Scout Hut Quarry, Potton

Teaching Pack

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BEDFORDSHIRE GEOLOGY GROUP

bringing landscape to life

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Scout Hut Quarry, Potton Education Pack

Introduction

There are several LGS (Local Geological Sites) across Bedfordshire. These are sites considered worthy of protection for their earth science or landscape importance. Some are chosen particularly due to their educational value.

Bedfordshire Geology Group have produced this resource pack consisting of worksheets aimed at Key Stage 3 and 4 science and geology studies, as well as resource sheets for teachers or older students.

The pack has been designed to aid the teaching of subjects which link to Bedfordshire's rocks and landscape.

Contents

Notes for teachers

This pack provides background information and supporting material for groups wishing to study Bedfordshire's rocks and landscapes.

The contents are outlined below along with suggested uses:

Worksheets

Field sketch	To be completed by students
Sedimentary graphic log	To be completed by students
Questions and ideas to think about	To be completed or discussed

Resource Sheets

An Introduction to Bedfordshire

General information about Bedfordshire's geology.

Field sketch notes

Notes on what should be on a geological field sketch.

How to do a graphic log

Notes on how to create a graphic log in the field.

Case Study: Scout Hut Quarry, Potton

A brief outline of the history of this site.

An introduction to Bedfordshire's rocks

Bedfordshire lies in southeast England, about 45km north of London. Out familiar landscape has been shaped by a series of geological events that have occurred over many millions of years.

The basic geology of Bedfordshire is quite simple: limestone in the northern Ouse Valley and Oxford Clay elsewhere in the north of the county, then Lower Greensand and Gault Clay in bands across the middle, followed by Chalk across the South.

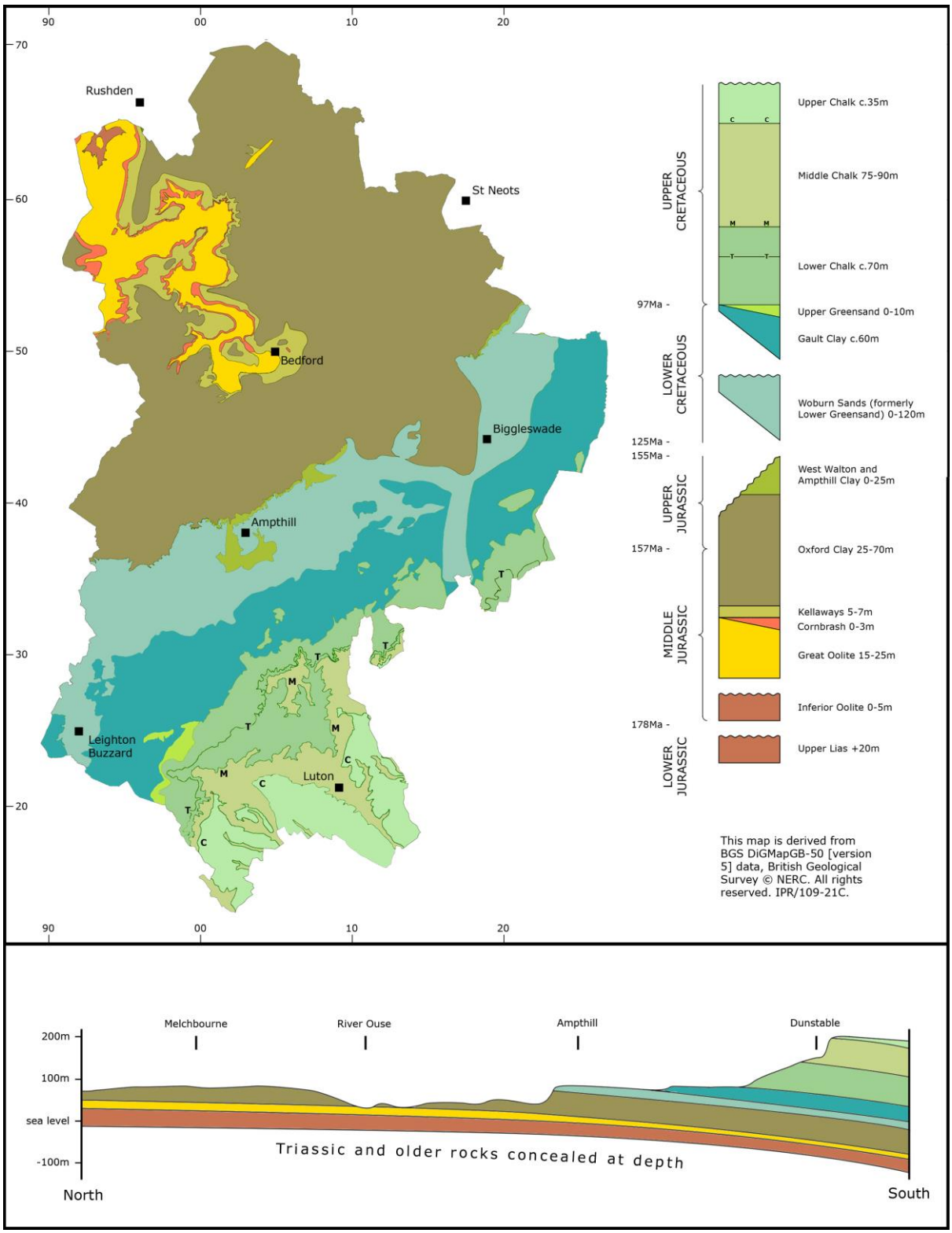
All these rocks are classed as *sedimentary*. Sedimentary rocks form as small pieces of rocks (sediments) or tiny animal shells that settle onto seabeds and, over long periods of time are packed and cemented together in layers. Bedfordshire's rocks formed many millions of years ago; the oldest rocks are over 200 million years old.

Almost all of Bedfordshire's landscape is strongly influenced by the underlying rock. Hard rocks are more resistant to *erosion* (being worn away by the action of weather, ice and water), so stand higher in the landscape.

The north of Bedfordshire tends to be flat where the soft clay has been washed away or scraped away by glaciers during the Ice Age. In the south the Chalk of the Chilterns is not only a harder rock it is *permeable*. This means water can flow down through the rock instead of flowing across the top of the rock and wearing away the surface.

The underlying rocks not only shape the land, but also influence the wildlife and habitats found on it. Gorse and heather favour the free draining soils of the Greensand Ridge, while Rock Rose and Chiltern Gentian prefer acidic chalky soils. The Black Hairstreak butterfly tends to be found along the low-lying band of clay from Oxford to Cambridge feeding on Blackthorn.

An introduction to Bedfordshire's rocks *continued*



Field Sketch

One of the aspects of recording geology in the field is to start from a distance with a field sketch.

Field sketches should include the following:

- As much of the section as possible
- A scale
- A north arrow or indication of what side of the quarry the section is located
- Annotation
- And indication of lithologies (sand, silt, clay, limestone etc.)
- Bedding thickness and general character (e.g. planar, lenticular, channel-like, wavy etc.)
- Sedimentary structures (e.g. ripples, cross-bedding, bioturbation, desiccation cracks etc.)
- Any interesting features obvious at this distant view such as nodules, fossils, iron-staining etc.

Field Sketch of Scout Hut Quarry, Potton

How to do a graphic log:

Graphic logging is a geologist's shorthand for a full description of the rocks present, their thickness, bedding, sedimentary structures and presence of fossils.

Graphic logs can record the whole sequence, or you can choose to record in detail a part of the section. The patterns revealed in a graphic log often assists in interpretations and logs are used to correlate between sites.

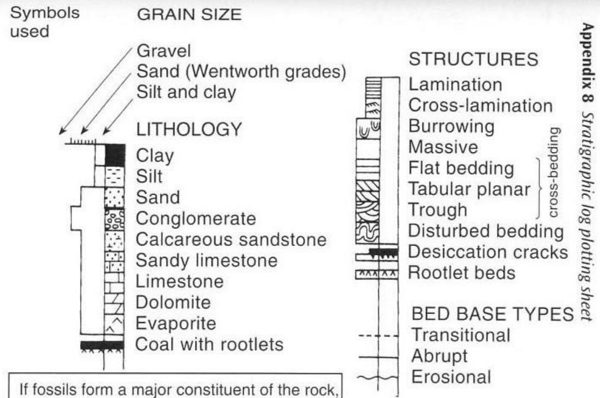
So, where to begin:

1. Decide where you are going to do your log.
2. Always start from the bottom and work up.
3. Choose an appropriate scale.
4. Note the grain size scale at the bottom of the log.
5. From the bottom of the section, determine the grain size of the sediment and hence how far the line is going to project to the right (e.g. conglomerates are coarsest and project furthest and mudstones are finest and project the least).
6. Then measure the thickness of this unit in metres to record this on the log sheet on the vertical line.
7. Mark onto the log all features such as rock type; sedimentary structures, bioturbation etc.
8. Move up the section bed by bed until the log is complete.

Appendix 8 *Stratigraphic log plotting sheet*

Locality					Grid reference	
Unit No.	Thick-ness mm	Grain size	Colour	Other characteristics and remarks	Graphic log (g sand silt & clay)	Scale

Symbols used



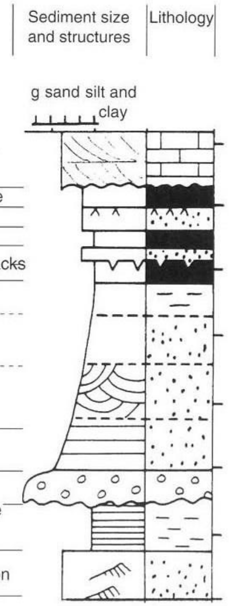
If fossils form a major constituent of the rock, then indicate this in the lithology column

- Brachiopods
- Corals
- Crinoids
- Echinoids
- Burrows/Traces
- Ammonites
- Gastropods
- Bivalves
- Plants
- Roots
- Unidentifiable fragments

Indicate the relative abundance of fossils by giving a % value next to the symbol

An Example

106 mm	Coarse limestone	Grey	Tabular planar cross bedding
16	Coal	Black	Erosion surface
21	Fine sand	Brown	Roots
15	Coal	Black	
14	Finesand	Brown	Dessication cracks
18	Coal	Black	
58	Silt	Dark brown	Lamination
93	Very fine sand	Brown	Massive
106	Medium sand	Brown	Trough cross bedding
74	Coarse sand	Brown	Plane bedding
78	Gravel	Pale brown	Erosion surface
91	Silt	Dark brown	Lamination
78	Coarse sand	Brown	Cross lamination



Questions and ideas to think about

Below are a number of questions and ideas to think about whilst investigating a sedimentary site:

Weathering

Are some rock surfaces crumblier than others of a similar type?

What might have caused the rock surface to crumble?

Are some rock surfaces discoloured when compared with others?

Are plants/lichens found on some surfaces?

What is the name of the processes that loosens and discolours rock faces without removing grains?

Are the rocks lightly, moderately or heavily weathered?

Grains

How big is the largest grain you can see? Estimate the length in mm or cm.

When the sedimentary grains were being laid down, how might they have been moved here _by wind, water, ice or gravity? (Hint: Water-lain grains are glassy and wind-lain grains are not.)

Was this deposit laid down in low, medium or high energy conditions? (Hint: Large grains take more energy to move and deposit them than smaller grains.)

Does the rock have several sizes of grains or just one size? (Hint: The further grains are carried, the more they tend to be sorted out into coarse, medium and fine sizes.)

Have these grains travelled far? (Hint: Grains with sharp corners have not been moved far but rounded pebbles will have travelled a long way; also, the further they have travelled, the more different sorts there are likely to be.)

What does the grain evidence tell you about this sedimentary deposit?

Sedimentary structures

If you were standing here when this sediment was being deposited, what would it have been like?

Would you have been on land or in water?

If in water, how deep? Would you have required a snorkel, scuba gear or a submarine?

Could you have stood up? Would the current have been too strong or the sediment too sloppy?

What would you have been able to see, hear, taste, smell?

Recording

If the site were to be filled in or destroyed, in what ways could the geological information be recorded for future use?

Which of these ways would be best? Why?

Useful contacts and sources of information

Bedfordshire Geology Group	www.bedfordshiregeologygroup.org.uk
Bedford Museum	www.bedfordmuseum.org
The Association of UK RIGS Groups	www.ukrigs.com
The Earth Science Teachers Association	www.esta-uk.org
The Sandpit Project	www.sandpitproject.co.uk
The Greensand Trust	www.greensand-trust.org.uk
Geosupplies Ltd	www.geosupplies.co.uk

The following PDF's are available to download at www.bedfordshiregeologygroup.org.uk**:**

The Building Stones of Bedfordshire: a 32pp introduction to the rocks used in Bedfordshire buildings. Illustrated in full colour. Includes six *Bedrock Trails* describing good places to see rocks in buildings, including Bedford itself.

A4 information leaflets illustrated in full colour:

The Lower Greensand: the basics

The Lower Greensand: for geologists

Ice Age Sand and Gravel: the basics

A4 site leaflets illustrated in full colour:

Ice Age Gravels: Ivel Walk, Biggleswade

(Ice Age Gravels) The River Ouzel: its wild past

Ice Age Landforms:Stockgrove Country Park

Lower Greensand: Mundays Hill Quarry

Lower Greensand: Stone Lane Quarry

Lower Greensand: Tiddenfoot and Ledburn

Lower Greensand: The Lodge, Sandy

Warren Quarry

Lower Greensand: The Pinnacle, Sandy

Case Study: Scout Hut Quarry, Potton

Introduction

The Scout Association privately owns Potton's Scout Hut Quarry. Bedfordshire Geology Group manages it. The site is used as an educational exposure of the Lower Greensand. The site was originally a Victorian building stones and sand quarry that was closed in the 1850's.

Geological History

The section of Lower Greensand exposed here is part of the Woburn Sands Formation of late Aptian and early Albian stage (121-99 million years ago) of the Cretaceous Period. The formation is dominated by quartz-rich sand, which is variably cemented. The sand is cemented by the precipitation of iron minerals between the sand grains, which occurs after deposition. Exposed here is the Upper Sandstone, which has been quarried for building stone and sand.

These sands were deposited in an active tidal environment of a shallow shelf sea, which covered much of southern Britain in the Cretaceous time. It is hypothesized that this part of the Woburn Sands might represent a marine embayment, of which a modern analogue would be the Wash. This formation is characterised by south to southwest dipping large cross-strata which are characteristic of an energetic near shore environment with strong tidal currents. Times that are more quiescent are shown by burrowing (the burrows are often preferential sites for nodular iron concretions) and the deposition of clays. The only evidence of life preserved in these strata are the burrows made by bottom dwelling creatures, such as worms or bivalves. However, the sea would have been teeming with life, such as sharks, rays, fish, sea urchins and starfish. Creatures that are more unusual include the plesiosaur, a large dolphin-shaped reptile, which would have hunted for fish and the ammonite, a squid-like creature with a spiral shell. On land, dinosaurs were well established with mammals forming a minor but increasingly important part of the fauna. The plants were not very similar to those common today (no grasses or flowering plants) with abundant species such as conifers, cycads, ginkgoes, ferns and horsetails.

The Scout Hut Quarry today

Today, the exposure of Lower Greensand here has been recently cleaned of vegetation. There is more work to be done and maintenance is very important in the future to retain the pristine face.

Fieldwork and further study ideas

- Local geology
- Greensand Ridge
- Past industries including the coprolite industry
- Modern quarrying and the sand and gravel industries
- Process of erosion and deposition
- Investigate local habitats