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Recommended preparation prior to field work:

At an early stage, it is advisable to contact the Dryhill Country Park Ranger Service (countryparks@kent.gov.uk) to arrange a date for the visit, to ensure that the gates will be open for a coach to enter the site. A preparatory visit is essential, not only to familiarise yourself with the Earth science aspects but also the wildlife potential of the site.

It is assumed that, prior to this visit, schools will have already undertaken class-based activities related to rocks and possibly soils. The following packs, published by ESTA, were written to support the QCA Guidance, Unit 3D Rocks & Soils. These, and the additional activities listed, will give teachers and pupils a useful vocabulary and introduce Earth science concepts in a practical way. Many can then be put into context by investigating the ancient world largely hidden in the rocks beneath our feet. "Working with Rocks" provides useful background on the rock cycle and explains the terms igneous, sedimentary and metamorphic rocks. In both packs porosity and permeability are clearly defined. The UK Geology Wall Map, published by the Ordnance Survey would be useful additional reference material. Teachers may wish to introduce soils as part of the field visit, collecting samples for later investigation.

'***Working with Rocks'*** includes the following activities:
1. Sequencing – Story of a marble gravestone [literacy];
2. Sorting rocks – using different criteria, incl texture, colour;
3. Rock identification – using key terms as clues, introducing names of common rocks;
4. Testing rocks – testing for porosity, permeability and "hardness". Making wells;
5. Weathering – how to weather your own rock by freeze/thaw;
6. Use of rocks – devising a town trail & showing the use of building materials.

'***Working with Soil'*** includes the following activities:
Science/Geography:
1. Looking at soil - see, feel, smell, content & properties;
2. Separating soils - by sieving dry;
3. Separating soils - by settling in water;
4. Porosity - water held in pore spaces;
5. Permeability - rate of water draining through;
6. Soil erosion - with or without vegetation cover?

There are also four Literacy and five Numeracy activities based on a storybook about a family of worms! Work on maps includes scale and compass points.

Additional activities:

1. To model layering in sedimentary rocks by settling in water – a demonstration.
Collect samples of different coloured sand, silt, and a few broken shells. Mix each sample with water in a beaker. Half fill a transparent tank or plastic jar with water. Ask the children to predict what will happen when material is tipped in. Carefully pour one beaker at a time into the larger container. Observe the settling of the sediment. Do not disturb. Pour in another beaker and observe. Repeat, using shells and the remaining samples. Note that clay in any of the samples will remain in suspension, make the water cloudy and take ages to settle. The sediment will be layered. Ask the children which is the oldest layer (the one on the bottom). Which is the youngest layer? (the one at the top).

Geologists call this 'the Law of Superposition' and it helps them to work out the order of a sequence of events as shown by the rocks.

2. Fossils. As fossils may be seen on the visit, it will be useful if the children have some idea what they are.
"A fossil is the remains or trace of an animal or plant which lived in the distant past and is now found preserved in rocks. A body fossil is the altered remains of an animal or plant itself, eg shell, bone, leaf. A trace fossil is the trace left behind by an animal, eg footprint, burrow".
Your local museum may have specimens to loan to schools. There are also many reference books available for children.
See also: Teaching Primary Earth Science Issues 1 – ***Fossils***; and 22 – ***Putting Fossils into the National Curriculum.***
Making plaster casts of fossils is one activity children enjoy.

3. To model geological time. There are several ways of demonstrating the immensity of geological time. The Earth was formed about 4,600 million years ago. Use a paper roll or string to make a time line. At a scale of 1cm to 1 million years it will be 46 metres long. To fit your classroom, you may need to reduce the scale in the oldest part. The names and dates of the geological periods of the last 570 million years, with significant events, are illustrated in column form on the UK Geology Wall Map, published by the Ordnance Survey. The advantage of a column is that older are below younger!

Other comparisons involve using a 24 hour clock or a calendar year.
See also: Teaching Primary Earth Science, issue 43 – ***Geological Time***.

4. For a demonstration on folding in sedimentary rocks see the follow-up notes.

For Teacher Reference
The following issues of Teaching Primary Earth Science provide useful background information for a visit to Dryhill:
1- ***Fossils***; 2 – ***Introducing Rocks***; 3 – ***Soil;*** 5 – ***Using Rocks***, 9 – ***Minerals***; 10 – ***Out and About*** 1; 12 – ***Out and About 2***; 20 – *Out and About 3;* 24 – ***Out and About 4***; 25 – ***Out and About 5***; 37 – *Organising Field Trips*; 38 – ***Spotlight on Limestones and their uses***.

Dryhill KS2 Suggested Follow-up work:
Much material could go into a folder on Dryhill Country Park, being the first part of a wider study, adding later sections on soils, vegetation, wildlife, conservation, recreation and quarrying.

1. Completion of all worksheets.
Map and Site 1: pupil work sheet 1 – The Fenced Cliff.
Site 2: pupil worksheets 2-5 – A close look at Rag & Hassock.
Sites 2 & 3: pupil worksheet 6 – Field sketch of sloping rocks; Folded rocks at site 3.
Site 2: pupil worksheet 7 – Sloping Beds Summary, [**as an alternative to sheets 2-5**]

2. Classroom display of all aspects of the field visit, including maps, diagrams and photographs. A sample of limestone [rag] could be displayed, showing a weathered face and broken to show a fresh face, suitably labelled. A sample may be cut [by an adult with a DIY tile cutter] and varnished to bring out the detail, possibly showing layering within the rock.

3. Investigate a sandstone sample – crush sample to its constituent grains. Put into a clear plastic container half full of water. Shake vigorously for a minute. Allow to stand undisturbed. Sand settles quickly, followed by finer silt, leaving clay in suspension - to settle over a day. Draw sketch & measure the thickness of sand, silt & clay. A similar activity is done with soil samples in Working with Soil [see below]. Put the results into the display, with a sample of the original sand/sandstone and the plastic container used in the investigation. Passing shakers could be encouraged!

4. Demonstrate folding in sedimentary rocks. Strips of thin card [about 8], thick card [3] and 1cm thick foam [2] should be cut, about 30cm long & 4cm wide. Place the strips at random on top of each other and secure with three rubber bands. As it is tricky to squeeze from both ends at once, keep hold of the ends and flex the sandwich. Try a range of combinations of different layering materials. Thin cards slide easily over each other. Thick card fractures in the hinge. The foam both stretches (over the top) and compresses (along the bottom) in the hinge of the fold.
At Dryhill the limestones are hard and when folded the beds fracture, especially at the hinge, like the thick card. The sandstones contain clays and are softer, so when folded the layers tend to slide like thin card, and stretch and compress at the hinge, like the foam.

5. The display could include the UK Geology Wall Map. Sevenoaks is located on the green colouring used to show the distribution of rocks of Cretaceous age at grid reference: TQ 498553. Samples of other Cretaceous rocks could be included, with chalk and flint the obvious ones. Rock samples children collect from further afield could be added to the display, with labels and markers linking the sample to the location on the map.

6. Make a model of the quarries - use plaster to cement sand into hard beds, with loose sand for soft beds, one layer at a time. Half of the model could show a working quarry with small machinery [including narrow gauge railway], the other half as landscaped today [with "vegetation" purchased from toy/model shops].

7. Research into quarrying and uses of rag and hassock - in the local area and further afield. The Kentish Ragstone leaflet produced by Kent RIGS Group is very useful [www.kentrigs.org or telephone Kent office of Natural England 01233-812525]. Ragstone was used by the Romans to build the walls of Londinium as well as the arch at Richborough. It is called ragstone because of the raggy surface when broken. It was later used in churches and houses throughout the area, as well as for rough walls. More recently, because it is the only hard rock easily available in the South East of England, it has been used as an aggregate for roads and concrete. Some was likely burnt in lime kilns for use in agriculture to neutralise acid soils. Take photographs of ragstone used near your school and include in the classroom display.

At Dryhill, the quarrying of the limestone rag was on a relatively small scale, with a narrow gauge railway used to carry the rock to the loading bay at the site entrance. Quarrying ceased in the 1960s. The frontispiece of the Geological Survey Memoir to sheet 287, Sevenoaks & Tonbridge shows an old photograph of a side-tipper truck and railway track as well as folded rocks.
The sandy hassock was likely used for a variety of purposes, including mortar. With such a high lime content it may also have been used in agriculture to neutralise acid soils.

8. Investigate local water supply. Your children will have discovered that there is no surface water at Dryhill, as the sandstones are porous and rainwater soaks into the ground and into the sandstones beneath.

a - from springs where porous rocks overlie non-porous [impermeable] ones.
b - from boreholes and wells in porous Cretaceous rocks, including Lower Greensand and Chalk.
c - from surface reservoirs on non-porous rocks.
"Working with Rocks" has an activity on making wells.

9. 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 140 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

Working with Soil.
If not done prior to the visit, it would be appropriate for the Soil topic to follow the visit even if the school isn't following the QCA guidance, (Unit 3D – ***Rocks and Soils***). The notes on preparation for the visit give details of ESTA's ***Working with Soil*** pack. It is anticipated that soil samples will be collected during the visit from a selecton of localities.