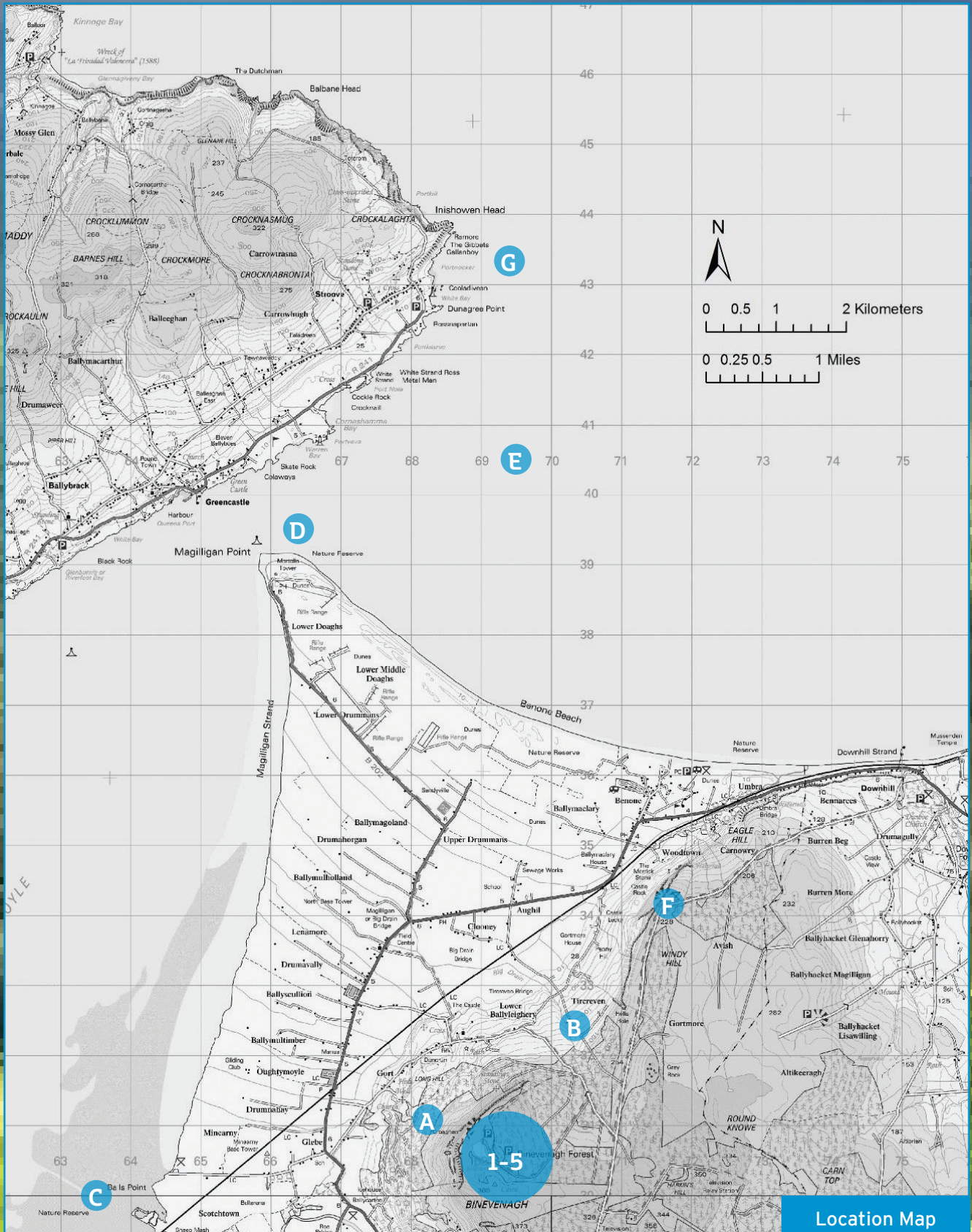


Binevenagh Mountain

Teacher's Sheet

Binevenagh Mountain marks the north-west limit of extensive lava flows which form the basaltic Antrim Plateau. This huge area of basalt rock extends from Cave Hill in Belfast, all along the coastline of Counties Antrim and Londonderry, ending here above Magilligan Point. At Binevenagh Lake you are standing on rocks which formed 60 million years ago, as Europe and North America were breaking apart. If you could drill down beneath your feet you would discover a fascinating sequence of rocks which we, as geologists and scientists can study to help us determine how the landscape, we see today has formed.



Location Map

Teacher's Notes

SUGGESTED STOPS	POINTS TO NOTE
Access:	Access to this location is via a small Forest Service trail which is accessed from the Leighery Road. A small car park suitable for minibuses and cars is available adjacent to Binevenagh Lake.
1	<p>This field visit location is located just a short walk from the car park at Binevenagh Lake. A series of trails lead to several viewing points on top of the steep cliffs which overlook Lough Foyle, Magilligan Point and Inishowen. Extreme care should be taken to avoid walking or standing too close to the cliff edge, particularly if weather conditions are poor.</p> <p>At stop 1 you are standing at around 380m above sea level on the extreme north-west of the basaltic Antrim Plateau (Binevenagh Mountain is 385m). The Antrim Plateau formed during a period of extensive volcanic activity in this part of Ireland as North America and Europe drifted apart due to plate tectonic activity 60 million years ago, during the Paleogene Period. Divergence of the North American and European plates caused the Earth's crust to stretch and thin. This generated enormous amounts of heat and caused huge volumes of basaltic magma to rise to the surface through cracks in the Earth's crust (the same process gives rise to volcanic activity in Iceland today). Upon reaching the surface, large amounts of basaltic lava flooded over, and buried the surface of the land. When the lava cooled this part of Ireland was covered in thick layers of basalt rock. The layered nature of the basalt demonstrates that a series of lava flows were erupted in this area. In between the layers of basalt, laterite beds can be seen. The presence of laterite (an ancient soil) demonstrates that there were periods of very limited volcanic activity, when the surface of the land weathered to form iron rich soils. To get a fantastic view of the basalt and laterite layers, visit the Binevenagh National Nature Reserve at the bottom of the cliff (see point a on map).</p>
2	<p>If you were to drill beneath your feet on top of Binevenagh you would discover a fascinating sequence of rocks which we, as geologists and scientists can study to help work out how the landscape we see today has formed. Directly below the thick layers of basalt upon which you are standing, are a series of Cretaceous rocks, mostly comprising Ulster White Limestone (chalk) and conglomerates. During the Cretaceous period (145 to 65 million years ago) global sea levels were much higher than at present as there was no ice at either of the poles. Higher sea levels meant this part of Ireland was located under a warm, tropical and very productive ocean. Over millions of years the calcic remains of billions of micro-organisms that lived in this ocean formed thick deposits of white limestone. This white Limestone extends all along the coastlines of Counties Antrim and Londonderry and can be seen at Downhill, Whiterocks, Ballintoy, Garron Point, Carnlough and Glenarm.</p> <p>In the Binevenagh area there is a very important exposure of Cretaceous rock at nearby Tircreven Burn Area of Special Scientific Interest (ASSI). At Tircreven Burn (see point b on map) it is possible to view some of the oldest Cretaceous rocks in Northern Ireland. These consist of conglomerates (mostly sandstone and quartz pebbles) which contain abundant fossil material such as fish bones, teeth, shells and sea urchins. Of note is the bivalve <i>Gryphaea arcuata</i>. The presence of conglomerate indicates a much higher energy environment than that which persisted throughout later stages of the Cretaceous.</p> <p>Also, exposed at Tircreven Burn are Jurassic sandstones and mudstones (200 million years ago). They are the oldest rocks which can be found in the Binevenagh area. The sandstones and mudstones exposed at Tircreven Burn are evidence that warm shallow seas repeatedly covered this area. During the Jurassic, this part of Ireland was located approximately 40° north of the equator with a climate resembling that of present day humid countries. Fossils preserved within the rock provide evidence of the range of life present in the Jurassic seas, including the remains of large vertebrates.</p> <p>Public access to Tircreven Burn is not permitted; however detailed information about the geology of the site can be found on the website of the Department of Agriculture, Environment and Rural Affairs (DAERA) website.</p>

3	<p>The rocks which formed in the Binevenagh area during the Jurassic, Cretaceous and Paleogene periods all exert an influence on the landscape of the area today; however, it is mainly the events that took place during the Quaternary (last 2.5 million years), that have been responsible for shaping the landscape you see today.</p> <p>During the Quaternary, a series of glaciations (ice ages), saw ice sheets expand southwards across Ireland. As the ice advanced it acted much like sandpaper, scraping and scouring the surface of the land. Upon retreat the material collected by the ice was deposited, forming large deposits of glacial material, with sediment ranging in size from fine clays, through to sands, gravels and boulders. If you look towards Lough Foyle and Magilligan Point (points c and d on map) much of the settlement and development you see in the area is built upon glacial deposits.</p> <p>The golden sandy beaches which stretch for 5 miles from Magilligan Point to Downhill are composed of sand deposited offshore at the end of the last ice age. This huge, but finite resource of sand is constantly worked and re-worked between the shore and near shore by the tides and wind. If the tides and weather conditions are favorable, you may spot breaking waves off the coast between Inishowen and Benone Beach. These waves are breaking over the Tunns Sandbank (point e on map) and are said by local people to represent the anger of Sea God Mannan Mac Lir.</p> <p>The interactions of the tides and winds between Lough Foyle and the Atlantic Ocean, have over thousands of years, formed the spit of land known as Magilligan Point. If you look at the land and field boundaries, it is possible to see how this area has advanced seawards over time. At present, there is significant erosion of the shoreline on the Lough Foyle side.</p> <p>When the last glaciation in Ireland ended, sea levels initially rose quite rapidly due to additional volumes of fresh water; however, because the weight of ice was removed from the surface of the land this eventually caused the land to rise relative to sea level in a process known as isostatic rebound. There is evidence for this sequence of events throughout the Binevenagh area. If you look below, it is possible to see an ancient shoreline and relict dunes quite close to the base of the cliffs (close to the railway line). This provides evidence that until relatively recently the sea extended much further inland than at present. In fact, there is archaeological evidence to support this theory, perhaps most famously the Brougher Gold Hoard, believed to be an offering to the sea gods, found in a ploughed field outside Limavady and now on display in the National Museum of Ireland.</p> <p>More recently this landscape has been changed dramatically by human activity. Tracing the railway line along Lough Foyle towards the city of Derry~Londonderry, much of the ground on the landward side of the railway was reclaimed from the sea and sold to help fund construction of the railway in the 19th Century.</p>
4	<p>Laying at the base of the cliffs at Binevenagh are enormous slipped masses of Basalt which sit on top of the older Cretaceous and Jurassic Rocks. At the end of the last glacial period, it is thought that when the ice receded from these cliffs the large blocks of basalt slipped downwards on top of this older material, adding to the distinctive appearance of the cliffs. Looking downwards from this location it is possible to view these slumped masses of basalt from above. To get a view from below, or from the side a visit to the Binevenagh National Nature Reserve (point a) or Gortmore Viewpoint (point f) is recommended.</p>
5	<p>Whilst standing on top of Binevenagh Mountain it is possible to get a fantastic view of the Inishowen Peninsula in County Donegal (point g). Many of the rocks found along the north coast of County Donegal are Pre-Cambrian in age, with the oldest rocks in Ireland (1.7 billion years old) found on Inishtrahull Island. These are composed primarily of metamorphic rocks such as gneiss, schists and quartzite which during the Silurian were subject to a period of mountain building known as the Caledonian Orogeny which was complete about 400 million years ago. This occurred as an ancient ocean known as the Iapetus was closing. Compared to the 400 million year old mountains in County Donegal, Binevenagh mountain at a mere 60 million years old, is a very young mountain indeed.</p>