Lough Navar Forest

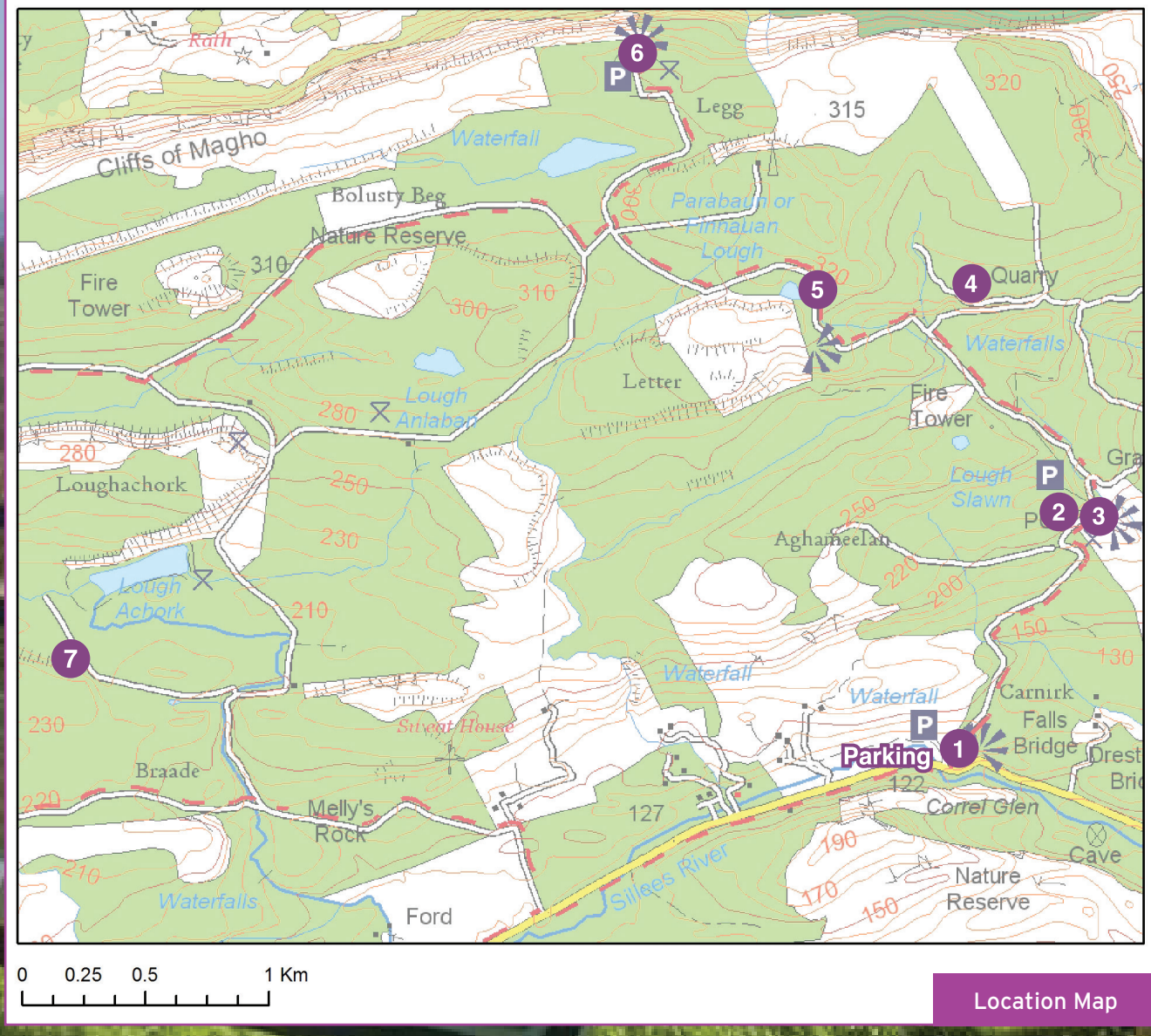


Teacher's Sheet

Visit Time: 3 to 4 hours

Lough Navar Scenic Drive takes visitors around some of the most scenic locations in West Fermanagh. This once dense conifer plantation provides a diverse range of sites including quarries, scarps, viewpoints and lakes.

All sites are easily accessible by car and / or minibus usually accompanied by a short walk.



Location Map

Teacher's Notes

SUGGESTED STOPS	POINTS TO NOTE
Access:	Lough Navar forest, located approximately 5km outside the village of Derrygonnelly, has a 9km long scenic drive that allows easy access to a number of prime geological sites. There are several car parks and laybys along the route as well as picnic tables and walking routes.
1	The geology exposed within the forest is predominantly Carboniferous sedimentary rocks all of which formed when the island of Ireland lay on or very close to the equator and was part of a much larger continent together with most of North America and the rest of Europe. Generally speaking, the sedimentary rocks are lying sub-horizontally so that limestone is found beneath the sandstone. Before entering the forest drive it is worth noticing that the rocks exposed opposite the entrance to the forest are sandstone, whilst those rocks at similar altitudes within the forest are of limestone. Although very seldom exposed, there are several faults nearby that can be inferred from geological mapping. Faults are fractures that displace rock sequences due to pressures in the Earth's crust. In this case the fault appears to have downthrown the sandstone so that it rests beside the limestone. It is thought that the line of the fault lies somewhere in the vicinity of the main road at the entrance to the forest drive.
2	Follow the route of the scenic drive until you reach a large parking area. There is a small disused quarry face in the car park in which you will notice a vertical outcrop of rock protruding. This is part of a much larger feature known as the Blackslee Dyke. The Blackslee Dyke is a vertical sheet of igneous rock that would have been intruded into a pre-existing weakness (or fault) within the existing Carboniferous rocks. In this case the weakness was a major northwest trending fault (Blackslee Fault). At the car park, the dyke consists of a core comprising 1.5m of blocky, spheroidally weathered dolerite. The margins of the dyke are highly altered so that it is difficult to tell the original rock type. The dyke is flanked by basaltic breccia containing angular fragments of sandstone and shale. Brecciation could be due to fault movement after the dyke was intruded, or it could be due to steam explosions as the molten rock came into contact with water-rich sediment. The latter is less likely as it would have produced a high incidence of xenoliths, foreign inclusions in igneous rocks, which are absent from the dolerite here. There are numerous major dykes in the area and these form part of the Donegal-Kingscourt dyke swarm. Intrusion took place during the late Cretaceous and Palaeogene times when Ireland was affected by major Earth movements associated with the opening of the North Atlantic Ocean. This activity also led to the creation of the Giant's Causeway and other volcanic activity around the periphery of the North Atlantic Ocean.
3	Remain parked at the car park at Blackslee and walk over to the fence that offers a stunning vista over much of Fermanagh and beyond. The views from Aghameelan allow you to see examples of the long natural history of the area. The oldest rocks in Northern Ireland can be seen to the north from this location, formed over 800 million years ago during the Precambrian period. These rocks formed when the island of Ireland was split in two, with each part located on separate continents. They are metamorphic rocks, meaning that they have been changed by either heat and / or pressure and include metamorphosed sandstones, and an igneous rock known as pegmatite. Knockmore Cliff, off in the distance straight in front of you is made up of Carboniferous limestone that formed around 330 million years ago. This entire area would have been submerged beneath a shallow, tropical sea and the resulting limestone rocks contain many interesting fossils. Just behind you, is the Blackslee Dyke, an igneous rock (a rock that was once molten) feature that formed around 65 million years ago, when all of the rocks in this area were buried deep beneath the surface. In front of you is an example of a drumlin, a streamlined hill formed during the last glaciation. As ice sheets moved across the area (at their thickest around 18,000 years ago) they would have sculpted any loose material beneath them into such hills, indicating the direction of ice movement. After the ice sheets melted, around 13,000 years ago, native forest began to take hold of the area between 7,500 and 5,000 years ago, with elm, hazel, oak and alder successively colonising the landscape, the likes of which can be seen to the right of this viewpoint. Much of this native woodland was gradually replaced with blanket bog, much of which would have occupied this area before forestry activities took place. The change to blanket bog is thought to have been partly due to human activity and partly due to climate change, with the present natural character of the landscape being created largely in the Bronze Age, about 4,000 years ago.

4	As you drive on up the scenic drive you will pass signs for the Whiterocks and Lough Slawn trails. After these signs, you will pass a forest track on the right with a gated entrance before the road takes a sharp turn to the left. There is a safe place to park at the bend on the road. Walk back down to the forest track and take the track for 100m until you reach the quarry. **Please note:** Do not approach the quarry face as it may be unstable. The large quarry at Lough Navar displays the bedded limestones of the Lower Carboniferous Dartry Limestone Formation. As you look into the quarry, approximately two-thirds up the left hand quarry face, there are beds of limestone that display nodules. If you look on the quarry floor there are also large blocks of limestone that display these nodules in plan view. Nodules are common within many sedimentary rocks and in this case are spherical in shape, and flattened parallel to bedding. They have a slightly different composition from the host rock in that they are much finer grained and more heavily cemented than the surrounding limestone. This structure indicates formation by the precipitation from an aqueous solution and thus indicates that the nodule grew in place. This means that the nodule formed during sedimentation, or shortly after sedimentation but during the early stages of compaction. The origin of the nodules may be related to the presence of fossils within the limestone as they can act as nuclei for nodules to form around and can result in localized cementation. The nodules also appear to be concentrated along a limited number of stratigraphic horizons meaning that there may have been a hydrological control on cementation.
5	As you continue on the scenic drive the road will take a sharp turn to the left. Letter Lough is located on your left hand side. Pull in safely at the side of the road. The small 'lake' seen here in the townland of Letter is only a remnant of what the lake originally looked like. Over the past 50 years, the lake has become gradually infilled and a form of peatland known as a raised bog is developing. Peatlands are composed of layers of waterlogged peat and a surface layer of living vegetation. Peat consists of the dead remains of plants that have accumulated over a long period of time. Peat accumulates in areas where the rate of plant production exceeds the rate of plant decomposition. Complete plant decomposition is prevented in areas where waterlogging occurs. In Ireland, high rainfall and low temperatures result in low evaporation which means that waterlogged soils are a common feature. These waterlogged soils are anaerobic or poor in oxygen, and oxygen is essential for the growth of the soil microorganisms that bring about the complete breakdown of plant material. As a result of the poor microbial activity, dead plants accumulate in waterlogged areas as peat. Raised bogs are dome-shaped peatlands that develop in former lake basins. They differ from blanket bogs that are common elsewhere in the area that consist of a carpet of peat extending over a large area. In Lough Navar forest, this peatland seems to be developing at an exceptionally fast rate that may or may not be connected to the plantation of the area during the 1950s. There are a number of possible reasons for this. Coniferous trees produce particularly acidic soils that may have inhibited the decomposition of plant material. The planting of large numbers of trees will also have limited the drainage of the lake meaning that waterlogged conditions could develop a lot easier. Tree planting will also have resulted in the disturbance of large areas of soils that could also have influenced bog formation.

6	Continue on the scenic drive until you reach the Magho viewpoint. The spectacular view from this location is arguably one of the most dramatic in Ireland. The bird's eye view of Lower Lough Erne and its islands allows you, on a clear day, to see the rounded Sperrin Mountains to the east, the Blue Stack Mountains to the north, and Slieve League, Donegal Bay and the Atlantic Ocean to the west. The most striking feature from this location is Lower Lough Erne itself with its breathtaking size only really appreciated from a viewpoint like this. But how did Lower Lough Erne get to be here in the first place? Like so many places on the island of Ireland, the present landscape is a direct result of the last glaciation, which ended around 13,000 years ago. The valley that is now occupied by Lower Lough Erne probably contained a pre-existing river and was a v-shaped valley. Glaciers usually follow the easiest route along which to flow, often a pre-existing river valley. The erosive power of glaciers, resulting from the debris embedded within the ice, changed the original v-shape of this valley to form a wider u-shaped valley. Further evidence for this is the presence of many drumlin islands in the lake, formed as glaciers moved across the valley floor. Once the glaciers melted, sea-levels rose and this huge valley became flooded and formed the over-deepened glacial lake that we now call Lower Lough Erne.
7	To reach the Clliffs o'Braade you should travel across the small bridge seen on your right hand side as you travel alongside the Sillees River. This is a forest track so should be approached with caution if you are intending to drive along it. The scarps are approximately 500m along the track on the left hand side where there is a small layby. The Carboniferous Glenade Sandstone is exposed in a series of scarps throughout Lough Navar Forest. The Glenade Sandstone is mainly confined to high ground and is frequently concealed by peat deposits or 'hidden' in extensive coniferous tree plantations. The sandstone itself comprises very thick beds of coarse-grained, pebbly sandstones that form low topographic ridges. Fossils are rare, but plant remains are common and can be seen as carbonaceous (black) fragments. The sandstone is white to buff in colour but it commonly displays an orange limonitic weathering crust. Cross-bedding is also common and in the large scarps seen here, channel and slump structures are easily seen, clearly indicating deposition in a fluvial environment. The scarps here also display unusual weathering features that resemble honeycomb. This particular type of weathering is known as tafoni and is commonly found in granular volcanic rocks and also in some types of sandstone. They often occur in groups that can riddle a hillside, cliff, or other rock formation. Tafoni are found in all climate types, but are most abundant in intertidal areas and semi-arid and arid deserts. Currently favoured explanations controlling their formation include salt weathering, differential cementation, structural variation in permeability, and the length of the drying period between wettings.