

Questions for any rock face 3: soil

What questions about soil might be asked at any rock exposure?

The ELI* series of ‘Questions for any rock face’ helps teachers to plan investigative fieldwork at any rock exposure**. In each case some possible questions are given, with some likely answers, to help you to decide whether the questions might work well at your site, or whether they would be asked better elsewhere. Answering the questions will provide basic understanding of the evidence preserved in rocks of the processes that formed them.

Soil

Soil is the mixture of material at the Earth’s surface that can support the growth of plants. It has four key components: rock fragments (from the rock beneath or brought into the area), decaying plant and animal material***, water and air. It often has a vertical sequence of layers, called a soil profile.

Show your pupils the soil at the top of the rock face, if a good profile can be seen in cross section, and ask them these questions:

Possible questions	Possible answers
How many different soil layers can you see?	Often three layers can be seen, an organic (dark) upper layer, a mixed middle layer and a lower layer full of rock fragments
How does rock become changed into topsoil?	The rock becomes broken up into fragments by weathering, more and more organic activity takes place until topsoil forms (extra sediment may also be deposited on top)
Is this a rich or poor soil? (Generally, the greater the number of growing species there, the richer the soil)	Soils on top of rock faces are often thin and poor



Soil profile at the top of a rock face. (Peter Kennett).



A soil scientist examining a soil profile.

Diagram of a typical soil profile.



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* ELI = Earthlearningidea

** An exposure is where rocks can be seen at the Earth’s surface, exposed by natural or artificial means; anywhere where a rock reaches the surface, even if it is covered by soil, etc. is an outcrop, so an exposure is also part of an outcrop.

*** Some soil definitions also include the living organisms the soil contains.

The back up

Title: Questions for any rock face 3: soil

Subtitle: What questions about soil might be asked at any rock exposure?

Topic: Helping teachers to ask suitable investigative questions about soil-formation on top of rock exposures.

Age range of pupils: 9-16 years

Time needed to complete activity: 10 minutes

Pupil learning outcomes: Pupils can:

- describe how a soil can develop from a parent rock by the interaction of weathered rock fragments, organic activity, water and air;
- describe the layered appearance of a soil profile.

Context:

Some rock faces have well-developed soil profiles on top, allowing soil-formation processes to be discussed in the position where the soil actually formed.

Remember to carry out a risk assessment before taking anybody to any rock exposure.

Following up the activity:

Try the range of Earthlearningideas that investigate soil in the classroom/lab, including: *'Why does soil get washed away? Investigating why some farmers lose their soil through erosion whilst others do not'*, *'Permeability of soils – the great soil race: investigating the properties of different soils by pouring water on them'*, *'Darwin's 'big soil idea': can you work out how Charles Darwin 'discovered' how soil formed?'*, *'Make your own soil – investigating the type and origin of the ingredients of soil'*, *'Soil doughnuts - sorting out soils'* and then test their understanding with *'Soil layers puzzle - make your own soil profile and investigate others'*.

Continue developing fieldwork activities with other 'Questions for any rock face' Earthlearningideas

Underlying principles:

- Soil is the mixture of material at the Earth's surface that can support the growth of plants. It has four key components: rock fragments (from the rock beneath or brought into the area), decaying plant and animal material, water and air.
- The vertical sequence of soil layers, is called a soil profile.
- Many soils have three main layers: an organic (dark) upper layer (horizon A), a mixed middle layer (horizon B) and a lower layer containing many rock fragments (horizon C) above the bedrock beneath.

Thinking skill development:

Discussion of the mode of formation of a soil through interaction of the different components is a construction activity which can be bridged to 'real world' situations in the field.

Resource list:

- the resources needed for pupil fieldwork listed in the Earthlearningidea, *'Planning for fieldwork: preparing your pupils before setting out to "ask questions for any rock face"'*

Useful links:

Try the <http://www.soil-net.com> website for more information on soil.

Also see: 'Working with Soil' - activity pack and booklet (Waldorf the Worm ISBN 873266 16 2), ESTA Primary Committee, Earth Science Teachers' Association, 2003.

Source: Devised by Chris King of the Earthlearningidea Team.

The 'Questions for any rock face' series of Earthlearningideas and the sites where they may be applicable

'Questions for any rock face' Earthlearningidea	Site
Planning for fieldwork	Preparation in school beforehand
1: weathering	Any exposure (cliff, coastal exposure, quarry, cutting) or weathered constructions (wall, gravestone, monument)
2: erosion	Any exposure and many walls
3: soil	Some exposures have a useful soil profile at the top (but many do not)
4: rock group (igneous or sedimentary)	Any exposure of igneous or sedimentary rock or both; also applicable to sedimentary and igneous building stones, gravestones or monuments
5: sedimentary grains	Any exposure of sedimentary rock and also building stones, gravestones or monuments
6: fossils	Any exposure containing readily found and obvious fossils, including some building stones, gravestones or monuments
7: tilted or folded rocks	Any exposure of clearly tilted or folded rocks
8: faults	An exposure where rocks are clearly faulted, preferably where beds can be matched up on either side of the fault
9: metamorphism	An exposure where metamorphic features are clearly visible and preferably, where there is also evidence of the former rock type

10: sequencing	An exposure where a sequence of geological events can be relatively dated using 'Stratigraphic Principles'
11. tectonic plates	An exposure of sedimentary rocks containing evidence of deposition in different climates and altitude/depths from today, with further evidence of plate margin processes
12. quarry/ cutting potential	An exposure in any quarry or cutting
13: quarry economics	An abandoned (or working) quarry
14: recording	Any exposure

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