Funded by Defra's Aggregates Levy Sustainability Fund, administered by English Nature.

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Earth Science background information for KS2 teachers using Dryhill Nature Reserve

The story of Dryhill Nature Reserve is told by the evidence contained in its rocks. The evidence to explain the sequence of events that took place over millions of years is there for you and the children to find. The Teaching Trail Notes list the Key points to investigate:

We are looking for three lines of evidence from these exposures of rock:
1 – to find out how the rocks were formed.
2 – to find out what happened to the rocks after they were formed.
3 – to find out what is happening to them today or in the recent past.

Summary of the Geological history

The rocks of Dryhill consist of alternating layers of hard sandy limestone [called "rag" or "Kentish ragstone"] standing out from soft sandstone [called "hassock"], which is less resistant to weathering and erosion. Individual beds vary in thickness from a few centimetres up to a metre. They belong to the Hythe Formation, one of four sub-divisions of the Lower Greensand, deposited during the Cretaceous Period. The name "Greensand" was used by William Smith in 1815 as the rocks contain glauconite, a green mineral. The Greensand hills form distinctive scenery around the Weald.

Time Sequence Of Events

* 142 – 120 million years ago, during the earliest part of the Cretaceous Period, this part of Britain lay at about 40^{o} North of the equator. The large "Wealden" lake covered the area and steadily filled with sands and clays brought in by rivers. Apart from fresh-water shells, the fossils include plants and dinosaurs. These rocks lie beneath Dryhill and outcrop at the surface further south, in the Weald.

* 120 to 110 million years ago, later in the Cretaceous Period, sea level rose over much of what is now southern England and rivers were eroding a landscape which lay to the north and east. The sand and mud brought by the rivers was swept along by currents in the shallow sea. Many creatures lived in the sea. When they died their soft parts were eaten or decayed, and their shells were often broken up by the currents, settling on the seabed along with the sand and mud.

* As the layers of sediment built up, they became compacted and water was squeezed out. With so much calcium carbonate [lime] present as shelly material, much was dissolved and carried in solution by the water. This was precipitated as the mineral calcite between the grains of sediment, cementing the quartz sand and clay mud together. This cementation was the most important process in creating the solid rocks, not compaction. Both rock types contain plenty of sand, but the limestones contain more calcite than the sandstones. One likely cause is that the limestones were deposited when there was more shelly material available than the times when the sandstones were deposited. These changing conditions may be the seasonal effects of storms or currents.

* 110 – 65 million years ago, as the Cretaceous Period progressed, sea level rose steadily, flooding more land. At first only fine clay sediment reached this area, forming the Gault clay. Later, with much of Britain flooded, a steady stream of microscopic shelly material fell to the seabed, forming hundreds of metres of Chalk, a very pure limestone. Although much has later been eroded, the Chalk forms distinctive scenery, like the North Downs to the north of Dryhill.

* Earth movements 30 – 25 million years ago caused the rocks of SE England to be folded. This was as a result of the African Plate moving northwards to collide with the European Plate. All the sediments and sedimentary rocks in between were compressed and folded. The most severe effects can be seen in the Alps, with huge overfolds and thrusts. In SE England the folding was more gentle, with the fold axes running east-west. It was at this time that the Wealden Anticline [upfold] and synclines [downfolds] of the London Basin and Hampshire Basin were formed. Dryhill now lies 100 metres above sea level, between the Weald and London Basin, and although its folding is on a relatively small-scale it was clearly involved in this dramatic event.

* Over the last several millions of years the landscape has been weathered and eroded almost to the state we have today, before Man intervened! At Dryhill we can see that the tops of the folds have been removed by erosion long before quarrying began.

* Even though quarrying has ceased, these processes of weathering and erosion are still operating today. The rocks are being weathered by chemical action involving acid rain and acids from the soil soaking into the porous rocks or running off the surface. Physical processes, like winter freeze-thaw, are helping to break down the rocks to form soil, which plants quickly colonise. Rabbits, moles and plant roots further help to break up the rock material. Gravity then carries it downhill to form scree slopes at the base of quarry faces.

* The wildlife and geological features of Dryhill Nature Reserve are conserved for the benefit of everyone. We hope that you and your children will enjoy the visit.

* More detailed information on the geological history can be found in the teacher notes for KS3 and KS4 on the Dryhill (Secondary) pages.

The geological history is summarised in the follow-up notes:

Sequencing exercise on the story of Dryhill. This could be illustrated as a cartoon story.

1. Deposition of sandy and muddy sediment in the sea 115 million years ago.
2. Hardening as layers are compressed and cemented with lime.
3. Rocks are uplifted, folded & fractured by Earth movements as Africa collided with Europe to produce great folds of the Alps & lesser folds of the Weald & Dryhill.
4. Weathering and erosion remove the tops of the folds over millions of years.
5. The present landscape is used by Mankind for farming, quarrying, building etc.