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## Strathardle, Perthshire: rock, ice and meltwater

Geological walks at Straloch and Glenferate

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How ancient glaciers left their fingerprints on the landscape

### Tayside Geodiversity

Tayside Geodiversity is a voluntary group that is interested in making Tayside's geology and landscape better known. The group aims to produce leaflets and information boards about local geology and geomorphology sites and to protect and improve these sites in the three council areas (Perth & Kinross, Angus and Dundee) that make up Tayside.

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### The Scottish Outdoor Access Code

1. Take responsibility for your own actions. Make sure you wear proper clothing and footwear. Be mindful of weather conditions and safety considerations.
2. Respect people's privacy and peace of mind. Keep a sensible distance from homes or gardens and use the path or track if one is available.
3. Help land managers and others to work safely and effectively. Do not hinder farm operations, and respect requests for reasonable limitations on when and where you can go.
4. Care for your environment. Do not disturb plants and wildlife. Take away your litter.
5. Keep your dog under proper control. Do not take your pet into fields with calves or lambs. Dispose of dog waste.

### Sites of Special Scientific Interest

Much of the high ground between the River Tay and Glenshee is an SSSI designated for breeding birds such as hen harrier, osprey, short-eared owl, black grouse and many other upland species. The southern part of Walk 1 crosses a small SSSI of lowland dry heath and unimproved calcareous grassland, with damp areas rich in orchids. Rare butterflies can also be found here.

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### How to get there

Straloch is on the A924 road, 15 minutes from Pitlochry and half an hour from Blairgowrie. OS maps required are Landranger 1:50k sheet 43 (Braemar and Blair Atholl) or Explorer 1:25k sheet 387 (Glen Shee and Braemar). Above, the blue square shows the area of the detailed maps overleaf. The nearest publicly available toilets are at Kirkmichael village shop.

The start point for walk 1 is a layby (marked P1 overleaf, grid ref [NO 0378 6371]; takes 3–4 cars) on the south side of the A924, just west of the drive to Straloch House. The start point for walks 2A and 2B is a layby (P2, grid ref [NO 0497 6388]; takes 5–6 cars) just west of the bridge at Straloch. Please do not park in the entrances to private roads.

Walk 1 is over pasture land (which can be wet) and takes about 3/4 hour. Walk 2A is mainly along a rough track, not recommended in wet weather, and takes about 1.5 hours. Walk 2B is an all-weather, level walk along a private tarmac road and takes about 2 hours. In the walk directions overleaf WM indicates a wooden waymarker post.

## Introduction

Strathardle is northwest of the Highland Boundary Fault and is underlain by a series of ancient metamorphic rocks known as the Dalradian. Originally a thick succession of sediments and lava flows, the Dalradian was metamorphosed under great heat and pressure during mountain-building events some 500–400 million years ago. Most of the Dalradian in Strathardle is a pinkish-grey psammite, originally a muddy sandstone. Green meta-volcanic rocks, quartzites and thin calcareous schists occur locally. Igneous intrusions include the Ben Vuirich granite (deformed along with the Dalradian) and a series of pink microgranite dykes.

As glaciers and ice sheets flow they generally erode rocks from highland areas and deposit debris at lower levels. Hence the different rock types deposited by a glacier can be used to work out where it came from.

During the late Quaternary (from 30 to 15 thousand years ago) a major ice sheet moved generally eastwards or southeastwards across Perthshire. Its direction can be deduced from erosional features (streamlined topography, striations on bedrock) and depositional features such as moraines. Strathardle is a complex area where ice flowing from the west (along the Tummel and Garry valleys) encountered ice derived from the southern Grampian Mountains. As the climate became drier and warmer at the end of this Ice Age, ice retreated from the main valleys, leaving a blanket of 'ground moraine' (glacial till) on the slopes with terraces of sand and gravel in the valley bottoms. In higher tributary valleys, small glaciers continued to retreat unevenly, leaving many ridges and hummocks of till. Small channels cut by meltwater are common. This leaflet focuses on the area round Straloch, where Glenfernate ice flowing from the north joined with Tummel–Garry ice from the west.

## Photographs

Modern glaciers: moraines, meltwater, lakes and kettle holes

Examples of lateral and end moraines; photo Belmont Secondary School, Canada.

Proglacial lake formed between a glacier (top left) and a moraine (right). Nellie Juan Glacier, Alaska; photo U.S.Geological Survey.

Kettle-holes form where sand and gravel bury or bank up around a block of ice which then melts. Gigjokull, Iceland; photo Olafur Ingolfsson.

Meltwater depositing gravel in front of a glacier in Alaska; photo John J.W.Rogers.

Schematic map of how Strathardle may have looked during ice retreat. Olive colour represents areas of bedrock, or till deposited when ice covered the whole area.

## Walks

### Walk 1

From layby P1 [NO 03783 63706] walk 300 m west along the road, cross a stile on the right and join a grassy track (old drove route) just above the road. After another 200 m there is a fine view west along Glen Brerachan. The flat floor of the valley is a former proglacial lake; meltwater from a glacier in the Tummel and Garry valleys to the west was dammed by a rock and moraine barrier where you stand. In due course the lake overflowed and the meltwater stream became the present river Brerachan. Ridges and mounds on the north side of the valley are probably recessional moraines.

Follow the track round to the right along an old enclosure wall (WM), go through a metal gate and enter a steep valley with pine trees either side. This dry valley is a channel cut by glacial meltwater, flowing northeastwards uphill under the ice and then down towards where Straloch House now stands. The rock in the small crags on the NW (left) side is a green meta-volcanic rock. In the middle of the valley is a very large (5 m) boulder of granite, which has been transported by ice from Ben Vuirich 10 km to the north. Quartz and feldspar crystals are aligned along a weak foliation; the tiny red crystals are garnets. A good example of a glacial erratic, the groove round the base eroded by meltwater.

Walk up the slope SE through the trees (WM) to a stile [NO 0343 6384] at the top of a grass field. In High Park Field are several more erratic boulders of granite (picture on the front of this leaflet) and other rock types. The rocky slopes to the north contrast strongly with the smooth field mantled with till. Head back to the start through another gate at the SE corner of this field and steeply down along a fence to the final pair of gates, opposite the layby.

## Walk 2A

From layby P2 [NO 04959 63882] walk 500 m west to Straloch Primary School and turn right up a narrow tarmac road. From [NO 0439 6407] (WM) you can see where the meltwater channel in Walk 1 emerges from the trees. South of Straloch Old Lodge many mounds and ridges of sand and gravel show where sediment was dumped as glacial meltwater spread out and slowed down beyond the rocky barrier. Straloch Loch is an artificially enlarged kettle-hole.

Where the tarmac road bends left, keep straight on through a wooden gate. Continue north past a belt of pine trees on the right. Beyond the trees, hummocky, bouldery ground marks the position of the front of the Glenferinate glacier as it paused during its northwards retreat. Ahead on the left a number of rough heathery ridges run diagonally up the slope under the crags of Carn Mor. These are lateral moraine ridges separated by marginal melt-water channels; most of the channels are dry. Continue to a prominent hummock at [NO 0437 6524] (WM). Across the glen above the sheep pens a stream flows along, rather than straight down, the hillside (dotted line in photo below). This meltwater channel marks the position of the end of the glacier as it paused again during retreat.

Walk north for 300m to where another oblique meltwater channel crosses the track. Return by the same route.

## Walk 2B

From layby P2 [NO 04959 63882] walk 150m east and turn left on the road to Glenferinate farm. The large erratic boulders at the side of this road are of several different types, all of which outcrop up the valley to the north and have been transported here by ice. From the Castle Pirnie turning onwards, the road is on a level terrace and you can see a terrace at the same height across the valley to the west. There are many more large boulders on the hillside (till) than on the terrace (glaciofluvial sand and gravel). Once past the farm there is a good view across the glen to the hummocky slopes below Carn Mor.

Continue to the sheep pens [NO 0477 6565] where a tributary stream flows at a low angle along the slope, rather than straight down the hillside. Across the glen is a similar low-angle stream channel (dotted line in photo below). These are marginal meltwater channels marking the position of the end of the Fearnach glacier as it paused during retreat.

In the valley bottom a series of terraces have formed as the Fearnach river has successively cut down through glaciofluvial sediments. These terraces are clearly seen farther north up the valley.

Return by the same route.

## How thick was the ice?

The stepped form of the western side of Creag Dubh-leitir results from differential erosion. The metamorphic rock layers dip gently east; harder layers, including pegmatite sills up to 3m thick, stand out as near-horizontal shelves between softer layers which were more easily eroded by ice flowing south down the glen. This erosion is evidence that ice once filled Glenferinate up to at least the 500m contour.

## Figures

(Front cover)

(Figure 1) Location map.

(Figure 2) Psammite, Foliated grey granite, metamorphic rock, pink microgranite.

(Figure 3) Glacial features.

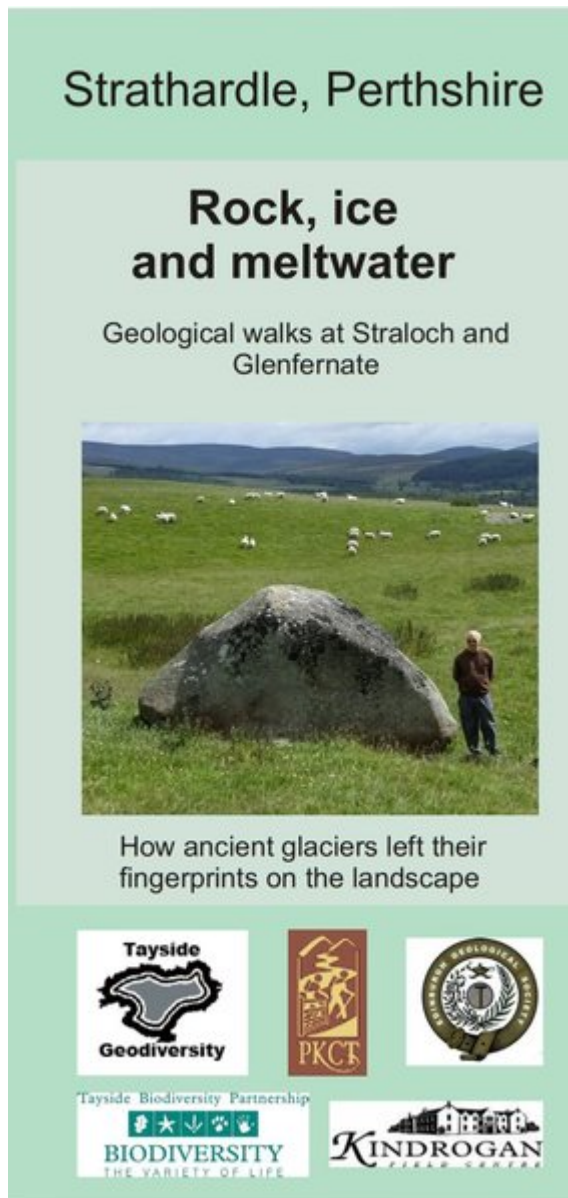
(Figure 4) Map showing walks; Map of solid and glacial geology.

(Figure 5) Walk 1. Photographs.

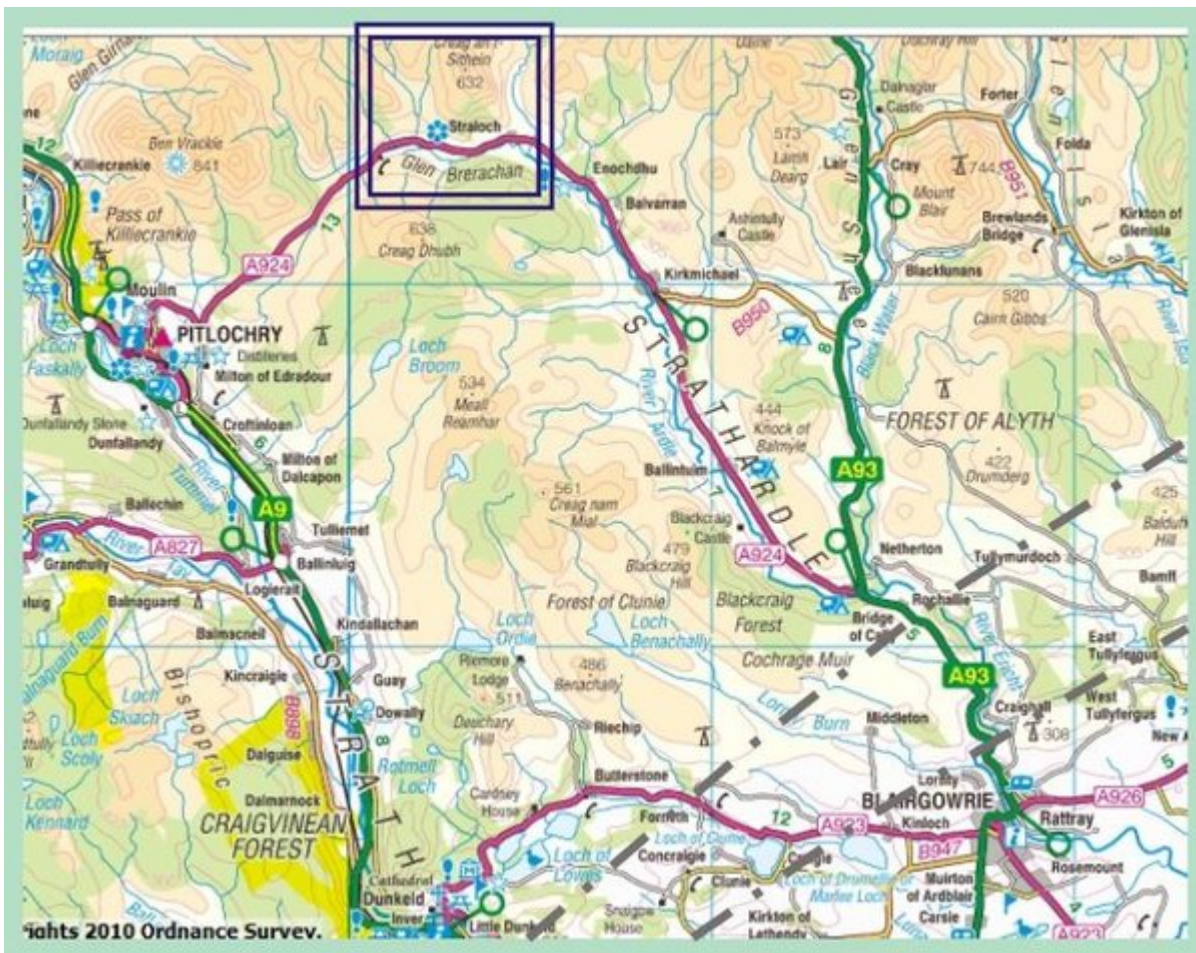
(Figure 6) Walk 2. Photographs.

(Figure 7) Walk 3. Photographs.

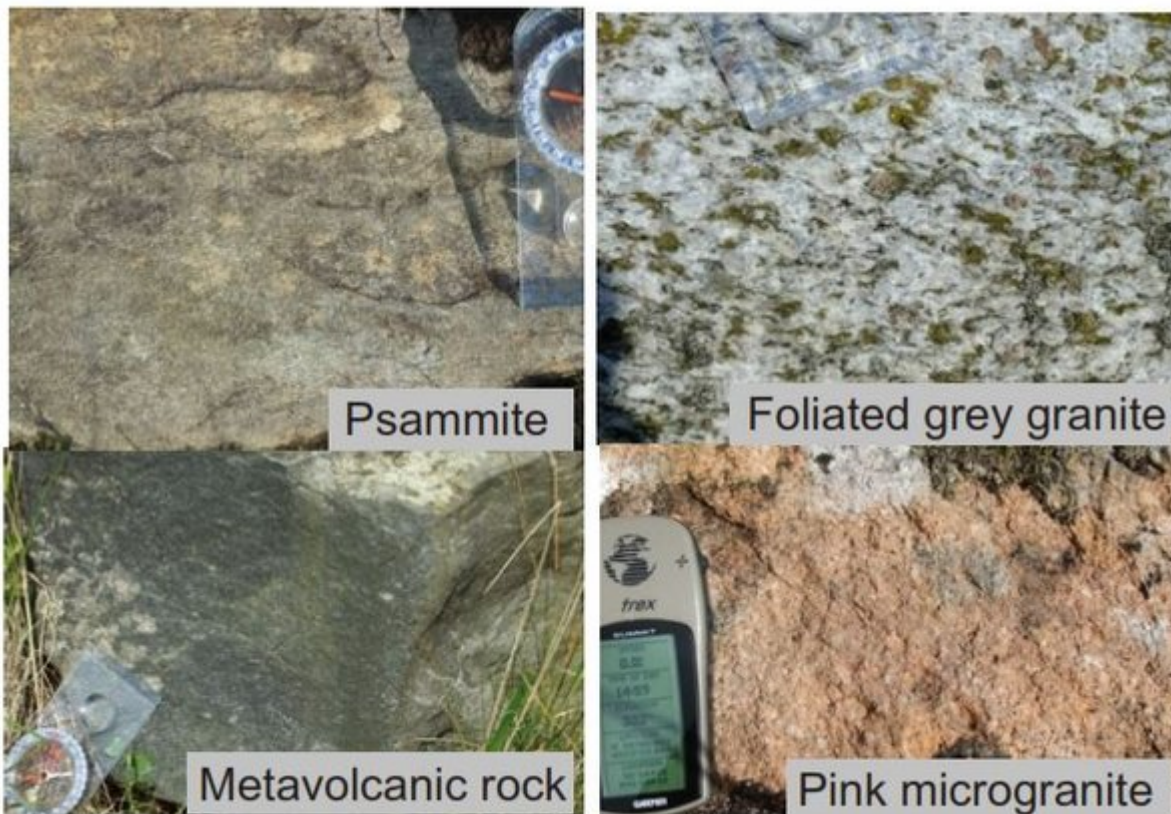
(Figure 8) View east to Creag Dubh-leitir.



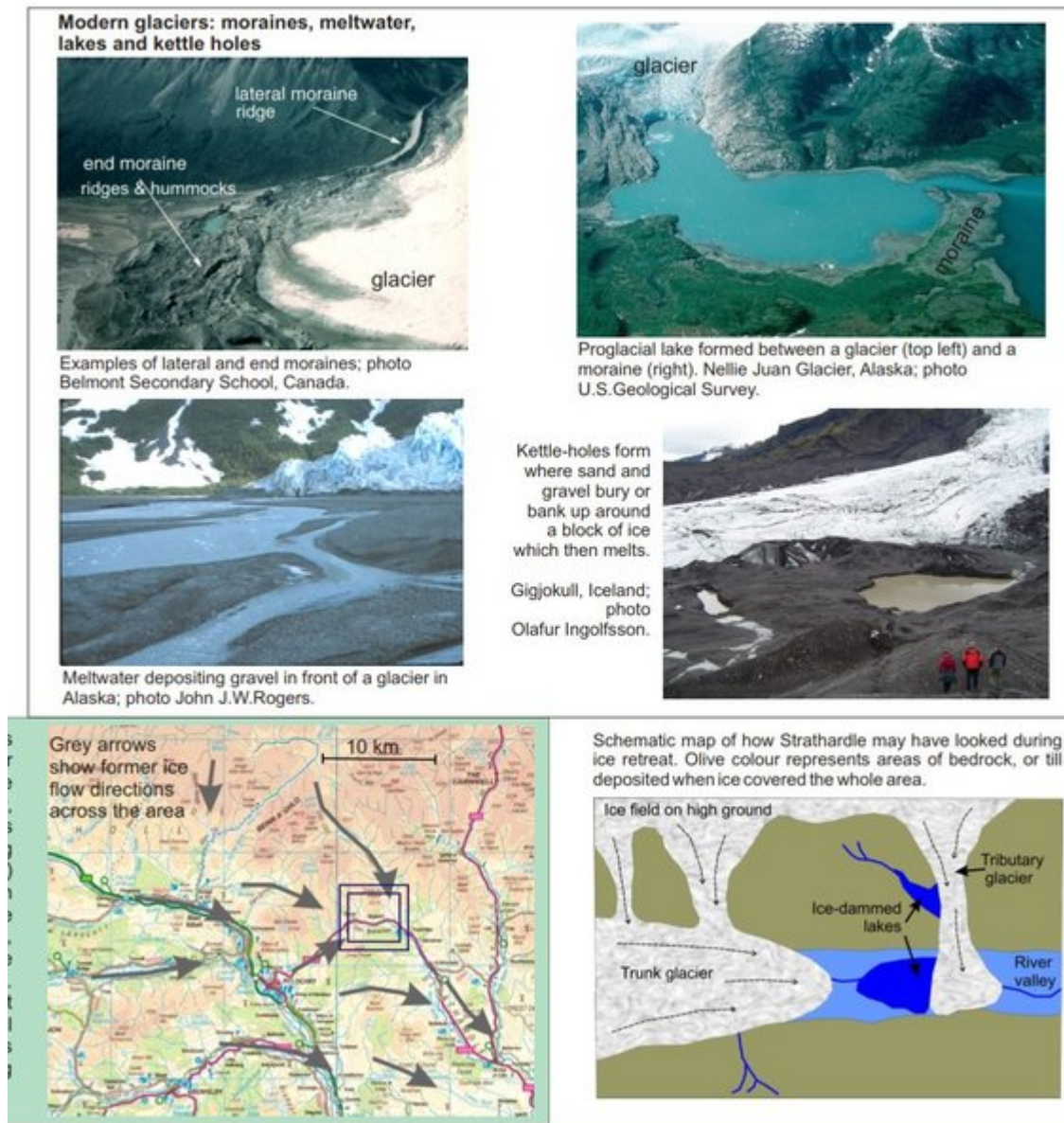
(Front cover)



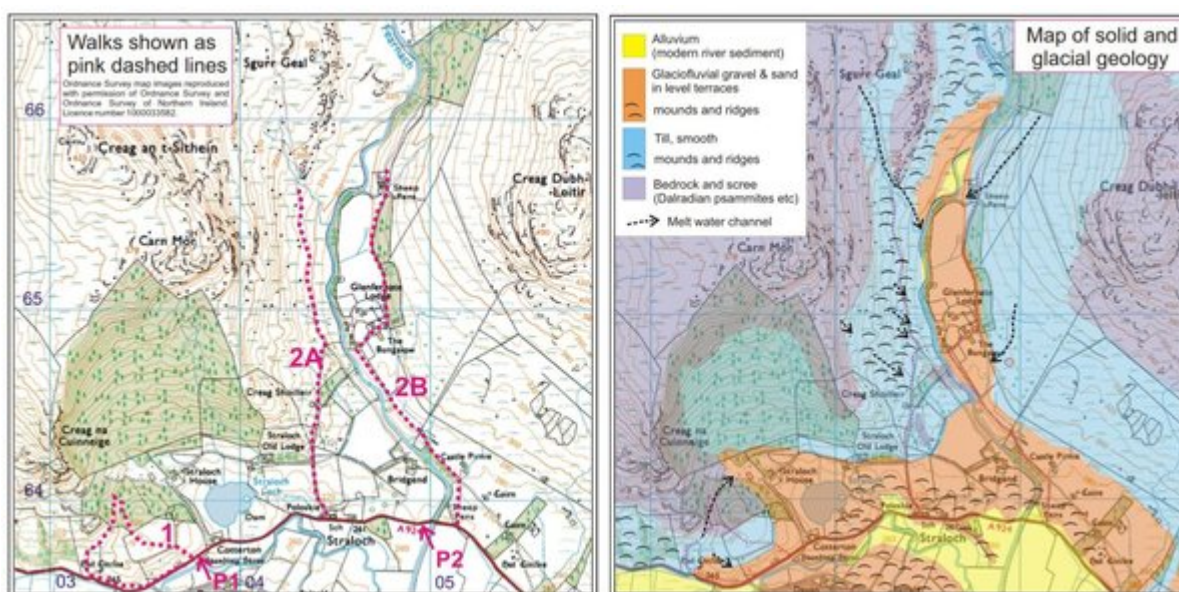
(Figure 1) Location map.



(Figure 2) Psammite, Foliated grey granite, metamorphic rock, pink microgranite.



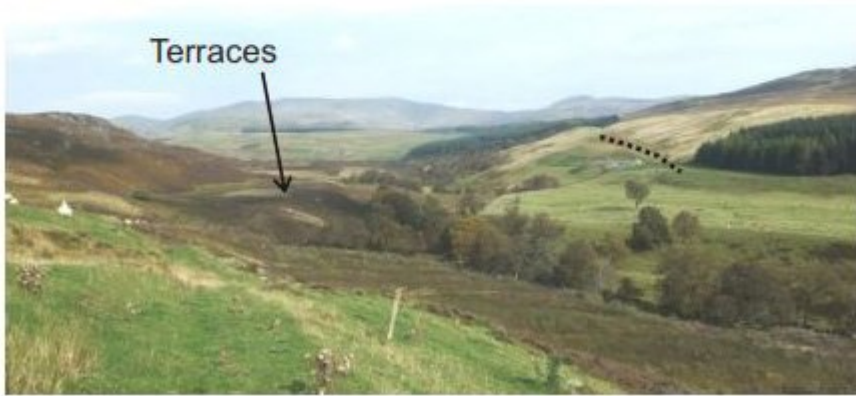
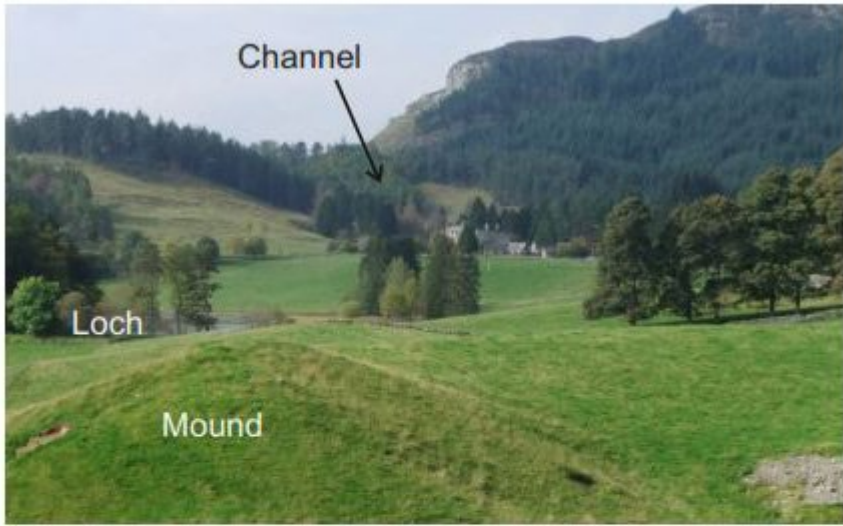
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(Figure 5) Walk 1. Photographs.



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*(Figure 7) Walk 3. Photographs.*



*(Figure 8) View east to Creag Dubh-leitir.*