

Higher Geography Physical Environments Biosphere Soils



Higher Geography course

The 3 types of soil studied as part of the Higher Geography course are:

- Brown Earths
- Podzols
- Gleys



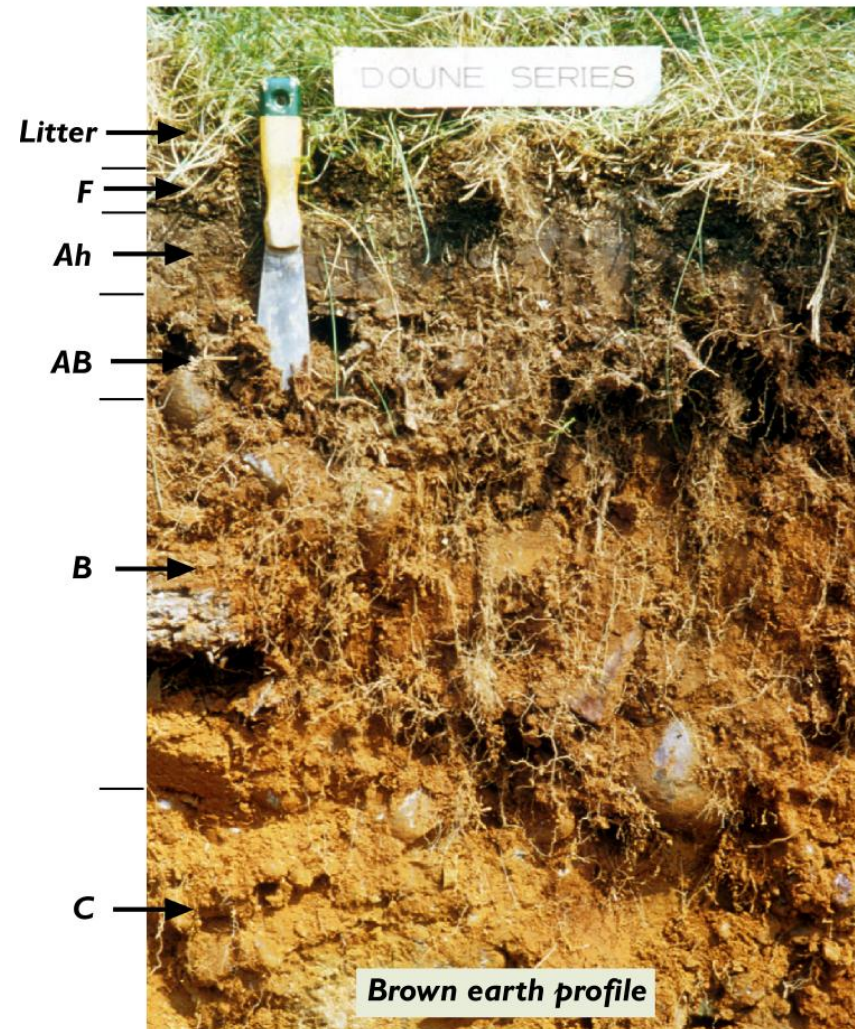
Characteristics of Brown Earths

- Free draining
- Brown/reddish brown
- Deciduous woodland
- Litter rich in nutrients
- Intense biological activity e.g. earthworms
- Mull humus



Brown Earth Profile

- Ah-topsoil dark coloured enriched with mull humus, variable depth
- B - subsoil with distinctive brown/red brown colours
- Lightening in colour as organic matter/iron content decreases with depth



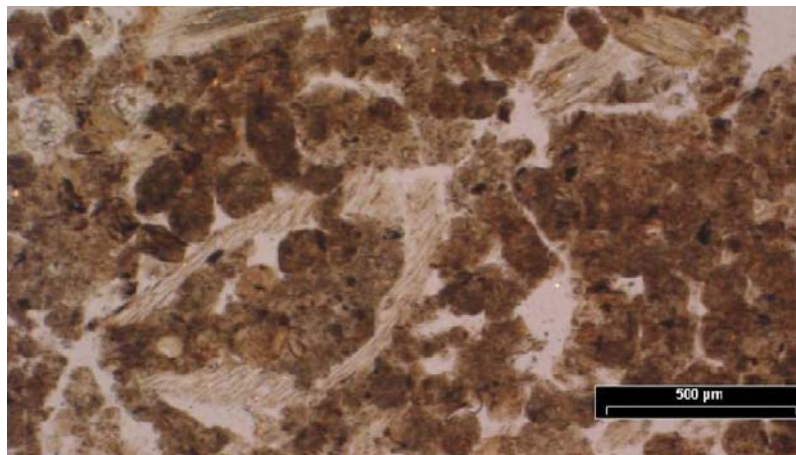
Brown Earth: Soil forming factors

- Parent material
- Climate
- Vegetation/organisms
- Topography
- Time
- Variable soil texture
- Relatively warm, dry
- Broadleaf woodland, mull humus, indistinct horizons
- Rapid decomposition
- Often earthworms and other mixers
- Generally low lying
- Since end of last ice age c10,000 years

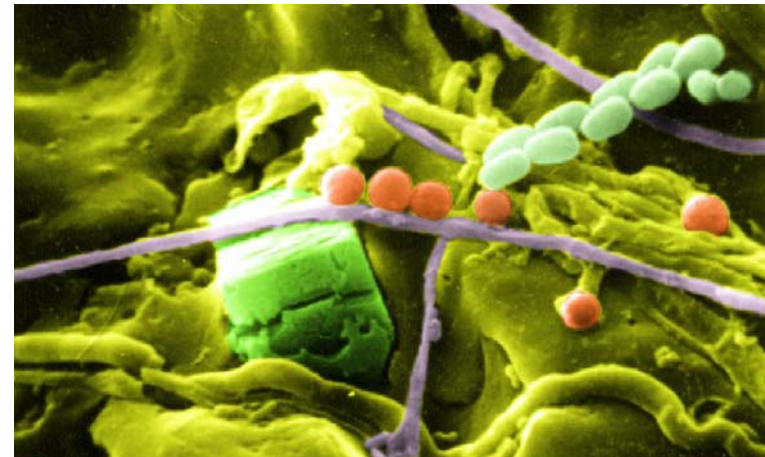
Organisms in Brown Earths

Help create a good and well aggregated, aerated and fertile crumb structured soil

Thin section of soil showing enchytraeid faecal material



False colour SEM of mixture of soil fungi and bacteria



Earthworm activity is important in soil mixing



Uses of Brown Earths

- Amongst the most fertile soils in Scotland
- Used extensively for agriculture e.g. winter vegetables
- Fertilisers required to maintain nutrient levels under agriculture
- Occurring on gently undulating terrain - used extensively for settlement and industry
- Sheltered sites suit growth of trees



Test yourself: Brown Earths

Write down 3 characteristics of a brown earth

Draw a sketch profile of a brown earth labelling the different horizons with the correct letters

Podzol

Podzol - from the
Russian words;

pod = under

zola = ash



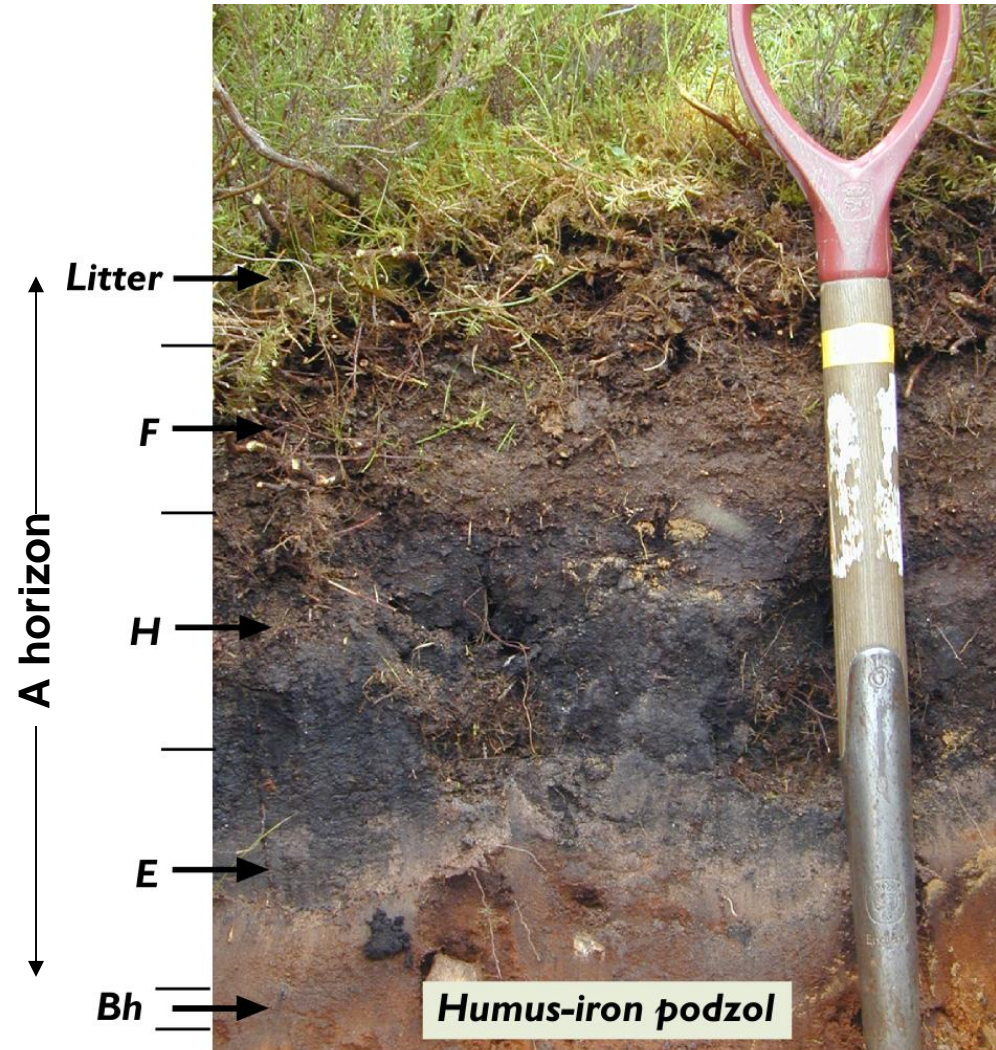
Scots Pine forest with heather moorland on hill summit

Characteristics of Podzols

- Extensive group of leached, acidic soils
- Distinctive light coloured horizon found immediately below organic debris - eluvial horizon formed due to loss of iron/aluminium by leaching
- Mor humus with no recognisable plant remains
- Brightly coloured zone of iron/aluminium deposition - illuvial horizon
- Darker zone of organic deposition
- Relatively unaltered C horizon at variable depth
- Most podzols are free draining

Podzol Profile

- L - fresh annually supplied acidic plant material
- LF - partially decomposed organic debris
- H - mor humus
- E - eluvial horizon loss of Fe/Al oxides
- Bh - illuvial horizon-deposition of Fe/Al oxides
- Hardpan - zone of induration

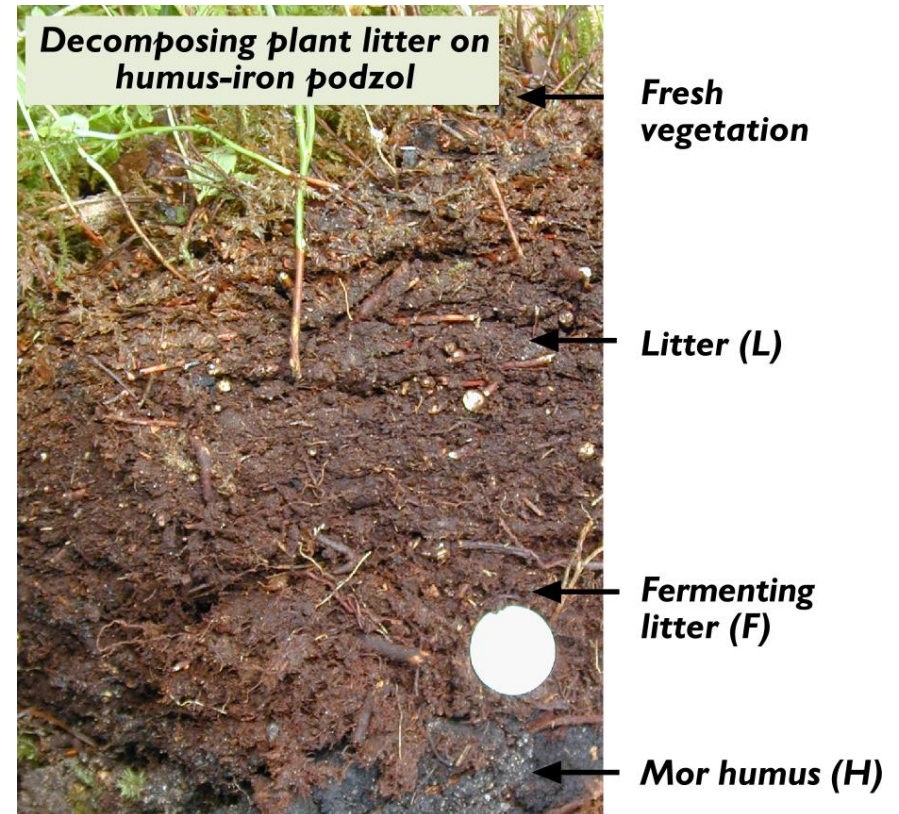
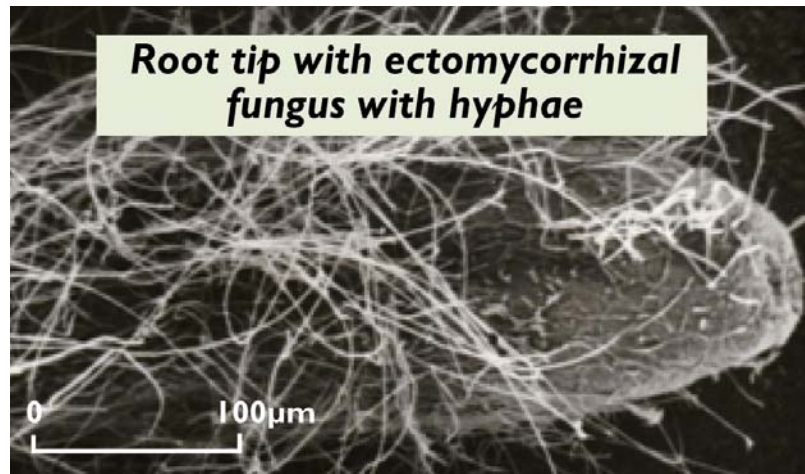


lower B and C horizons not shown

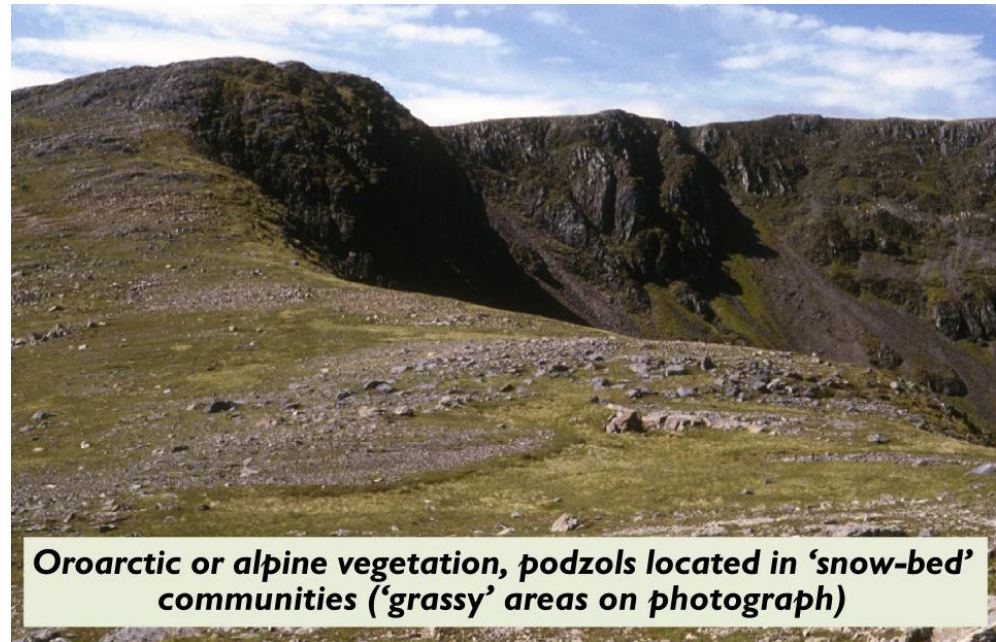
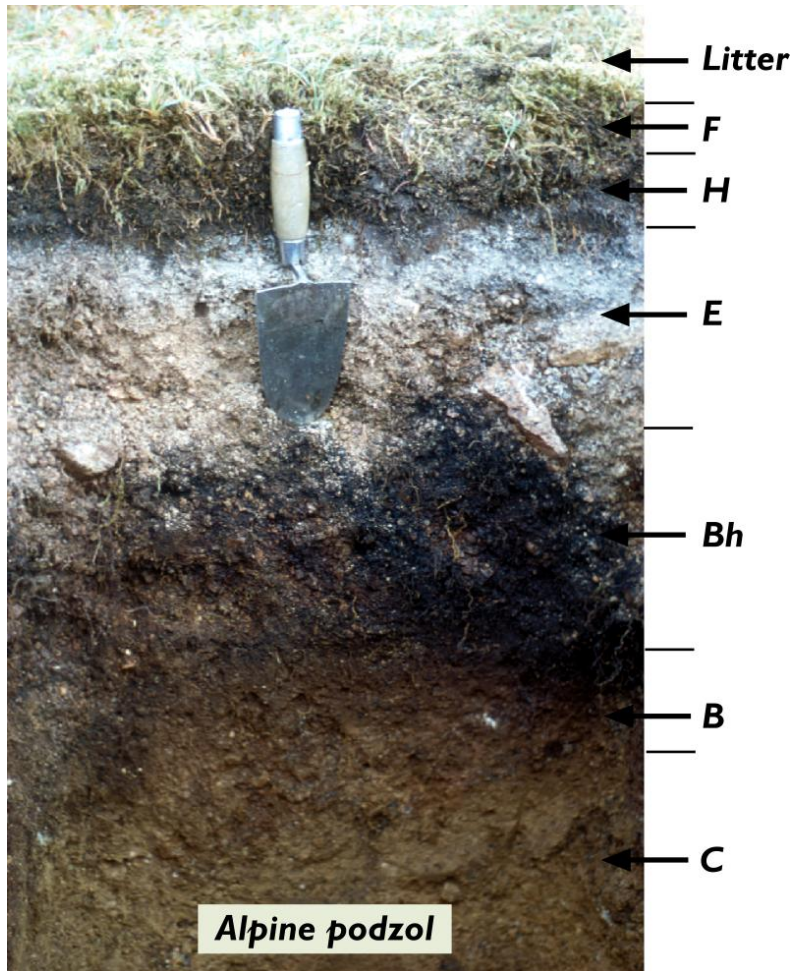
Podzol: Soil forming factors

- Parent material
- Climate
- Vegetation/organisms
- Topography
- Time
- Acid rocks, often from granite or schist
- Cool
- Precipitation greater than evaporation
- Coniferous woodland/heather moorland
- Slow breakdown, limited or no mixing
- Stable sites from sea level to mountain summits
- Since end of last ice age 10,000 years

Organisms in podzols - Organic matter breakdown



Alpine podzol



Shallow podzol found in high altitudes



Uses of Podzols

- Generally infertile, non-productive
- Principally used for forestry and recreation (e.g. forestry plantations, grouse moors). In Scotland also used for grass production and stock rearing
- Where used for agriculture the top soil is often limed (to decrease acidity) and artificially fertilised (to increase nutrient status)
- Continual fertilisation and liming necessary to maintain adequate yields

GMT

“Describe and analyse a podzol profile”

If you were undertaking soil fieldwork and were studying this profile what evidence is there to show that this soil is a podzol ?





Test yourself: Podzol

- List the different types of vegetation that may be found associated with podzols
- Explain why the eluvial horizon is ash grey in colour

Gley

Gley-from the
Russian word;
glei= compact
bluish grey

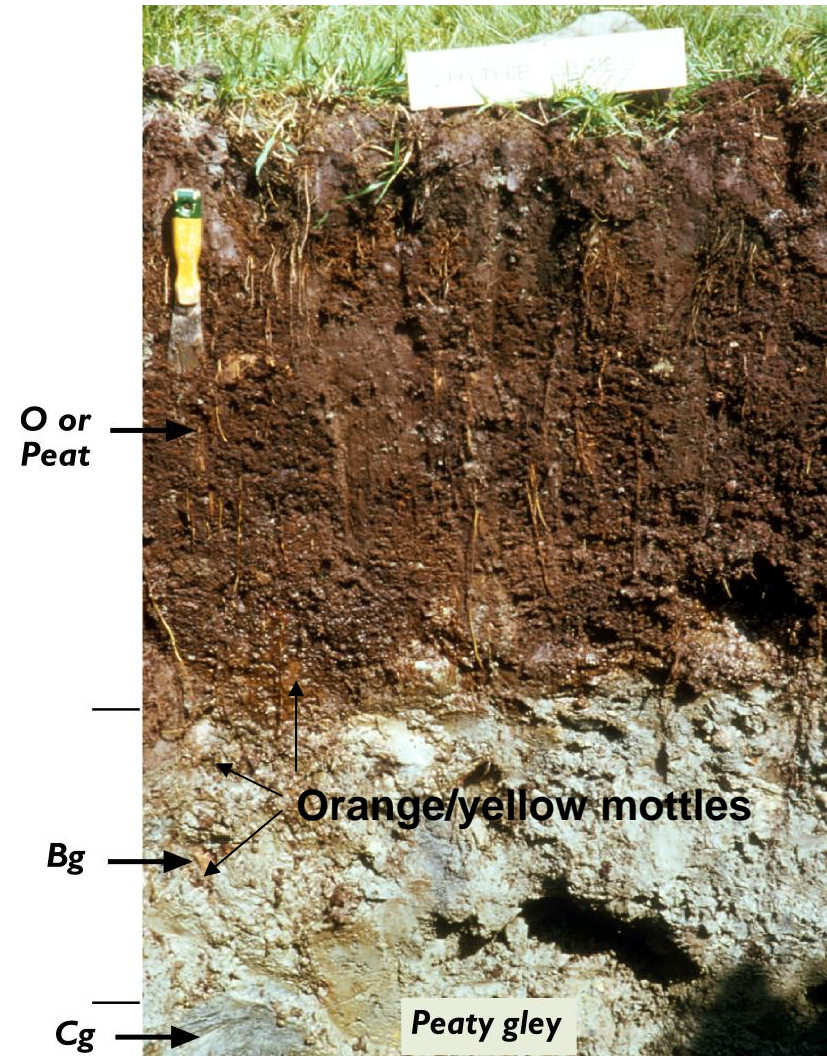


Characteristics of Gley soils

- Poorly drained
- Periodic or permanent waterlogging
- Lack of oxygen in pore space = anaerobic conditions
- Chemical reduction occurs prior to translocation
- Grey or bluish grey colour to subsoil
- Where gleying is intermittent, orange/yellow coloured mottling can occur
- Horizons generally rich in organic matter intergrading into peat deposits - peaty gley to peat

Gley profile

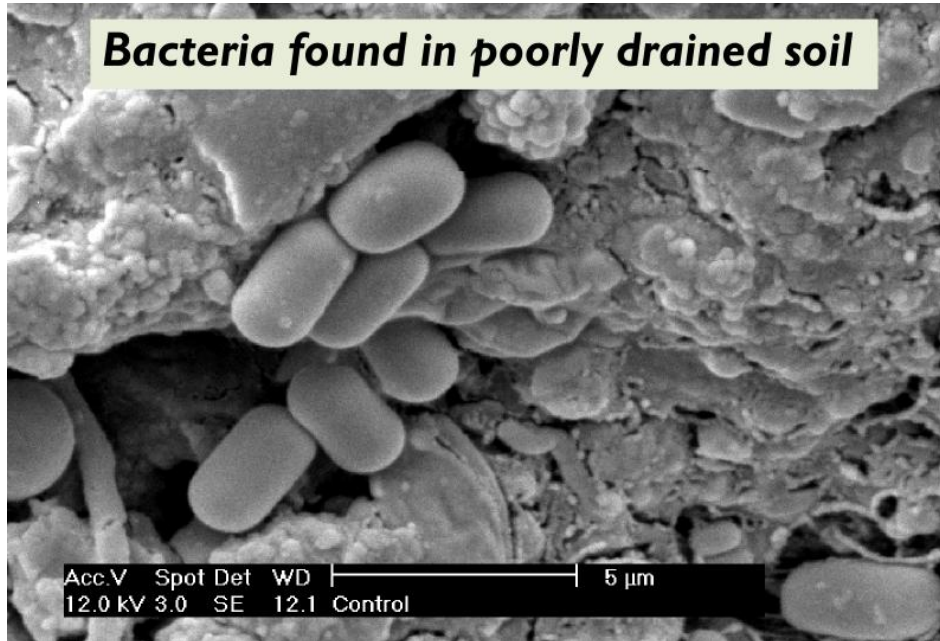
- O - organic layer
- Bg - B horizon with evidence of gleying
- Cg - C horizon with evidence of gleying



Gley: Soil forming factors

- Parent material
- Climate
- Vegetation/organisms
- Topography
- Time
- Variable - coastal sand to glacial till
- Relatively warm
- Precipitation greater than evaporation - leaching
- Anaerobic organisms found
- Where groundwater high/ impermeable layer below
- Since end of last ice age 10,000 years ago

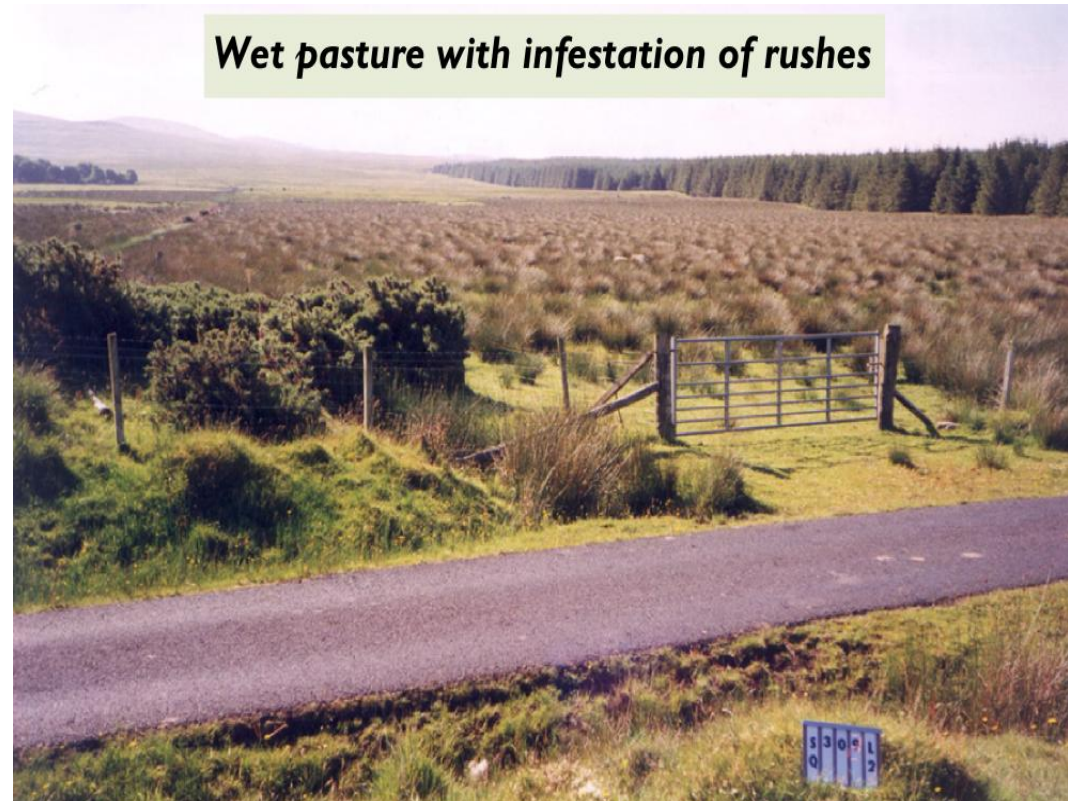
Anaerobic organisms in gleys



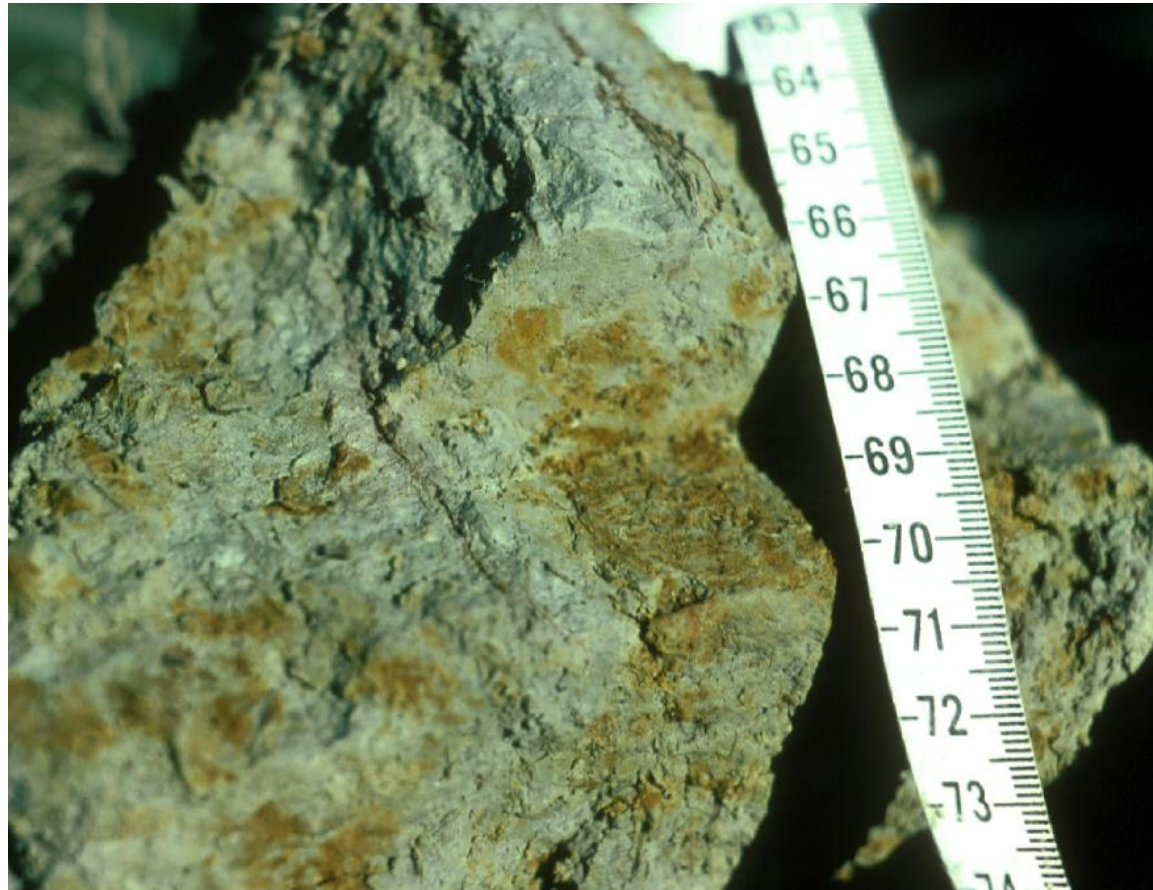
Uses of Gleys

In their natural state they support wet plant species and are used for rough grazing and forestry

When drained, the better gley soils can be used for agriculture; usually productive grassland for dairy or beef cattle



Mottling



Block of gleyed soil with distinct mottles - grey colours denote gradual depletion of iron because of reducing conditions, “rusty” mottles depict zones enriched with ferric compounds within well-aerated pathways such as old root channels or distinct pores.



Test yourself: Gley

What does “anaerobic” mean?

Where in a landscape would you find a gley?

Follow up laboratory work



pH
(acidity)
testing



Soil
moisture
content





Soil revision ideas

- Draw out each of the 3 soil profiles with and without labels e.g. on a separate index card for each soil
- Shade/highlight the soil characteristics in one colour and soil processes in another
- Make photocopies of the profile without labels and practice labelling it when revising
- Write out some one word answer questions such as those on the following slides
- Test yourself using past paper questions

Test yourself - 10 questions

one word answers

- Name of the zone that material moves out of in a podzol
- Type of humus found in brown earths
- The term used for a downward movement of minerals in a soil caused by precipitation being greater than evaporation
- F refers to in a soil profile
- The h in Ah refers to ...

Test yourself - 10 questions

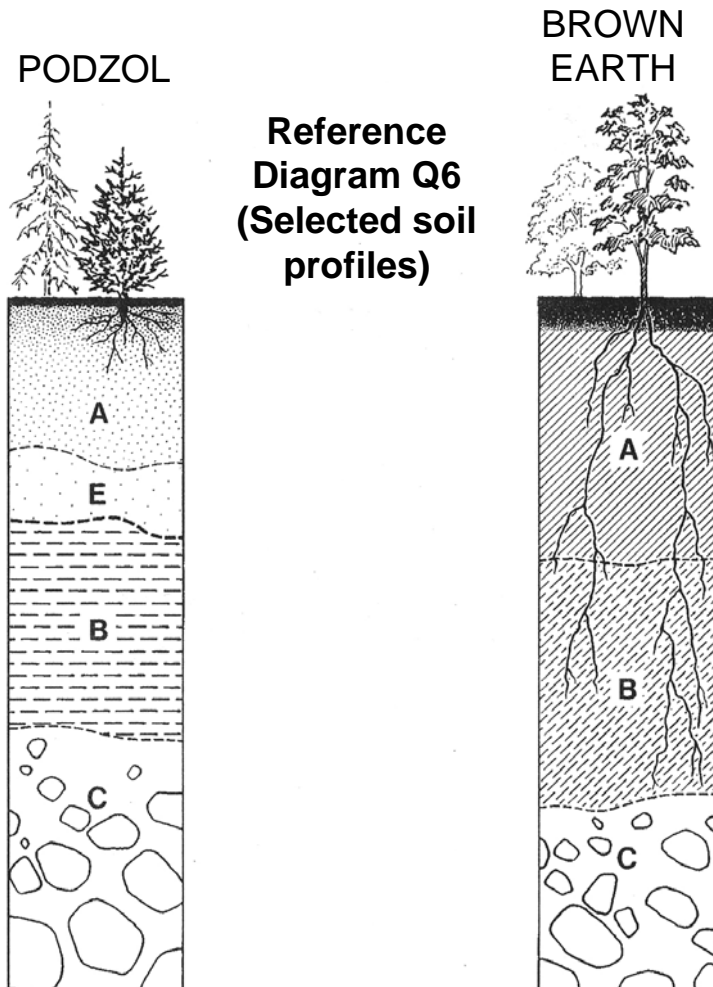
continued

- The type of vegetation found above a podzol
- Typical colour of the sub soil in a Gley
- In Brown Earths the horizons are often indistinct due to the activity of
- The acidic humus found in a podzol is known as
- The iron pan in a podzol is a zone of ...

SQA past questions

2006

Question 6: Biosphere



Study Reference Diagram Q6 which shows soil profiles for a podzol and a brown earth

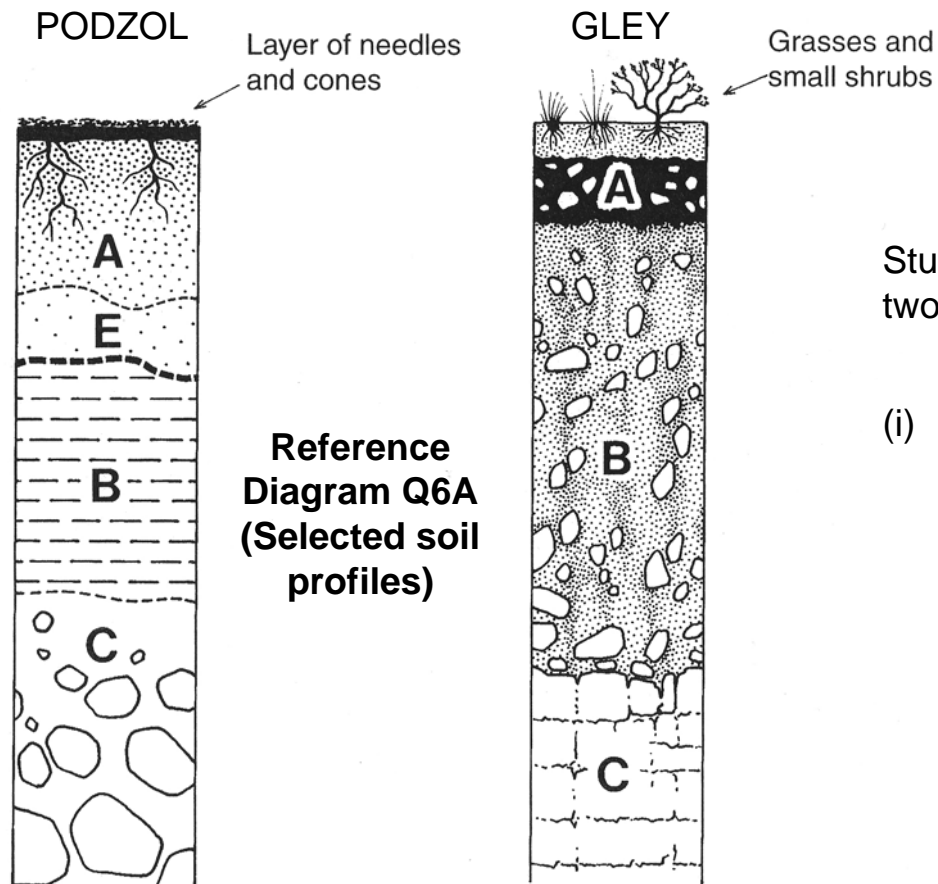
- Describe the different properties (horizons, colour, texture, drainage) of the two soils shown.
- Explain the differences in their formation.

Marks 14

SQA past questions

2007

Question 6: Biosphere



Study Reference Diagram Q6A which shows two soil profiles.

- (i) Describe the characteristics of the soil, including horizons, colour, texture and drainage.

Marks 6

The Macaulay Institute web site links

<http://www.macaulay.ac.uk/soilposters/index.html>