SAFETY AND AWARENESS

- **Forge Valley Woods National Nature Reserve is a Site of Special Scientific Interest (SSSI) and is protected by law. Do not disturb the flora and fauna.**
- **Enter the quarries with care and do not approach the quarry faces unless you are wearing a safety helmet.**
- **Collect only a small number of fossils from loose material on the quarry floor. Do not use a hammer on the quarry face and do not damage the drystone walls. Please keep detailed records of each fossil, stating where it came from with photographs and drawings.**

Forge Valley Woods National Nature Reserve is owned by Scarborough Borough Council and managed in partnership with English Nature.

This leaflet is a joint production of Scarborough Borough Council, English Nature, Dinosaur Coast Project and the North York Moors National Park Authority.

For further information go to www.dinocoast.org.uk

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ENGLISH NATURE

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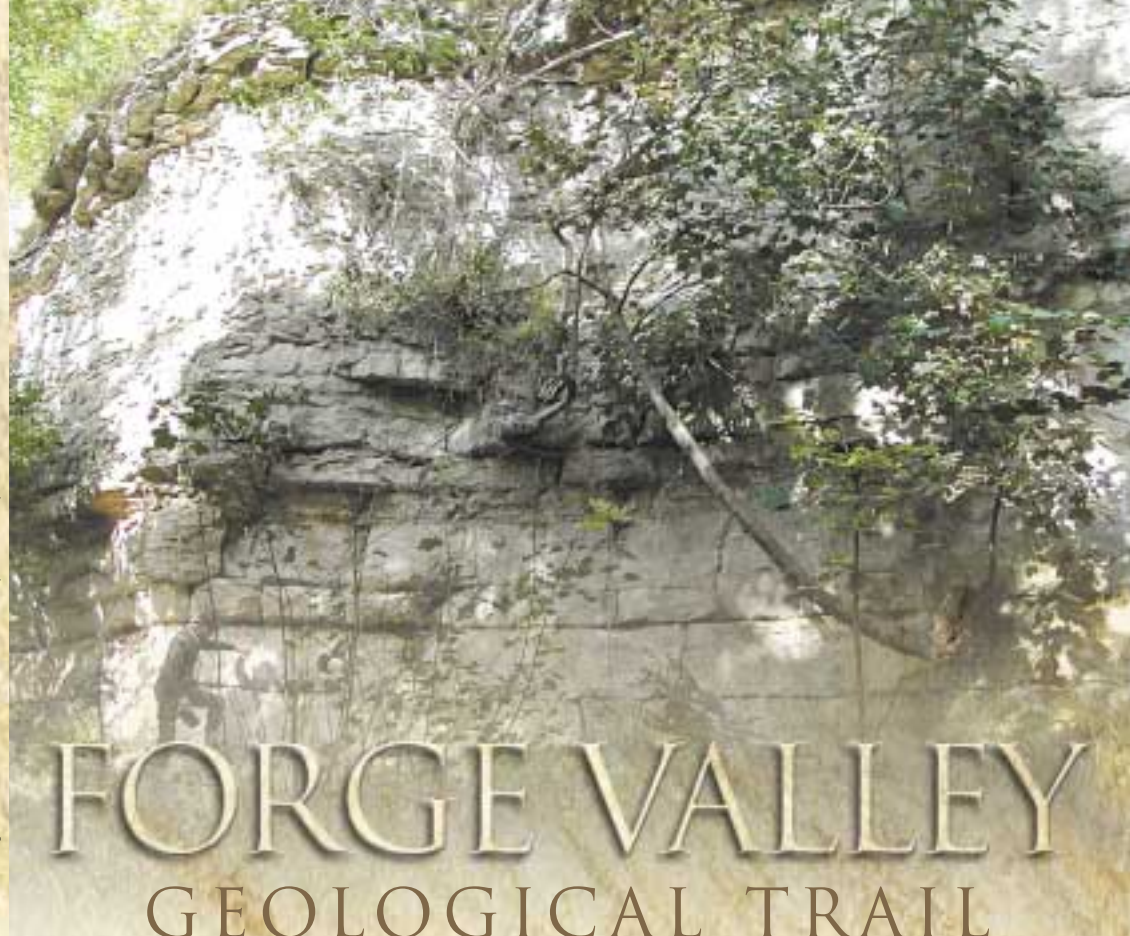


FORGE VALLEY
GEOLOGICAL TRAIL
ICE, ROCKS AND LANDSCAPE

Discover the fascinating geological secrets of Forge Valley Woods National Nature Reserve.

165 MILLION YEARS IN A DAY

Walking through Forge Valley Woods, it is hard to imagine the changes that have taken place since the Age of the Dinosaurs. From the sub-tropical seas of the Upper Jurassic Period to the arctic conditions of the last Ice Age, these changes have given rise to the present day landscape with its familiar plants and animals. Follow the Geological Trail and walk through time to discover some of the secret past of Forge Valley.

During the Upper Jurassic, warm shallow seas covered much of the UK. Ammonites and marine reptiles swam over a seabed rich in corals and a wide range of shellfish. Over the next 165 million years, geological periods came and went, burying the Jurassic rocks deep below the earth until major earth movements, erosion and weathering exposed them to the surface again. The last major episode of erosion took place during the Ice Age (about 170,000 years ago) forming the valley we see today.

In more recent times, iron smelting took place in Forge Valley giving the valley its name. Iron ore was brought in to take advantage of the charcoal made from the woodland. Today, the River Derwent meanders through the over-sized valley, cut long ago by glacial melt-water.

The waymarked trail follows a linear route through the woodland and valley base on the east side of the River Derwent. It can be joined from any of the car parks between Green Gate and Seave Gill, but we do recommend you follow the route described in this leaflet.

Upper Jurassic ammonite

YOUNGEST ROCK

OLDEST ROCK

GEOLOGICAL COLUMN

The solid rocks in Forge Valley are all of Upper Jurassic age. The oldest beds are from the Osgodby Formation (at the bottom of the column). Above the Osgodby Formation, in ascending order are the Hackness Rock, Oxford Clay, Lower Calcareous Grit, Passage Beds and the Hambleton Oolite. The Geological Trail goes from the Lower Calcareous Grit into younger rocks.

Ma = Millions of years

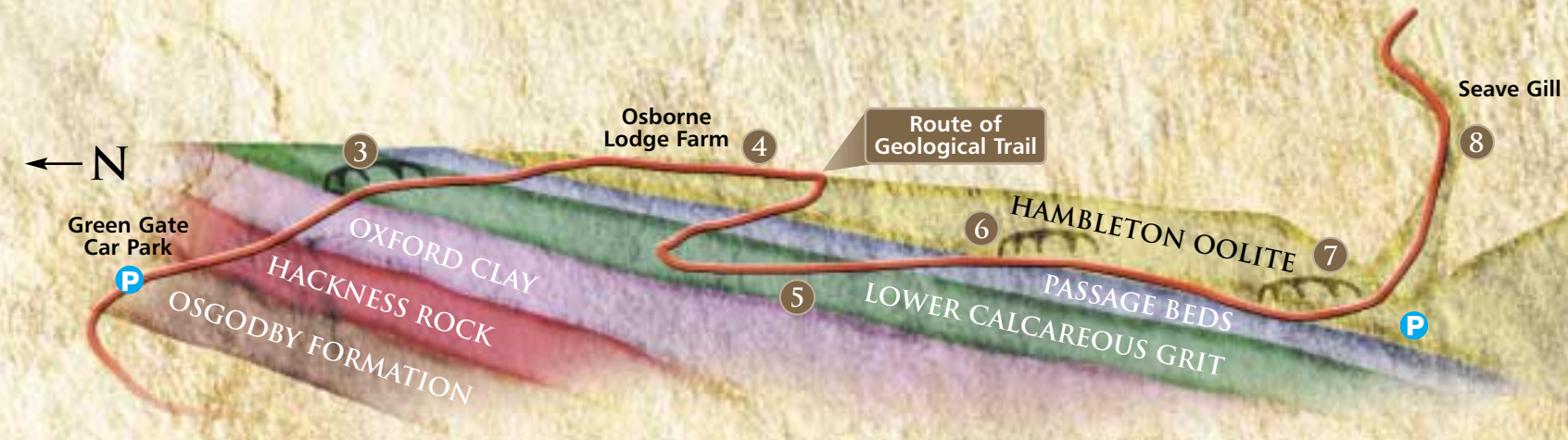
PALAEOGEOGRAPHY OF THE UPPER JURASSIC

During the Upper Jurassic, Britain was situated in the subtropics, much further south than today. The sea level had risen, flooding the coastal deltas of the Middle Jurassic to form shallow seas rich in life.

Low-lying land

Shallow sea

Deeper sea



FORGE VALLEY
GEOLOGICAL TRAIL

1 OLD MAN'S MOUTH

The trail starts at Old Man's Mouth car park overlooking the River Derwent. This beautiful and unspoilt river flows through Forge Valley to be diverted away from the sea westwards through the Vale of Pickering and into the River Ouse in the Vale of York. The Derwent supports an abundance of wildlife (as shown on the interpretation board near the footbridge) and is one of the best examples in the UK of a lime-rich clear water river.

2 HAZEL HEAD

Here, the picnic area gives good views over the northern end of the Vale of Hackness, where the river enters Forge Valley. During the Ice Age the path of the river east to the North Sea was blocked by sea ice. The dammed melt-water flowed into the vale forming a lake, Lake Hackness. The level of water rose to well above the present viewpoint. Eventually, a mighty glacial torrent burst through a low point and plane of weakness in the rocks and carved Forge Valley.

Between Hazel Head car park and Whetstone Quarry, the track crosses over the Osgodby Formation and Hackness Rock as you ascend up the slope. Close to the woodland interpretation board springs flow out across the path, giving rise to an alkaline-rich flora, which supports a number of rare species.

3 WHETSTONE QUARRY

Rock was quarried from here to make grindstones for sharpening tools. The rock is formed of the Lower Calcareous Grit, a lime-rich sandstone formed 165Ma ago in shallow sub-tropical seas. Fossil seashells can be found here along with the fossil infilled burrows of ancient crabs (*Thalassinoides*). Over time, most of the lime has been leached out of the rock to leave a predominantly acid sandstone. The rock beds in Forge Valley dip at an angle of 5° to the south. Therefore, as we walk south along the Valley we will be travelling through time over younger and younger rocks, until at Seave Gill the youngest solid rocks (the Hambleton Oolite) meet the level of the river.

© Craig Ralston

Follow the path up from Whetstone Quarry to the viewpoint and interpretation board explaining the geological history of Forge Valley.

4 OSBORNE LODGE FARM

The drystone wall around the farm is made up of the Lower Calcareous Grit seen at Whetstone Quarry. Fossil seashells can be found preserved in the stones forming the wall. Do not damage the stones or the wall as you look for fossils. The farmland lies over the Passage Beds and Hambleton Oolite, both of which give rise to shallow lime-rich soils ideal for cereal crops.

In walking down the trail to the middle path, passing through primrose and bluebell woodland, you have gone back in geological time to older rocks exposed at Whetstone Quarry.

5 THE MIDDLE PATH

The low outcrop in the left hand side of the path just past the hairpin bend is of Lower Calcareous Grit. Due to the 5° dip of the strata, the beds exposed at Whetstone Quarry are again exposed in a number of places here on the middle path. The overlying Passage Beds are exposed some 40m before the path enters Wallis's Quarry.

6 WALLIS'S QUARRY

Wallis's Quarry is cut into the Hambleton Oolite, an oolitic limestone made up of tiny bead-like grains. The rock was quarried for lime and building stone. 160 million years ago these sediments were laid down in a shallow coral sea similar to that of the Bahamas today. Fossil seashells with crystals of calcite may be found amongst the pieces of rock on the quarry floor.

7 WHITESTONE QUARRY

The Hambleton Oolite outcrops both in Whitestone Quarry and Seave Gill. Here the oolite is more massively bedded than at Wallis's quarry and the bedding and joint planes may be clearly seen. The joint planes form two sets of vertical cracks and fissures between the near horizontal bedding planes. Large quantities of water from the River Derwent are lost into these planes (also known as swallow holes) where the Hambleton Oolite dips down below the river level.

8 SEAVE GILL

Seave Gill is a minor glacial outwash channel and was cut by the torrential waters draining from the melting ice fields on the high ground to the northeast. The waters exploited joint planes in the Hambleton Oolite, cutting a sinuous channel through the bedrock to form a miniature canyon flanked by cliffs of solid rock. From the small fence near the top of the Gill, the opposite cliff shows where the channel water has scoured a concave base to the solid rock forming a superb meander. Above the top of the Gill two shallow melt-water channels either side of a domed hill can be seen. The Gill forms a specialised habitat for wildlife and supports an unusual flora dominated by ferns, liverworts and mosses.

GEOLOGICAL TRAIL

Distance: *4-5km.*

Description: *A moderate walk, mostly woodland paths with some steep sections. Follow the waymarked trail, which can be muddy after rain. Wear stout shoes and suitable clothing.*

Time: *2-3 hours.*