What are Local Geodiversity Sites?

Local Geodiversity Sites (previously known as RIGS) are important local sites that have been identified by a local volunteer group as having significant value for educational and tourist information, academic research, for the history of science or for their aesthetic appearance. They might be a landscape feature, or particularly interesting rocks, or a good example of the local rock types.

Local Geodiversity Sites are indicated to the local council and in this area sites are designated by Lothian and Borders RIGS Group, which is a committee of the Edinburgh Geological Society.

Why do geological sites need looking after?

Geology has great influence on everyday life. Soils and rocks provide essential water and raw materials. Demand is continually increasing for land for housing, commerce, waste disposal, recreation etc. This can lead to the destruction, damage or burial of important geological features.

The rocks are over 320 million years old (the Carboniferous Period) and were laid down as soft sediment when Scotland was located just south of the Equator, and the climate was tropical, both hot and wet. The sea level changes were caused by subsidence of the land and changing global sea levels.

The sea level changes were caused by subsidence of this area, as well as changes in sea water and climate, such as that at times this area was under shallow sea water, and at other times it was a flat coastal plain. The sea level changes were caused by subsidence of this area, as well as changes in sea water and climate, such as that at times this area was under shallow sea water, and at other times it was a flat coastal plain.

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Later, the land would subside once more or global sea-levels due to ice ages. The sea level changes were caused by subsidence of this area and changing global sea-levels due to ice ages.

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What's so special about Barns Ness?

This short walk along the shore from White Sands to the Barns Ness Lighthouse allows you to discover the most extensive limestone outcrops in central Scotland. There are also other sedimentary rocks including sandstone, mudstone and coal, and plenty of fossils.

Barns Ness Fossils

Barns Ness is a great place to find fossils, the remains of the life that thrived in tropical seas 320 million years ago.

Body fossil: Colonial coral Siphonodendron

Body fossil: Solitary coral

Trace fossil: Zoophycos (burrow)

Trace fossil: Rhizocorallium (burrow) – left of pen

Trace fossil: Thalassinoides (burrow)

Body fossil: Crinoid Parazeacrinites sea lily

Body fossil: Cladoceran Parazancorinities sea lily

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The Barns Ness site is a Local Geodiversity Site designated by the Lothian and Borders RIGS Group. It is an important site for the study of Carboniferous sedimentary rocks and fossils. It is also a Site of Special Scientific Interest and the geology and fossils on the beach are protected by law.

Trace fossils - the remains of the burrows or trails left by an animal. Body fossils - the actual animal or plant, and hammering is not encouraged. The Local Geodiversity Sites are designated by the Lothian and Borders RIGS Group, which is a committee of the Edinburgh Geological Society, a charity registered in Scotland with the Office of the Scottish Charity Regulator.

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The importance of limestone

Barns Ness is a good place to appreciate the agricultural and economic importance of limestone. The lime kiln at the back of the beach was one of many in the Lothians, where layers of coal and limestone were burnt to create quicklime for agriculture. This was a dangerous and labour-intensive process, but proved its worth in increased crop yields.

In the distance to the south, you can see the tower and chimney of Dunbar Cement works, which processes local limestone and mudstone to produce cement. This is the only cement works in Scotland with the capacity to produce one million tonnes of cement a year.

Stop 1: Limestone and sandstone

The limestone forms a prominent platform extending from the east end of White Sands. The rock is creamy white in colour, and looks lumpy. It is full of fossils including colonial corals that look like spaghetti, large solitary corals, brachiopod shells, and crinoids.

Beneath the limestone is a layer of dark brown sandstone. It contains trace fossils; both U-shaped tubes and Zoophycos 'cocks tails'. These features are the result of unknown animals searching for shelter or food just under the seabed, before the sand was converted to rock.

Walk along the top of the limestone. You may spot parallel scratches on the rock surface caused by rock moving against rock during an earthquake. The yellow colour of the limestone is due to small amounts of iron.

Stop 2: Old jetty and limekiln

The jetty is on the shore a short distance west of the limekiln. There is a curious layer on top of the limestone here, which looks quite solid, and contains shells and sand just like layers in other parts of Scotland that formed when the sea level was high after the last ice age. Look closely however and you’ll find bricks and other human debris.

Stop 3: Hollows in limestone

This extensive area of basin shaped hollows, each about one metre across, is the most impressive geological feature of this trail. Look closely in the hollows and you’ll find some are partly filled by a grey rock called ‘seatearth’. This is a fossil wetland soil, full of preserved roots. The hollows are an original feature of the limestone, perhaps formed when the sea receded to expose the top of the limestone allowing a forest to grow on the newly exposed land. Perhaps each pothole is the location of the roots of an individual tree.

Stop 4: Coal seam and fossil mudstone

In the small cliff above high tide you can find a thin coal seam overlying the grey seatearth. Above the coal is a layer of mudstone with lots of fossil shells including Eomarginifera and the bivalve Streblopteria, along with crinoid debris. The top layer is another limestone.

Stop 5: Fault line

When the tide is low, a discontinuous wall of limestone runs out to sea. This marks the position of a small fault line. Along the fault some of the limestone has converted to dolostone that resists weathering better than the unaltered limestone. You can find some good crystals of dolomite along the fault.

Because the dolostone forms a wall, it has been previously confused as a dyke of igneous rock.

Stop 6: Decorative Dunbar Marble

Walk along the pebble beach to the rocks at the far end, and search for a bed full of solitary corals, called Koninckophyllum. What unusual conditions gave rise to this amazing death assemblage is not known; did they all die in a storm? Over 100 years ago, this attractive but relatively soft stone was quarried as a decorative marble for fireplaces.

Proceed around the small headland of lumpy limestone and look out for rare fossils called Chaetetes. This is a demosponge and was a common reef-building organism of the Carboniferous. Look closely and you can see tiny holes similar to a bath sponge.
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Stops 2 - 6
From McAdam and Clarkson, 1996, Lothian Geology.

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