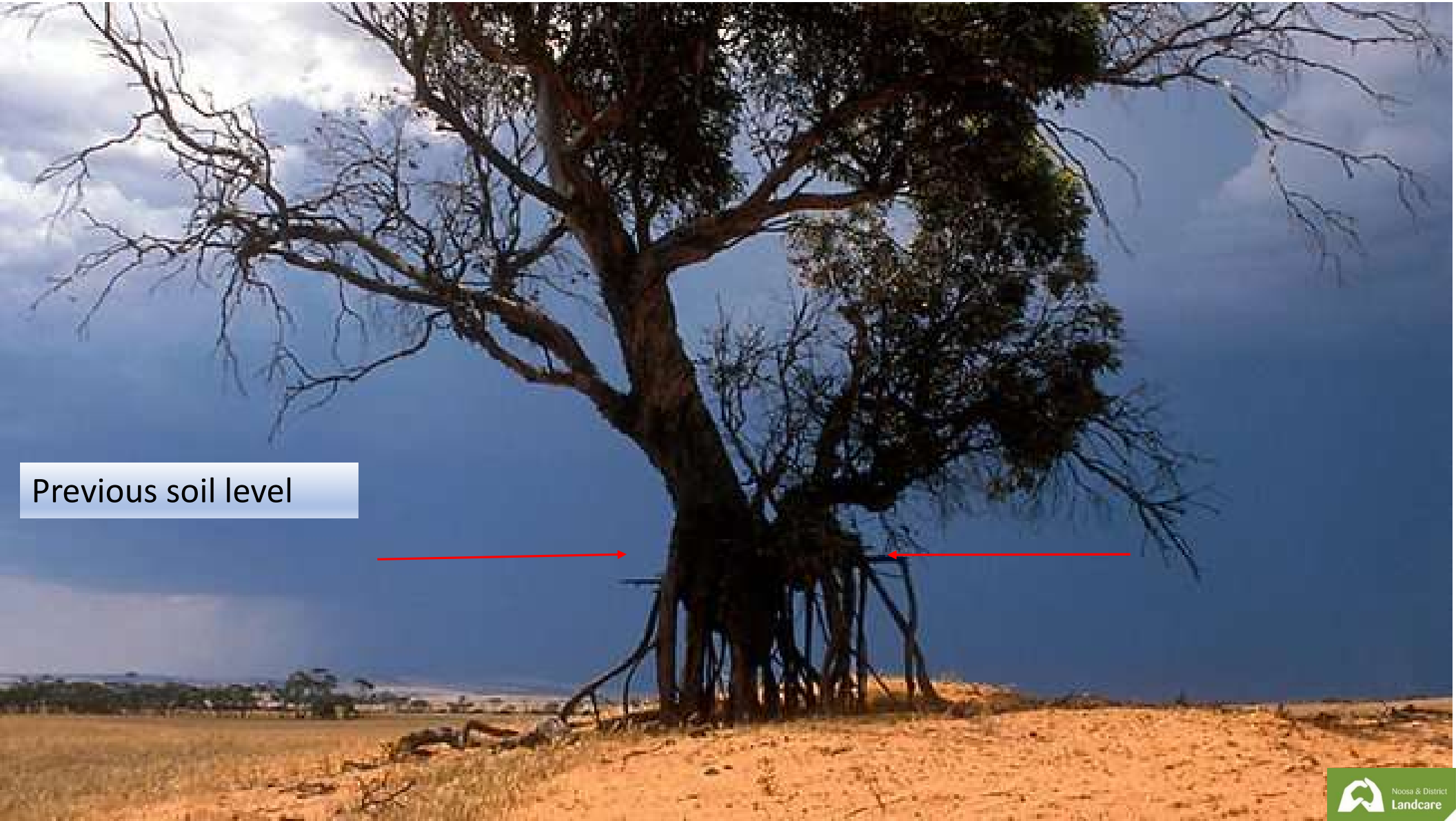
**Parent
Material**
actual bedrock
underlying the
soil layers



‘Weeds’ are something!

‘Something’

- Reduces run off
- Reduces direct sunlight
- Creates organic matter
- Creates habitat...strata
- Which leads to poo,
- Which leads to seeds
- Allows worms to do their thing
- Reduce wind at low levels
- Less evaporation of soil moisture

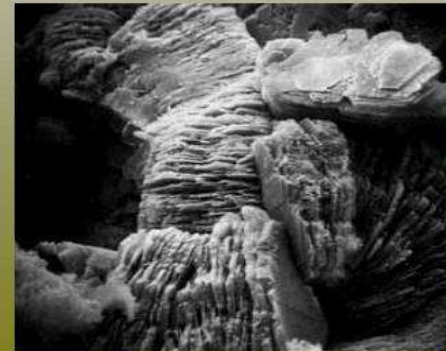


Previous soil level

Soil is a combination of broken down rocks, minerals and organic matter, all mixed together by worms and bugs. It forms at the surface of land and provides plants with an anchor for roots and enough nutrients for growth.

Soil Structure

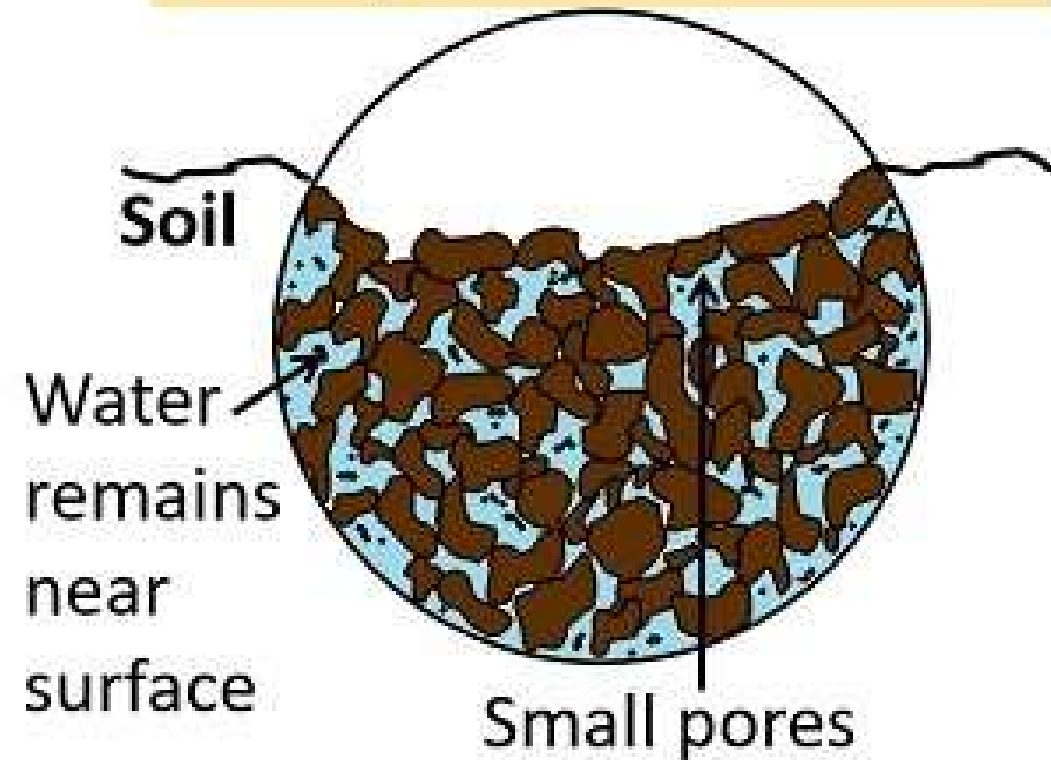
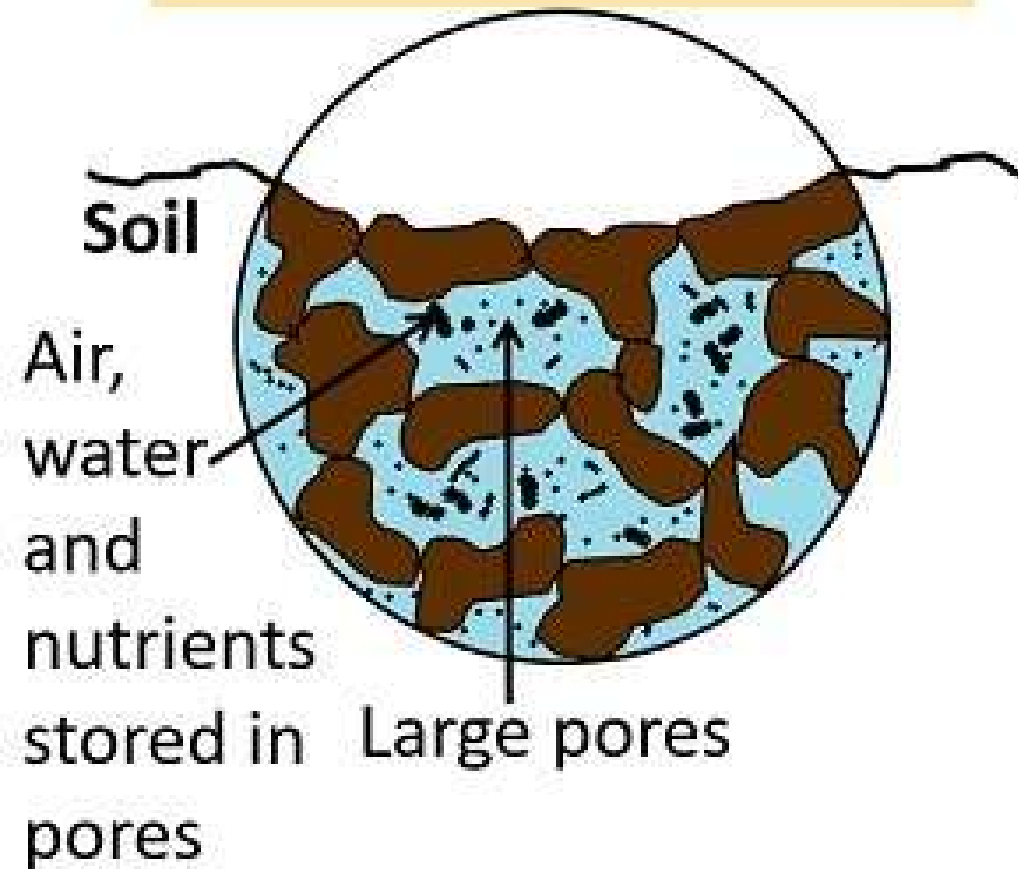
- ◆ *Soil structure* is the **arrangement** of particles in the soil
- ◆ Structure affects aeration, water movement, heat transfer, and root growth
- ◆ **Granular** is ideal for agriculture, allows for maximum pore space



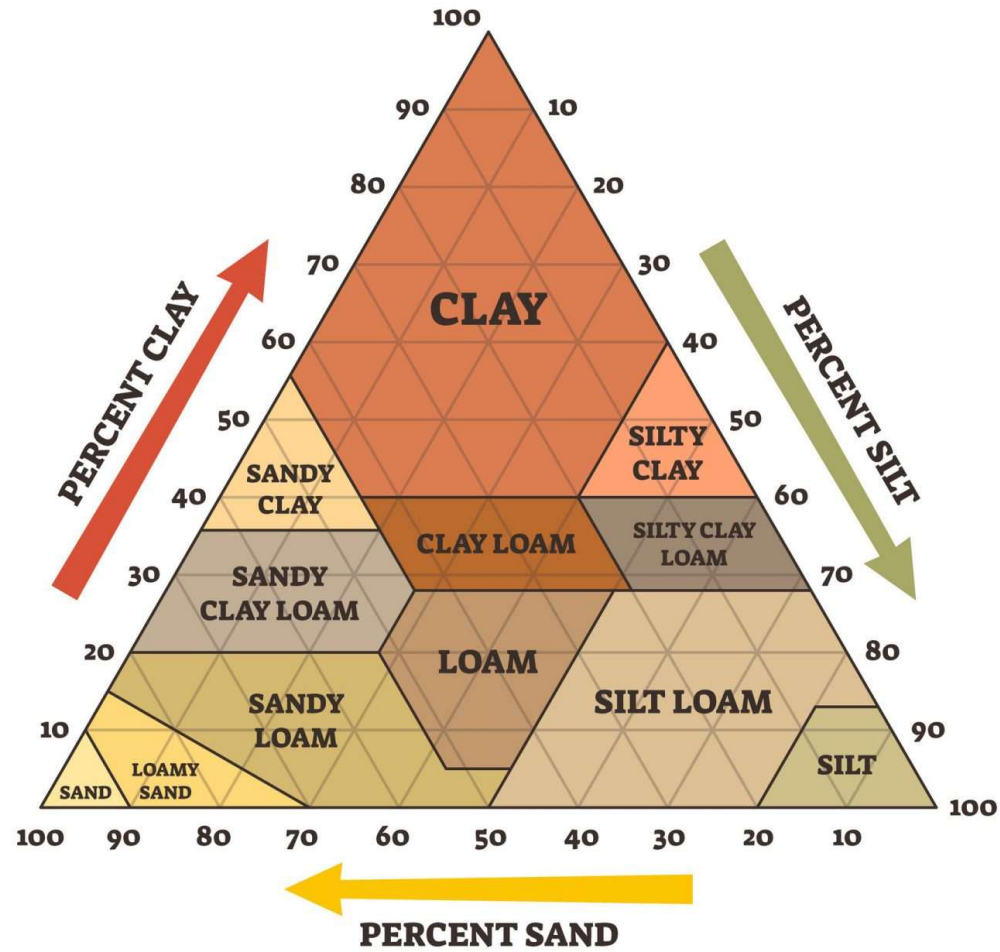
Soil Structure

Well-structured soil

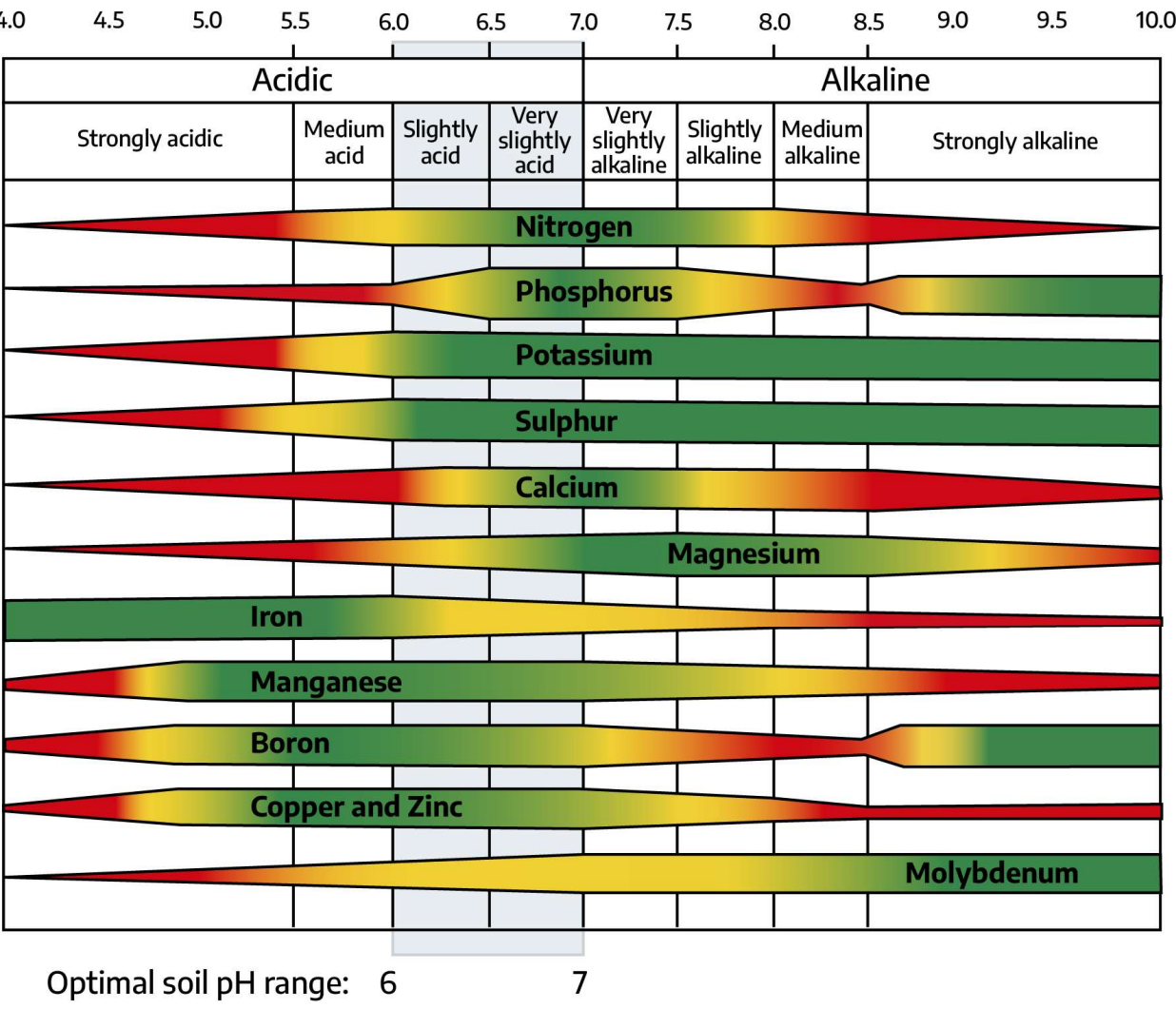
Poorly-structured soil



SOIL TYPES



How soil pH affects availability of plant nutrients



If over 7, soil is alkaline [rare here]

To lower pH –add Sulfur

Below 7, Soils is Acidic – common here - mine is about 4.5

To increase pH – add lime or dolomite

Any change will take time - years



'Clay' Soils get a bad wrap...but many of our native plants handle it pretty well.

However, clay soil does not have good structure, is easily compacted, does not allow penetration of water, and harder for fine root growth.



Clay soils can be improved by:-

- Adding gypsum [clay breaker]
- Aerating the soil...even a garden fork works well
- If small area, incorporate sand or gravel
- Adjusting the contour of the land to increase slow and spread the water [whoa boys]
- Adding plenty of organic matter, and
- Continue to add.



The other end of the scale is Sandy soils

Sandy Soils dry out quickly, and its large particles create wide spaces that allow water and nutrients to drain away too . Often low in nutrients.

Sandy soils can be improved by:-

- Adding plenty of organic matter – mulch
- Ensuring consistent watering
- Selecting suitable plants
- Adding folia fertilisers
- Adjusting the contour of the land to increase water retention [whoa bous]



Mulch - organic matter is brilliant. It:-

For ALL Soils

- Cools the surface of the soil, and deeper down
- Enables worms etc to start the recycling process
- Slows runoff and erosion
- Improves soil fertility
- Suppresses weeds
- Improves soil texture



Remember; Rocks are mulch too!



Habitat piles...not
'pretty, but great
for wildlife & your
soil!

Great habitat



Phyllite

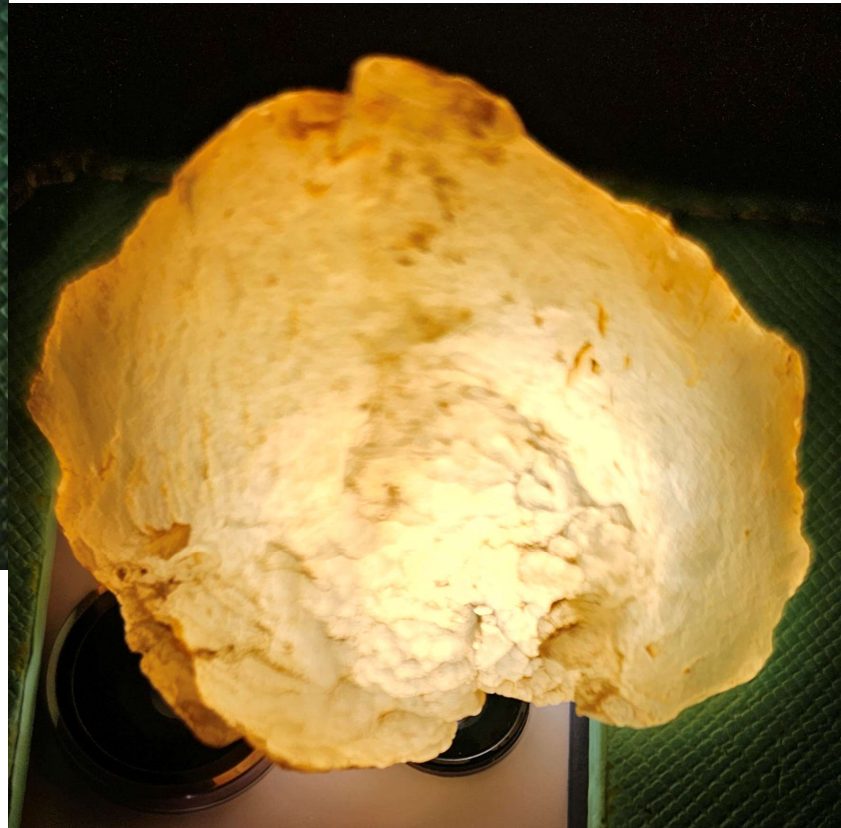




Lichens, Interbedded
volcanics, a bit on RE's



Chalcedony







Thank you & Questions