



National
Trust

The Geology of Borrowdale

A history by Andy Warner

So how did Borrowdale come to be? Well, this is a story that is about 500 million years old and it is a story that is never ending, it will stretch all the way to eternity. I think we are talking epic here!

In the beginning...

Picture a warm ocean lapping at the shores of a long-lost continent. As the shores of the land mass eroded, and as riverbeds washed out into the sea, the resulting sediment was laid, layer upon layer, on the ocean bed. Its own weight compressed it until it became solid rock. It was all very calm, very gentle, and it took about 50 million years. These became the earliest rocks of what was to become the Lake District. Today we call them the Skiddaw Slates. Meanwhile deep below the ocean something stirred... the tectonic plates were on the move! The huge plates that underlie the earth's surface were converging, and the results were cataclysmic. Enormous friction produced a massive build up of heat and exerted huge pressure on the surface rocks - the bed and shores of the ancient ocean erupted with apocalyptic violence. The effects were staggering. In the course of a few million years (just a blink in geological time) a layer of rock estimated at 20,000 feet thick was formed. It comprised hard lava beds interspersed with softer bands of ash and boulders called tuffs. Today it is known as the Borrowdale Volcanic Series.



The two rock types. To the left, craggy, rugged Borrowdale Volcanics. To the right, sleek, smooth Skiddaw Slates

A tale of two rocks

The characteristics of the two rock types are completely different. Skiddaw Slate is a very brittle sort of rock breaking down very easily into thin shards. The fells formed from Skiddaw Slate tend to be smooth and sleek. The fells of the Newlands valley and Skiddaw itself are prime examples. Borrowdale Volcanics, on the other hand, are almost as hard as granite, and tend to break down into large blocks. They are very resistant to external forces. The Volcanic fells tend to be much rougher, with rugged, craggy slopes reflecting the resistant nature of the rock. The head of Borrowdale is wholly composed of these harder, stronger rocks.

So the rocks of Borrowdale and Newlands had been laid, but there was still nothing that could be recognised as the valley we see today, nor of the Lake District as a whole. And it would be wrong to assume that any of this occurred in the place we now call Cumbria. It actually happened several thousand miles away somewhere in the southern hemisphere. The Lake District had a lot of travelling to do before it would reach its present resting place!

Building mountains, forming valleys

Over the course of the next 300 million years the area underwent several periods of uplifting and subsequent submergence. During submergence more sedimentary rock would be laid, whilst during the mountain-building periods stress faults appeared in the bedded rock, and the high ground was dramatically eroded by the elements. During these times the erosion was so great, even the deep underlying Skiddaw Slates were eventually exposed. Finally, a mere 70 million years ago, there was one more massive period of convulsion, the "Alpine" mountain building movement. This time a huge dome was pushed up with a summit centred on what is now known as the central massif of the Lake District. This period produced a distinctive north/south faulting system which is the general axis of Borrowdale today. Faulting was complex, including fault lines from previous periods of uplift, which in turn would have been distorted and disrupted by the new faulting. Together though they started to drain the dome and eventually they would develop into the distinctive valley systems of the Lake District.

The Ice Age arrives

One final major factor was needed to create the much loved landscape that we enjoy today. The Ice Age started a mere 2 million years ago, and in the geological timescale it has only just finished. Unmelting snow, built layer upon layer on the upper levels of the eroded dome formed great ice fields that finally spilt as they started to grind their way down the fault line valleys. Descending under the huge pressure of their own massive weight, the

glaciers' destructive power was awesome. And yet from all this anarchy, something supremely beautiful was being created. Gouging and grinding, ever deeper, ever wider, scouring the fellsides, it was the ice that sculpted the fells of distinction and character, the dramatic crags and waterfalls, the mysterious "hanging" valleys, the lovely lakes and tarns, and the stunning "U" shaped valleys that we see today.

What next?

The Ice Age ended about 10,000 years ago, but the story continues. Currently we appear to be in a post-uplift period of erosion, but the tectonic plates still keep moving. Will continental drift continue to effect the Lake District as it has in the past? What effect will climate change have on the area? Are we still in an Ice Age? Is this just a temporary warming? One thing is certain; change will continue to happen, for geology never stops.