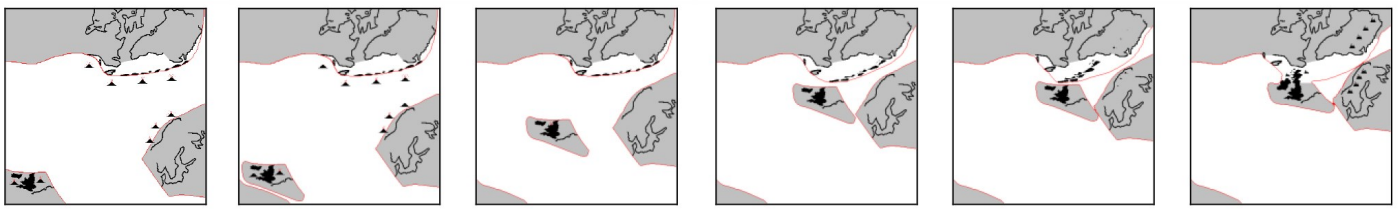
The Story of the Highlands – Geology Timeline

Eon/Period	MA*	Highland Events
Hadean	4600	(4600-3900) From the Greek '*Hades*' - hell. The Earth formed, along with the other planets, from material orbiting the newly formed sun. The young Earth was a ball of molten rock constantly bombarded by meteorites. Early on it was almost destroyed when struck by a smaller planet. The Earth reformed, but some material, thrown into a high orbit, coalesced to form the moon.
	4200	As the Earth cooled a solid crust began to form. Liquid water appeared and soon the whole earth lay beneath an ocean. However volcanic activity was still widespread and the continents began to form.
	4000	The earliest fossils, simple bacteria, are around 3.6 billion year old, but life began much earlier, probably as soon as water appeared. Perhaps in surface pools surrounding geysers or around deep sea volcanic vents. With no oxygen these bacteria fed on chemicals such as sulphides abundant in volcanic waters.
Archaean	3900	(3900-2500) From the Greek '*Arkhaios*' - ancient. For most of geological time the Highlands, along with the rest of Scotland and Northern Ireland, lay off the coast of Greenland and North America, part of a continent known as 'Laurentia'.
	2900	**Lewisian gneiss** - A complex of ancient metamorphic rocks formed from even older rocks buried deep within the earth and brought to the surface during an ancient period of mountain building.
Proterozoic	2500	From the Greek '*proteros*' - early and '*zoe*' - life. The Proterozoic lasted around 2 billion years, almost half of geological time.
	2300	Stromatolites (colonies of photosynthetic bacteria) were increasingly common.
	2000	Major period of Glaciation. Atmospheric oxygen approached current levels.
	1800	Eukaryotes (cells with nuclei) evolved.
	1000	**Torridonian sandstones** - coarse pebbly sandstones laid down on a flood plain. The material was eroded from an ancient mountain range in Greenland.
	600	Major worldwide glaciation - the Earth froze over!
Cambrian	570	From '*Cambria*' the Roman name for Wales. The first animals with shells evolved, fossils became much more common. Erosion and major earth movements saw the West coast lying beneath a shallow tropical sea. Fine white sand was laid down to form **Quartzite**. During the late Cambrian and early Ordovician this was buried beneath **Limestone** laid down in shallow lagoons.
Ordovician	520	After the '*Ordovices*' the last Welsh tribe to surrender to the Romans. At the beginning of the Ordovician Scotland was separated from England by the Iapetus Ocean. Over the next 50 million years England and Scandinavia closed this ocean to collide with 'Laurentia' - North America, Greenland and Scotland.



Silurian	440	After the '*Silures*' another ancient Welsh tribe. Plants, and later insects, make the first move onto the land. England and Scandinavia collided with the coast of 'Laurentia'. The impact effectively glued Scotland and England together and pushed up the immense Caledonian mountain range, then longer and taller than the Himalayas.
	400	**Moine schist** - The Moine schists are metamorphic rocks. Originally Proterozoic sandstones and shales they were buried deep within the earth's crust. Forced up during the formation of the Caledonian Mountains today they cover much of the central Highlands.

		These major earth movements lasted 250 million years and were accompanied by intense volcanic activity. Huge amounts of **Granite** were intruded into Ordovician, Silurian and Devonian rocks.
Devonian	410	After the English county of '*Devon*'. The Devonian is known as the 'Age of Fishes' and they dominated life on earth. Locked between America and Scandinavia, the Highlands lay in the middle of an arid desert. However rivers running from the Caledonian Mountains fed huge freshwater lochs, full of fishes, along the East Coast.
		Old Red Sandstone - The 'red' sandstone, found around Inverness, is made up of desert sand and pebbles washed into rivers and the shallows of the lochs. Whilst the thinly bedded Caithness flagstones, rich in fossil fishes, consist of finer sediment laid down on the beds of deeper lochs.
	350	Towards the end of the Devonian one species of Highland lungfish made the final move onto land. The earliest known amphibian, *Elginerpeton pancheni*, comes from the **Old Red Sandstone** at Scaat Craig near Elgin.
Carboniferous	360	From the Latin '*carbo*' - coal and '*ferre*' - carry, after the coal deposits. There are no Carboniferous rocks within the Highlands. The mountainous nature of the Highlands meant that rock formations from later periods are rare and confined to the coast.
Permian	300	After '*Perm*' a town on the Ural mountains. The climate changed during the Permian and the Highlands once again lay in a sandy desert. The end of the Permian is marked by a mass extinction event, 75% of land animals and 96% of marine animals became extinct.
Triassic	250	From the Latin '*trias*' - trinity, from its division into three units in Germany. New species evolved to fill the gaps left by the Permian extinction. The first dinosaurs and mammals evolved. Britain still lay under desert conditions and it is often difficult to separate Permian from Triassic rocks.
	210	**New Red Sandstone** - composed of desert sands it formed during the Permian and Triassic periods. At Clachach near Elgin whole sand dunes have been fossilised along with the footprints of early reptiles.
Jurassic	200	After the '*Jura*' mountains of the Alps. Rising sea levels saw the Highlands surrounded by shallow tropical seas. It is within Jurassic rocks that North Sea oil is found.
	190	The Jurassic was the true 'Age of the Dinosaurs'. They roamed the conifer forests covering the Highlands and their remains have been found on Skye.
Cretaceous	140	From the Latin '*Creta*' - chalk. There are no Cretaceous rocks within the Highlands. Thin deposits of chalk were laid down in coastal regions, but were scoured away during the Ice Age. A mass extinction event at the end of the Cretaceous saw the end of the dinosaurs (though their descendants, the birds, survived and flourished).
Tertiary	65	From the Latin '*tertium*' - third. The Tertiary became the 'Age of Mammals'. Rapidly evolving from small insectivores most modern mammal groups had appeared by the early Tertiary.
	60	Around 4 billion years after their formation the Highlands finally split from America. Greenland began to move away from Europe and as the North Atlantic opened huge volcanoes flooded the west coast with lava.
Quaternary	1.8	From the Latin '*quartum*' - fourth. The Ice ages began around 1.8 million years ago. This saw cycles of very cold (glacial) conditions followed by warmer (interglacial) periods. The glaciers shaped the Highlands into the familiar landscape we see today.
	0.01	The present interglacial began around 18,000 years ago, the Ice finally melted 10,000 years ago and 9000 years ago the first humans reached the Highlands.

*Million years before present.

Further reading: J. Roberts (2000) The Highland Geology Trail. Luath Press Ltd, Edinburgh.