PREFACE

This book is for all who want to truly explore Lakeland. For those who when they are out walking would like to understand how the fascinating rocks and landscapes of Lakeland have formed. It is for the enquiring, the curious, the appreciative residents and visitors who want to know when and how it all happened. You don't need to have a good knowledge of Earth Sciences to be comfortable using this book. Interested amateurs will find much to interest them, and professionals may be introduced to aspects or localities which enhance their knowledge.

We begin with an introductory chapter which sets the scene for the individual excursion chapters and tells the fantastic story how the rocks and scenery of Lakeland have evolved. There are 17 walks, ranging from Carrock Fell in the north to Arnside on Morecambe Bay in the south and from St. Bees in the west to the Pennine edge in the east. The walks include easy, half day lowland routes as well as all day demanding routes on the fellsides. Each chapter is self contained and all have been walked by volunteers to check rigorously the accuracy of our route-finding instructions. Details of parking locations are given. The Glossary gives brief explanations of terms that appear in bold in the text. Up to date details of museums and how to contact them are provided together with other sources of further information.

We hope this book will enhance your enjoyment of the lovely landscapes of Lakeland and its surrounding area, one of the jewels of the English countryside. Please help to maintain and conserve them. At a practical level, please drive carefully, park vehicles considerately, close farm gates and don't leave any litter!

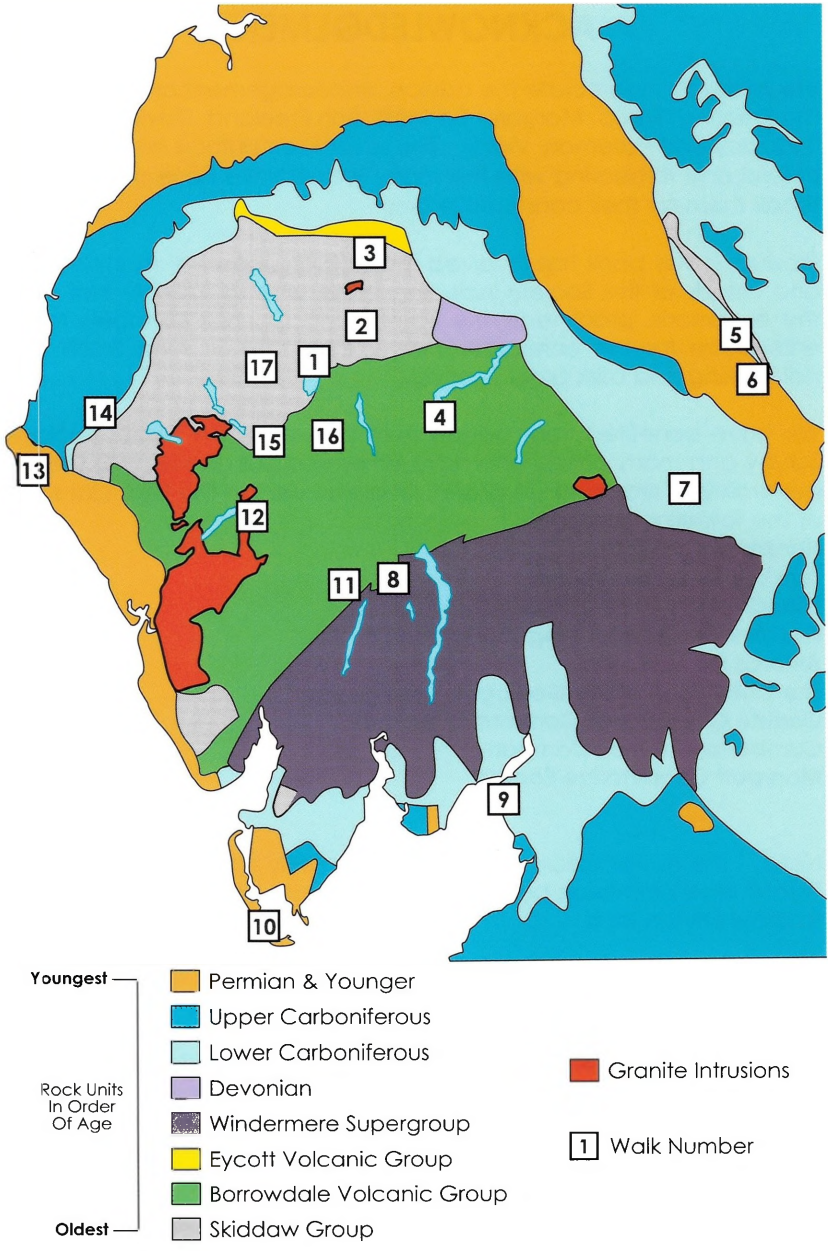

Figure i. Geological map of Lakeland.

Rivers from a landmass to the north brought down huge volumes of sediment, which built up on the shallow seafloor and eventually supported the luxuriant exotic forests of the Carboniferous Period. The trees and other vegetation of these forests accumulated as great thicknesses of sediments which changed after they had been buried and compressed to form valuable coalfields. These Carboniferous rocks of limestones, sandstones, shales and coal form an extensive but discontinuous ring around the Lake District (see Figure i).

Our tectonic plate continued to move and eventually all the landmasses were assembled to form the huge supercontinent of Pangea straddling the equator, with "Britain" surrounded by land and experiencing a hot arid climate. These uplands were eroded by flash floods to form the Permian **brockrams** or **breccias** which are now found in the Vale of Eden (Walk 6). Along with red (desert) shales, sandstones and evaporates which are normally highly soluble salts, these coarse sediments were laid down between 300 and 250Ma but dating of these particular rocks is so very difficult due to the lack of fossils. During the succeeding Triassic Period (250-200Ma) conditions were very similar – Walk 13 visits these. The Triassic is the last Period with extensive outcrops in Cumbria.

From this time (c200Ma) forward until near the end of the Great Ice Age there is virtually no record in the Cumbrian rock sequence. Sediments were almost certainly deposited but were removed by erosion. During this 200 million year interval the Atlantic Ocean has opened and the plate carrying Britain had travelled north to reach its present position.

The Cumbrian landscape was significantly modified during the Quarternary Period (2.6Ma to 10 000**BP**). This was the time of the Great Ice Age, a time of multiple ice advances and intervening warmer **interglacials**. The last main ice advance was the late Devensian (26 000-13 000BP)[2] the effects of which dominate

2 These dates are constantly being reviewed.

present day relief. Glacial erosion, mainly by valley glaciers but also in part by temporary icecaps covering Cumbria, was the major process in the Lake District fells. The main valleys were overdeepened, but with long, narrow, ribbon lakes like Coniston filling their basins.

Valley sides were straightened with the spurs or ridges separating tributary streams being trimmed off by moving ice. Tributary valley floors now "hang" high above the main valleys. Many of these tributary streams now rise in **corries**, deep armchair shaped hollows, excavated by valley glaciers. The corries are flanked by **arêtes**, narrow knife edge ridges like Striding Edge, formed when adjacent valleys were deeply eroded. Walk 4 in the Ullswater area and Walk 11 at Tilberthwaite visits such features. **Moraines**, other glacial **drift** and meltwater landforms are much smaller scale features of the valleys. Walk 1 beside Derwentwater, looks at these features, which are mentioned in other walks.

The Cumbrian lowlands, especially north and west of the Lake District, where there are thick layers of drift or **till**, have been mainly influenced by glacial depositon. **Drumlins**, long, low, blunt-ended hills of glacial drift sweep round from the Vale of Eden through the Carlisle Plain into West Cumbria, reflecting the direction of movement of ice sheets. Rather featureless masses of sand and gravel, laid down by meltwater from the ice, cover large stretches of the lowlands. Stream courses have been disrupted by diversions of drainage due to ice, the best known being the diversion of the River Derwent at the foot of Bassenthwaite. Walk 10 on Walney Island and Walk 13 at St Bees visit such landscapes.

Appropriately we are deeply concerned by the prospect of global warming due to man's activities, yet there remains the very real prospect of another major ice advance, but not in our lifetime.

Walk Number 1

Keswick Landscapes

by Margaret Bennett

Purpose	To look at glacial features in the landscape near Derwentwater.

Practical Details

Starting Point	Car park by The Theatre by the Lake, Keswick.
Walk Description	6-8 km easy, low level walk on good paths.
Maps	1:25 000 OL4 The English Lakes North Western area. 1:50 000 Landranger sheets 89 or 90.
Public Transport	Bus to Keswick bus station.
Public Toilets	Car park at beginning of walk.
Refreshments	Snacks available at Theatre by the Lake. Many cafes in Keswick.

GEOLOGICAL BACKGROUND

The Borrowdale Valley was excavated by ice in rocks of Ordovician age, the older Skiddaw Group to the north and west and the younger Borrowdale Volcanic Group in the south and east. The evidence of the most recent ice advances falls into two groups. One group of landforms is due to advancing ice moving down the valley. The second group of landforms is deposits formed as the ice retreated or wasted away. The advancing ice excavated the lake basin and deposited **drumlins**. The retreating ice left behind landforms best seen around Calfclose Bay.

EXCURSION DETAILS

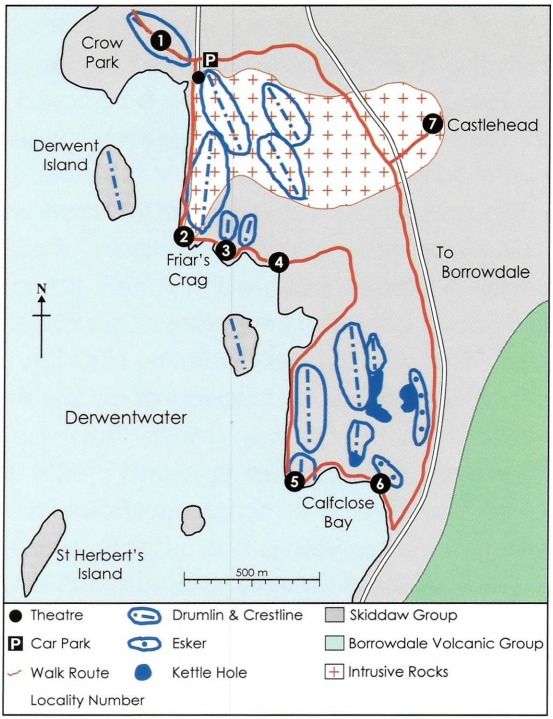

Figure 1. Excursion map.

Crow Park is across Lake Road from the car park (NY 265 229). Enter by the low gate nearest to the Theatre and walk to the crest of the low hill (300m). This, ***Locality 1*** (NY 265 230), is a drumlin, a long, low, rounded, streamlined oval mound, locally aligned southeast to northwest along the direction of ice movement Drumlins probably formed when moving ice, moulded subglacial material of various origins, shapes and sizes. Lord's Island and Derwent Isle, are partially submerged drumlins. From this vantage point you can look up Derwent Water with its lush wooded shores, to the Jaws of Borrowdale, where the valley narrows as it enters the Borrowdale Volcanic Group outcrop. The whole of the western shore is on the Skiddaw Group Rocks (Ordovician 475 - 460 **Ma**). The eastern shore from about halfway down the lake is on Borrowdale Volcanic Group rocks (460 - 450 Ma).

Leave Crow Park by the gate you entered. Follow the path for about 800m to the end of Friar's Crag, See Figure 2. This crag is ***Locality 2*** (NY264 223), and is thought to be named after the 8th Century Saint Herbert, who lived on St. Herbert's Island in the lake. This crag is where his followers stood by the lake and received his blessing. The crag is part of a diorite **intrusion** which can be seen quite clearly at the end of the viewpoint, though it is badly weathered and, in places, covered in lichen. It is a fine-grained igneous rock, rich in iron and magnesium which gives the rock its dark colour. The contact between the intrusion and Skiddaw Group rocks can sometimes be traced just above the high-water line. The intrusion resisted erosion more than the surrounding rock, and may form the core of a drumlin, with the up-valley end eroded by the lake. This feature is known as a crag and tail, with a steep slope up valley, but a gentle slope down valley where deposited material remains. The intrusion also outcrops in Cockshot Wood and north of Friar's Crag where again it forms the core of drumlins, and on Castle Head across the Borrowdale Road.