

© UKRIGS Education Project: Earth Science On-Site

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☛ On the journey

On the journey to Ryton Pools pupils should be encouraged to look out for ways in which geological resources are being used in the environment. This can be seen in walls, buildings, roads and concrete. Look out for sites where sand/gravel is currently, or has recently been extracted, or has been land-filled. If this topic has not been part of the preparation for the visit, it should be covered in the follow-up.

☛ Items to bring on the Visit

Appropriate clothing & footwear. Wellies are easy to clean.

Enough copies of worksheets/notes etc. selected, or modified, from the list below:

- *Pupil worksheet 1 - Map of sites in Ryton Pools Country Park.
- *Pupil worksheet 2 - Site 1: The "Mystery" stream.
- *Pupil worksheet 3 - Site 2: Ryton Pools in the Stone Age [display board].
- *Pupil worksheet 4 - Site 2: The view from Paget's Pool.
- *Pupil worksheet 5 - Site 3a: The rocks.
- *Pupil worksheet 6 - Site 3b: The pebble investigation.
- *Pupil worksheet 7 - Site 3b: Counting the pebbles.
- *Pupil worksheet 8 - Site 3c: Investigating soil.
- *Pupil Summary worksheets 9 & 10.

Rock Identification Sheets can be downloaded from Warwickshire website.

<http://www.warwickshire.gov.uk/Web/corporate/pages.nsf/WebPrint/A2CEF4DA023AC27E80256A29003D5616?opendocument>

Plus: Clipboard, notebook, sketchbook, camera, magnifiers, water dropper bottles, laminated piece of mm graph paper, tape measure, compass and materials for any other fieldwork activities [eg relating to wildlife]. Teachers and adult helpers should each have dropper bottle with dilute acid for testing limestone and marble. Domestic lime de-scaler may be used, and should be diluted to adequately react with limestone/marble [try x 10 dilution]. A bottle of water and tissues. Equipment for collecting soil samples.

☛ On Arrival

The Country Park has its own car park, off the A445. Follow the signs. [See Site location & access notes]. If the fieldwork includes activities involving Ryton Pools Country Park staff, teachers should follow the guidance given by them. Such a visit is likely to include a programme of work at the Centre classroom and fieldwork in the Country Park, guided by the Education Ranger. Details will have been discussed prior to the visit.

Next to the Country Park Centre there are public toilets and a café.

Remind the children of Health & Safety issues.

Avoid dog poo on the site.

☛ Using the pupil activity sheets

The Earth Science teaching trail and pupil activity sheets are only part of the work appropriate for Ryton Pools Country Park. There is a lot of information to be found in the sands and gravels exposed on-site. In the notes for each locality there are teaching points related to key observations and interpretations on the formation of rocks, with additional reference to soils and wildlife. The pupil activity sheets are linked to these observations/teaching points. **Teachers will need to decide which materials are appropriate for their pupils to use and adapt the sheets accordingly.**

There are opportunities to record information by taking photographs, sketching, mapping and note-taking to aid follow-up work. When soil samples are taken, the location of each sample should be marked on the map and on the collecting container.

For some children it may be useful if an adult helper acts as a "scribe", recording the agreed answers on a copy of the activity sheet. All should complete their own sheets as part of follow-up work, as an individual record of the work they did on their visit.

Key points to investigate

We are looking at four aspects of these exposures of rock material and the surrounding area:

- 1 - to try to identify pebbles in the sands and gravels and their origins.
- 2 - to find out how they got here, after they were formed.
- 3 - to find out what is naturally happening to them today or in the recent past.
- 4 - to find out what they have been used for by Man and the effect on the landscape.

RYTON POOLS CP, WARWICKSHIRE: KS2 TEACHING TRAIL

(WITH INSTRUCTIONS & ANSWERS TO PUPIL ACTIVITY SHEETS)

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Earth Science On-Site Trail

The Earth Science teaching trail notes which follow, incorporate teaching sheets for each site with teaching points, questions, answers, interpretation and other comments. The separate pupil worksheets are based on the content of the teaching sheets.

The fieldwork programme will likely include other investigations arranged by the Centre staff, which can fit in with the Earth Science materials which follow.

The site of the conserved sand and gravel exposure shows the link with the quarrying and landfill in the area opposite, while above and behind is Ryton Wood, showing the typical soil and habitat developed on such a variety of rocks. Geodiversity (differences in underlying rock types) clearly underpins Biodiversity (variety of flora and fauna)!!

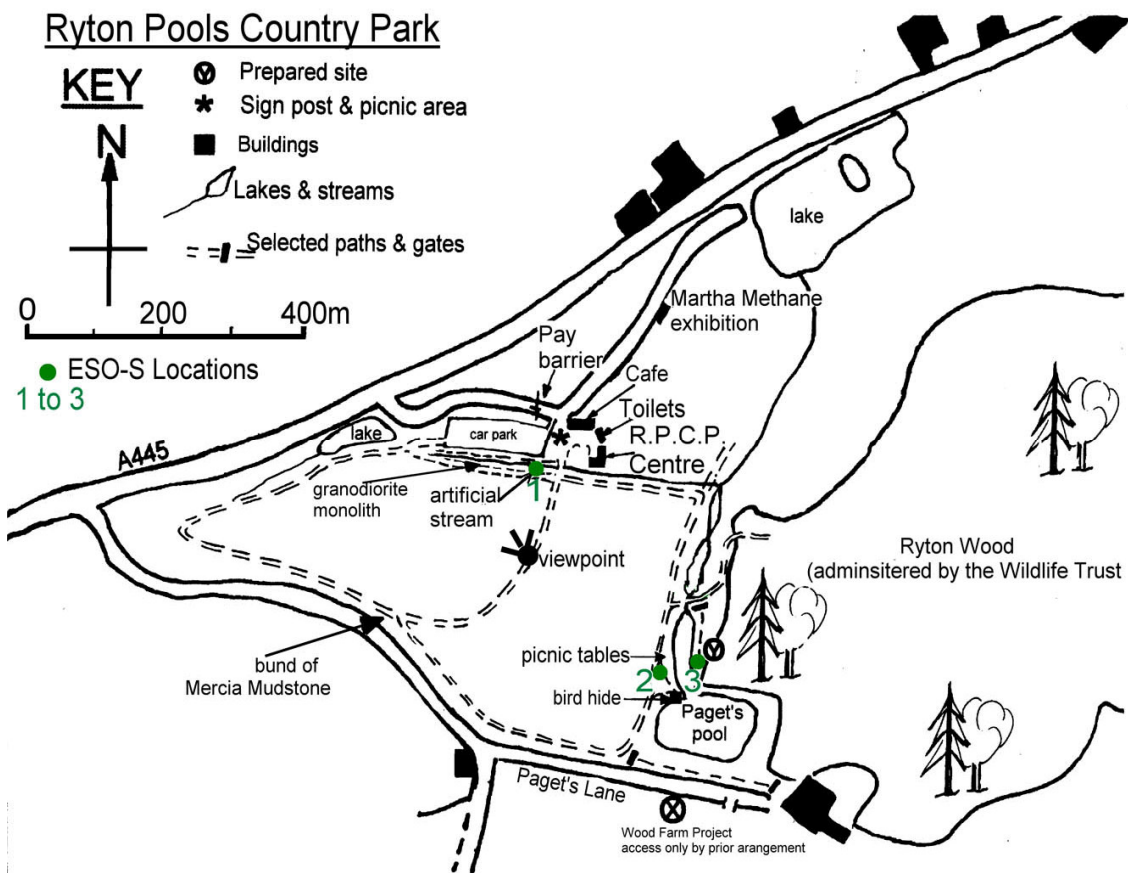


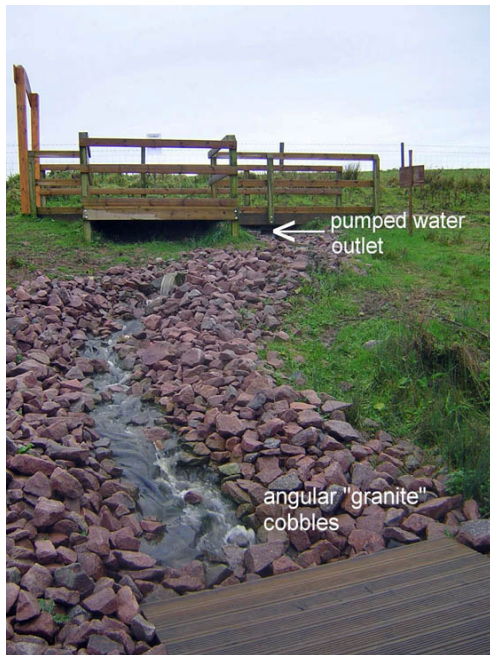
Figure 1. ESO-S Sites at Ryton Pools.

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Site 1. The “Mystery” Stream.



From the sign post and picnic area, head south for 20 metres, along the first part of the Ryton Wood Trail. (See **Figure 1**). Ask the children to keep their eyes open to see what plants are growing, what the soil is like [including a few rounded pebbles] and what the paths are made from. It is also good practice for children to use the map on **Pupil Worksheet 1** and compasses between sites.

At the crossing, turn right [west] for 20 metres to the boards over a “stream”. Prime the group along the lines of “Most people have seen streams and paddled in them. This one is a bit unusual. Let’s see how unusual!” It shouldn’t be too long for the children to realise that this is totally artificial!! The exercises on **Pupil Worksheet 2** will help.

Figure 2. Site 1 - The Mystery Stream.

Site 1 Pupil Worksheet 2 - The “Mystery” Stream.

Observations/Teaching points/Questions	Answers/Interpretation/Comments
Describe the shape (corners) and size of rocks on the stream bed.	Fairly angular boulders 10 – 15 cm.
Is there any mud or sand or small round pebbles?	No.
Are they mostly the same types of rock or are they a good mixture of different kinds?	Mostly the same.
From your knowledge of rocks, describe and identify the rock type[s].	Large crystals, different colours, some darker, others pinker, some white. Likely to include feldspar. Possibly granite or similar igneous rock [actually a silica-poor granodiorite].
These rocks are exactly the same as those found in a quarry in Leicestershire! How do you think they got here?	These came by lorry to make this feature on the landfill site!
Check the bed of the stream. Is the water cutting down and wearing away the bed?	It would, except the “bed” is made of black canvass-type sheeting to stop it wearing through and leaking away!
What is underneath this slope? [If you haven’t done this in preparation, try to answer it later].	Landfill tip of waste household rubbish. Not a wise idea to cut into it and expose the rubbish! There are no other streams on the landfill part of the site!
Look at the water. It is steep and flowing quite fast. Is it moving any of the rocks?	No sign of moving any sand or gravel or rolling the rocks. They show little sign of rounding!
Where does the water come from? Where does it go to?	It comes from a pipe, not a spring, at the top, not run-off from the field. Goes to a grid and tank under the decking, not into a proper stream and river. Then pumped back up! (against the force of gravity, which brought it down).
What do we call this process of using things again and again?	Recycling.

Draw the pupil's attention to the cross section on **Pupil Worksheet 1** and point out that the park was once a quarry now filled in by Warwickshire's rubbish (it had to go somewhere) and then landscaped over.

Ask the group for their opinion of the way this material has been used: "Do you think our "Mystery" Stream makes a nice feature in the Park?"

You may want to view the large stone block further along the track which is made of the same rock.

Remind the group that at each site we will be describing and identifying natural materials, trying to work out where they have come from, and how humans have used them.

To Site 2 View from Paget's Pool [and display board].

Retrace your steps and continue east, straight across the crossroads, following the Ryton Wood Trail signs. (See **Figure 1**). Head east for 200 metres, then south [right] for 300 metres, passing the left turn, stopping at or before the picnic tables over looking the northern arm of Paget's Pool. Find a location by the sign board with a clear view east, through the trees across to the exposure of sand and gravel below Ryton Wood. This is **site 2**.



Figure 3. The sign board at Site 2.

The display board explains what life was like here 500,000 years ago and can be used to complete the **Pupil Worksheet 2 "Ryton Pools in the Stone Age"**. The clues to the story are found in the sands, gravels and clays you can see across the pool and in other places in the area.

After the group has finished with the sign board ask them to look around. Use the following questions to help them finish the worksheet.

Questions/Observations/Teaching points	Answers/Interpretation/Comments
Look along the face. How can you tell that this was once the edge of a quarry?	Steep slope, almost a cliff face. Area below (the park) has been landscaped.
What has happened to the face in the 20 years since quarrying stopped?	Weathering & erosion, including gravity, water. Sand, pebbles, clay washed down slope.
What has been happening to the surface since the end of quarrying?	Soil is being formed, & plants colonise. Mini-beasts & rabbits!

Site 2 Pupil Worksheet 3 - Ryton Pool In The Stone Age.

By looking around us at this point, we can find out a lot about what has happened here at the Park. Look east, across the narrow end of Paget's Pool. Match what you see with the photo taken near here (**Figure 4**) and help the pupils complete **Pupil Worksheet 3**. The view across the lake is actually of site 3. We will go around the other side for a closer look, soon.

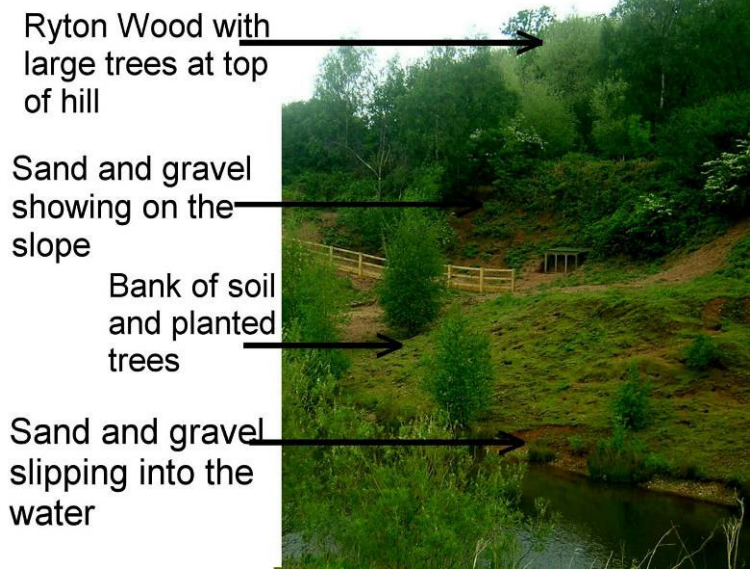


Figure 4. The view across Paget's Pool.

These questions go into more detail and provide the information to complete **Pupil Worksheet 4 – The view from Paget's Pool.**

Questions/Observations/Teaching points	Answers/Interpretation/Comments
Before the area was quarried what do you think we would be standing on here at this level? [Clue: look across under the trees and at the section on the worksheet].	Layers of sand and gravel.
What do you think the sand and gravel have been used for?	Mostly aggregates for roads, concrete, mortar etc. [see follow-up topics in RYT6]
From your earlier work, explain what has happened to the hole.	Filled with domestic waste and turned into a Country Park. You may want to follow this with a visit to the Martha Methane exhibition. See Figure 1 .
What has it been covered with?	Plastic sheet seal, topped with soil & grass. No trees have been planted because roots may penetrate the top seal and release methane.
Why doesn't the water in Paget's Pool completely soak away into the ground? [Look at the section on the worksheet]	Leakage is stopped by non-porous/ impermeable Mercia Mudstone which lies under the whole area.
Describe the materials used to make the paths you have walked along in the Country Park.	Mostly black fine grained igneous rock chippings – basalt/dolerite, with bitumen to stick it together. Other paths are lighter grey, made of limestone of Carboniferous age [which react with dilute acid].
What happens to the paths in wet weather? NOTE: The effect of running water is very clear at the edges overlooking Paget's Pool.	Rainwater is running on the surface forming miniature rivers, carrying the chippings along, wearing away the edges of the path i.e. erosion! This is very noticeable north of the gate into site 3.

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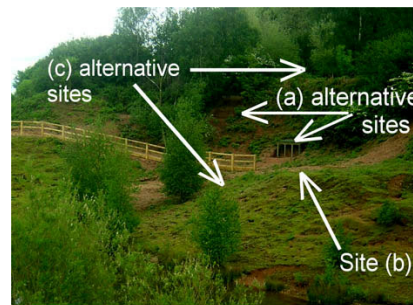
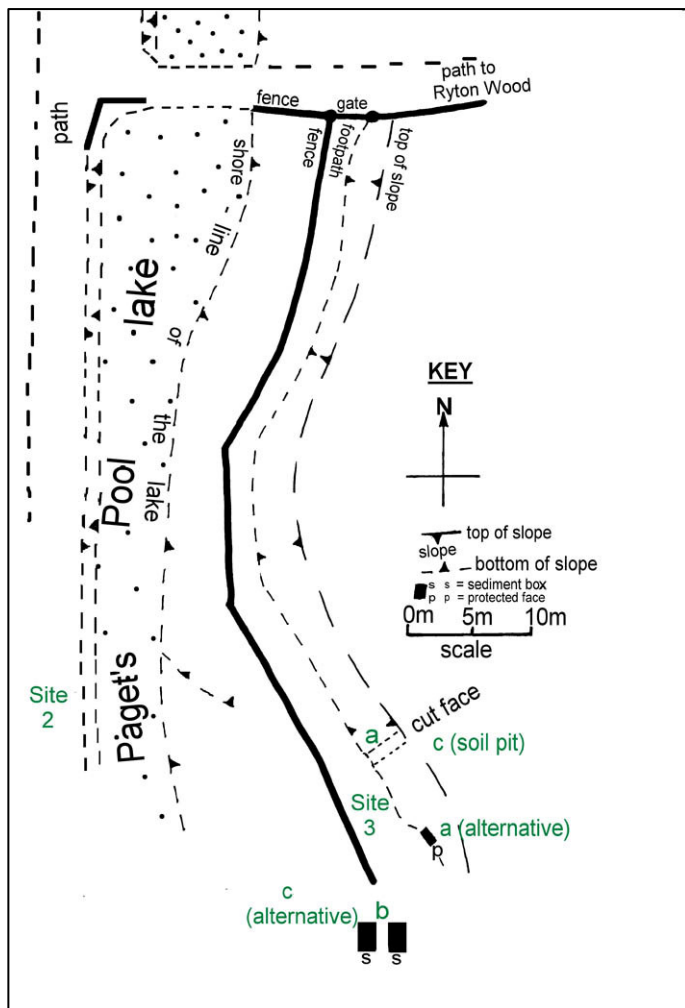
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To Site 3 - The Protected Sand & Gravel Site.

Return north for 100 metres, turning right onto the Ryton Wood Trail for 20 metres. (See **Figure 1.**) Go through the gate, on the right into the protected geological site replacing the padlock as you go. Follow the path by the fence for 150 metres as far as the exposed face in the side of the old quarry.

[NOTE: At the time of writing the planned viewing steps were not yet fully completed. As an alternative to location (a) children could use the protected faces behind the three panels to the south. As an alternative to location (c) children could use the flat area by Paget's Pool. (See **Figure 3.**) Children should NOT attempt to climb the unstable, slippery faces, but should use the wooden steps provided].



A large class could now be split into two or three groups, then move round the three sites:

one group to look at (a) the cut face, or the alternative three protected faces (the protective panels should be carefully removed);

one to investigate (b) the pebbles on the ground, using pebble identification sheets;

and one to investigate (c) the soil, either in the prepared pit above the face, or alternatively the ground surface closer to Paget's Pool.

Figure 3a and 3b. The alternative locations at Site 3.

Site 3a Pupil Worksheet 5 -The Rocks. Look at the cleared face by the viewing platform, or the 3 panelled protected face.

Questions/Observations/Teaching points	Answers/Interpretation/Comments
How would you describe these "rocks": Stuck together and hard or Soft and loose?	Soft and loose. The bits are not cemented/stuck together very well.
Are they all jumbled up or are there signs of layering?	Signs of layering in the sands
What does the fine layering in the sand tell us about how it was formed? [You may have done an experiment to explain this]	Settled in layers in water.

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Which is the oldest layer? [You may have done an experiment to demonstrate this].	The one at the bottom, the sandier layer. [NOTE: These are the Baginton Sands.]
What is it made of? Measure the size of the grains – about 1mm, less than 1mm, more than 1mm	Fine grains of quartz sand, 1mm or less.
Are the grains rounded, or angular, or in between?	Mostly in between.
What is the layer above the sand made of?	Mostly sticky reddish clay, with angular stones up to several cm across mixed in. This is the Thrussington Till [boulder clay]
What is special about the surface layer? Your teacher may wish to collect a sample for later study.	It is soil, with plant roots, decaying plant matter and animals, water and air. Lighter colour, merges down through sub-soil to till, from which it was derived! [Exercise is sheet 3]
Is there any sign that the upper soil layer is moving downslope?	Yes: rainwash, slipped material covering the cut face (the upper part of the panelled site is all slumped material).

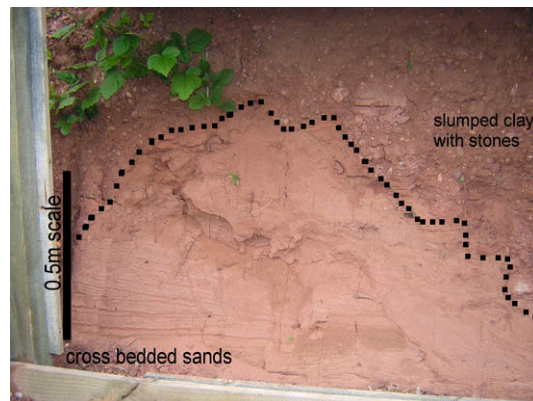
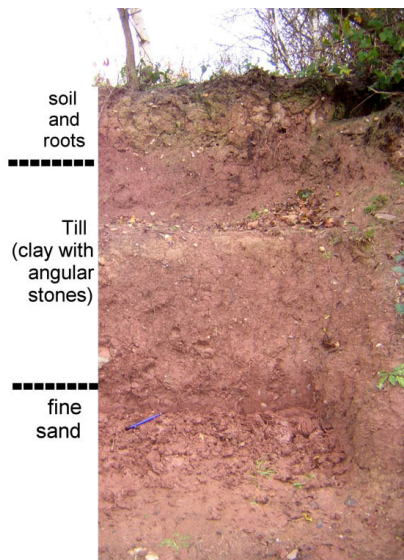
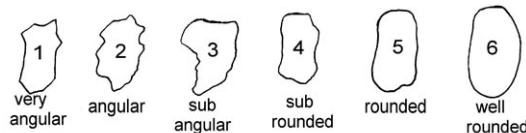


Figure 4a and 4b. Site 3(a) - The Cut Face and Alternative Site.

Site 3b Pupil Worksheet 6 - The Pebble Investigation. Use the pebbles at **Site 3b** to investigate the shape of pebbles in these rocks. **NOTE:** shape refers to the sharpness of the corners. Pebbles can be described as more or less “rounded” or “angular” on a 6 point scale. However, the worksheet suggests only using the words “angular” and “rounded”.



The significance of the shape of a pebble is that it is evidence for the amount of transport it has undergone. All pebbles start off being weathered from rock as angular pieces. Only prolonged transport in water (in rivers or on beaches for example) can produce well rounded pebbles. In the process, softer rocks become powdered away, leaving only more resistant rocks.

Use the worksheet to guide the investigation. Start by directing attention to the lower slopes.

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Questions/Observations/Teaching points	Answers/Interpretation/Comments
What changes to the soil do you notice lower down the slope? Describe the shapes and sizes of the pebbles you can see.	More pebbles. Mostly rounded & some angular pebbles of various colours, & sizes up to several cm long.
Suggest a reason why the soil here is so pebbly.	There is a pebbly layer under the sandy layer, running under the hill. [This is the Baginton Gravels.]
What happened to the pebbles when this was a quarry?	Removed, along with sand, as aggregates for roads & concrete in construction industry.
Describe the shape of most of the pebbles.	Rounded.
What does the shape tell us about how the pebbles were transported to here? You may have done an experiment to show this.	Rounded by contact with other pebbles rolling along bed of a river. [NOTE: Sugar cubes demonstration]
Most of the pebbles are made of very hard quartz and quartzite. Why does hardness improve a pebble's chances of survival?	Resists attack, with less hard ones breaking up sooner on the journey here.
In which direction did the pebbles come from in order to be deposited here?	Those eroded from Triassic conglomerates [pebble beds], by the Bytham River, about 500,000 yrs ago came from the south-west. A few [e.g. flint] have weathered out from the overlying till [boulder clay] and originate from the NE, the direction the ice came from.

Site 3b Pupil Worksheet 7 - Counting The Pebbles. Use the pebbles at site b to identify and count the frequency of different kinds of pebbles.

Pebble Identification Sheets for the site, and other information, can be found at :

<http://www.warwickshire.gov.uk/Web/corporate/pages.nsf/WebPrint/A2CEF4DA023AC27E80256A29003D5616?opendocument>

Also see UK Geology Wall Map and the *ESO-S* Park Hall KS2 Pebble Identification sheets.

Ask pupils to collect 25 pebbles at "random" by picking the 25 nearest to their left foot. Try to identify each with the help of the identification sheets and record them on the table on the Pupil Worksheet.

The pebbles from the underlying gravels have an origin in the south and southwest of England (or Europe), brought here by the Bytham River about 500, 000 years ago. However, any pebbles recently weathered from the till (flints etc.) will be from the north east, the direction from which the ice came. In addition they will be more angular.

Site 3c Pupil Worksheet 8 - Investigating soil.

NOTE: At the time of writing there were plans to install steps up the face of exposed sands and gravels, and leading to a soil pit at the top revealing the soil profile at the top, at the edge of Ryton Wood. **If this is not available, an alternative site 3c is marked on Figure 3.**

This exercise can be used in conjunction with materials produced by the Centre for trails through Ryton Wood, where the emphasis is on the links between the underlying rock, the soil and the vegetation. Geodiversity underpins biodiversity!! There is also a soil profile on display in the Centre.

See ESTA's Working with Soil.

Observations/Questions/Teaching points	Answers/Interpretation/Comments
Pour some water onto the soil surface. Is it permeable (does it let water through) or not?	At the soil pit, on top of the slope it is slightly permeable. In the sandier soils at the bottom it is quite permeable. [see Working with Rocks & Working with Soil]
What is the soil made from?	At the top of the slope it is mainly clay with some pebbles from the till (boulder clay). At the foot of the slope it is mainly sand (quartz) grains and pebbles, with some clay. In both cases there are also roots and mini-beasts, water and air.

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How do you think soil is formed?	Rocks are being broken down all the time by weathering processes. These include acid rain and freeze-thaw. These rocks are mostly “soft” sands and clays and easily form soil. [see WW Rocks p 14]. [Note leaching downwards of nutrients from upper layers by rainwater.]
Describe where the roots are growing.	Roots grow down and along, just below the surface. Some are long, even growing down into the sub-soil to anchor the trees, Some are short and absorb mineral nutrients.
Try to identify some plants growing in the new soil on the scree slopes.	At the top of the slope: Mixed woodland, with silver birch, oak and conifers, brambles. On the slope itself: Silver birch and other tree saplings. Grass, plus others – identification depends on season! Moss & lichen in dark, damper areas.
Try to explain why the trees in Ryton Wood at the top are larger than those on this slope.	Ryton Wood on top is older. It was woodland even before the sand and gravel was quarried. The trees on the later slopes have only grown after the quarrying finished and are therefore smaller and younger.
What clues have you found to show that animals live in the soil in this area?	Worm casts. Mole hills. Rabbit burrows and droppings.

A very brief summary of geological events to be used as final summary and in follow-up.

1. Deposition of pebble beds and red mudstone in Triassic times, followed by Earth movements and deposition of Jurassic clays and limestones and Cretaceous chalk, sands and clays.
2. Earth movements, uplift, tilting, weathering and erosion of existing rocks for millions of years.
3. Temperate climate, Bytham River cuts across S Midlands to NE. Early Man.
4. Cooling climate, deposition of river gravels and sands.
5. Glacial climate, deposition of till [boulder clay] by glaciers from the north.
6. Later melting and further cooling, with modern drainage of Warwickshire Avon established, flowing to SW cutting through latest deposits.
7. Extraction of sands and gravels for aggregates.
8. Landfill, reclamation, methane extraction and recreation.

EXTENSION VISITS AT RPCP: There are two other sites that would suitably be added to this visit which use the RPCP Centre teaching materials. These are Ryton Wood and The Martha Methane Exhibition. (See Figure 1.)

To Ryton Wood.

Return to main path at the north end of Site 3. Close and padlock the gate to the protected site. Turn right up the path for 200m to Ryton Wood Nature Reserve on the sands and gravels.

To Martha Methane Exhibition.

Return down the path from Ryton Wood. Turn right at the bottom, then after 200m turn left, following the path back to the Centre, the shop and toilets. The Martha Methane Exhibition is signposted, 300m along the path to the NNE of the Centre.

By the end of the visit the children will have seen the links between geodiversity and biodiversity and between aggregate extraction and landfill.

Future developments to the south are planned, including the opening up of the Wood Farm site to visitors. This has very clear faces of Baginton Gravels, Baginton Sands and Thrussington Till.