
3.4.5 Clackmannan Group rocks

The Clackmannan Group is characterised by strongly cyclical sequences of sandstone, siltstone, mudstone, limestone, coal and seatearth. It includes the Lower Limestone, Limestone Coal, Upper Limestone and Passage formations.

Outcrops of Clackmannan Group rocks comprise approximately 8,276 hectares, or 19.2% of the surface area of West Lothian. They crop out in a north–south strip from north-east of Linlithgow to the Gladsmuir Hills in the south-west corner of the district (Figure 76).

The Clackmannan Group formations are defined by the differing proportions of the main rock types. Thus, beds of limestone are more conspicuous in the Lower and Upper Limestone formations than elsewhere, coals are most common in the Limestone Coal Formation, and sandstones and seatearths are the most prominent constituents of the Passage Formation. Depositional environments, likewise, show an underlying similarity, being related to the repeated advance and retreat of fluviodeltaic systems into an embayment of varying salinity. Scotland during the Namurian and succeeding Westphalian was located more or less on the Equator. Its climate was essentially tropical with extensive swampy forests (mires and 'mangrove' swamps) rapidly producing large trees that subsequently died to produce great thicknesses of peat that with time and deep burial became transformed into coal. The Lower and Upper Limestone formations contain the highest proportion of marine deposits, while alluvial deposits dominate the Passage Formation; the Limestone Coal Formation occupies an intermediate position. The base of the Clackmannan Group is taken at the base of the Lower Limestone Formation, where a cyclical sequence of marine limestone-bearing strata rests conformably on the West Lothian Oil- shale Formation of the Strathclyde Group. This group is mostly Namurian in age.

The Lower Limestone Formation comprises repeated upward-coarsening cycles of limestone, mudstone, siltstone and sandstone. Thin beds of seatrock and coal may cap the cycles. The limestone beds are fossiliferous and pale to dark grey in colour; most were deposited in a tropical marine environment. The mudstone (which may also contain marine fossils) and siltstone are predominantly grey to black. A few non-marine faunal beds are also known. Nodular clayband ironstone and limestone are well developed in the mudstone sequences. The Hurler Limestone defining the base of the formation, the Inchinnan Limestone, the Blackhall Limestone, the Main, Mid and Second Hosie limestones and, defining the top of the formation, the Top Hosie Limestone. The thickness of the formation is not well constrained but in the range of 100 to 200 m. In the Bathgate Hills the formation is interbedded with and replaced by basaltic tuffs and lava flows of the the Bathgate Hills Volcanic Formation and the key limestone horizons are more difficult to identify, may be undeveloped or be fused together.

The marine bioclastic limestone exposed at Wairdlaw [NS 994 731] (Figure 71), (Figure 74) appears to be isolated within the Bathgate Hills Volcanic Formation.

The Limestone Coal Formation comprises sandstone, siltstone and mudstone in repeated cycles. The majority coarsen upwards, but others fine upwards. The cycles are usually capped by seatearth and coal (3–10% of the total succession). The siltstone and mudstone are usually grey to black, while the sandstone is usually fine- to medium-grained and off-white to grey.

The Upper Limestone Formation is characterised by repeated upward-coarsening cycles comprising grey limestone overlain by grey to black mudstones and calcareous mudstones, siltstones and paler sandstones capped by seatrocks and coal. The main limestones are the Index, Orchard, Calmy and Castlecary limestones. A persistent development of lavas, up to 40 m thick, is present between Kipps Hill [NS 986 738] and Bathgate. Some of the flows on Kipps Hill are very fresh glassy basanites with well-developed columnar jointing. The youngest recorded volcanic activity in the district occurs above the Castlecary Limestone in the base of the Passage Formation.

The Passage Formation is characterised by an alternation of fine- to coarse-grained sandstones (with some conglomerates) and structureless clayrocks (including some high-alumina seatclay and fireclay). The petrography and provenance of the Passage Formation sandstones has been studied. These sandstones were derived from a low-grade metamorphic source intruded by acid igneous masses comparable to the Upper Dalradian rocks of the Highlands. A

sandstone in the lower part of the formation at Leven Seat [NS 943 580] has been worked for many years as a silica sand and used for moulding sand and several other non-industrial uses. A thin bed of tuffaceous siltstone close above the Castlecary Limestone has been recorded north-west of Torphichen [NS 967 723]. This is believed to be the highest stratigraphical level at which the Bathgate Hills Volcanic Formation occurs.

3.4.5.1 Soils, habitats and land use

Like the Strathclyde Group, the rocks of the Clackmannan Group are predominately glacial till- covered, though a belt of glaciofluvial sand and gravel runs from the north-west around Westfield south-eastwards to Bathgate, and around Boghall in the north of the district. Also, much of the till is peat covered along the boundary with south Lanarkshire in the south-west. The resulting soils are very variable with drainage status varying from free to very poor, with non- calcareous gleys, peaty-gleys, brown forest soils with gleying and brown forest soils predominating (Figure 6). The topography is also variable with the Bathgate Hills in the north, the flatter ground of the Almond Valley in the middle and the upland fringe moorland in the south. Urban areas and ley grassland and rough grazing are the main land uses for most of the area, with plantation forestry predominating south of the A71.

3.4.5.2 Biodiversity

Conservation biodiversity interest is concentrated in: the biological SSSIs at (Figure 12) Carriber Glen [NS 968 751] and Lochcote Marsh [NS 981 742]; the mixed biological and geological SSSIs at Petershill [NS 985 693]–[NS 990 710]; and Skolie Burn [NS 984 618]–[NS 986 628]

There is one Listed Wildlife Site (Figure 12) — Beecraigs Reservoir [NT 010 744] and Wildlife Sites at: Bogburn Flood Lagoons [NS 977 677]; Cockleroy Wood [NS 984 748]; Easter Inch Moss [NT 003 664]; Foulshiels Bing NS 977 635]; Lochcote Reservoir [NS 978 737]; Longridge Moss [NS 956 618]; Nether Longford Moss [NS 975 613]; Petershill [NS 986 695]; Silvermines Quarry [NS 991 714]; Swinabbey Moss [NS 970 658]; Witch Craig Meadow [NS 988 725].

Over 20 areas of Ancient and Semi-Natural Woodland (Figure 12) occur and High Priority Wildflower Grasslands are present at Cairnpapple Hill [NS 987 717] (Figure 65) and Knock [NS 988 715], [NS 992 715] (Figure 125). The development of the best herb species-rich grassland and species-rich limestone grasslands in West Lothian (MG3 & MG5) occurs in areas underlain by the Clackmannan Group. The limestones within the Clackmannan Group rocks also support one of the richest assemblages of bryophytes in the district.

3.4.5.3 West Lothian Geodiversity Sites

The Clackmannan Group is well represented by good-quality geodiversity sites (Figure 76).

[23 Levenseat working quarry](#)

[24 Levenseat quarries & mines](#)

[25 Skolie Burn](#)

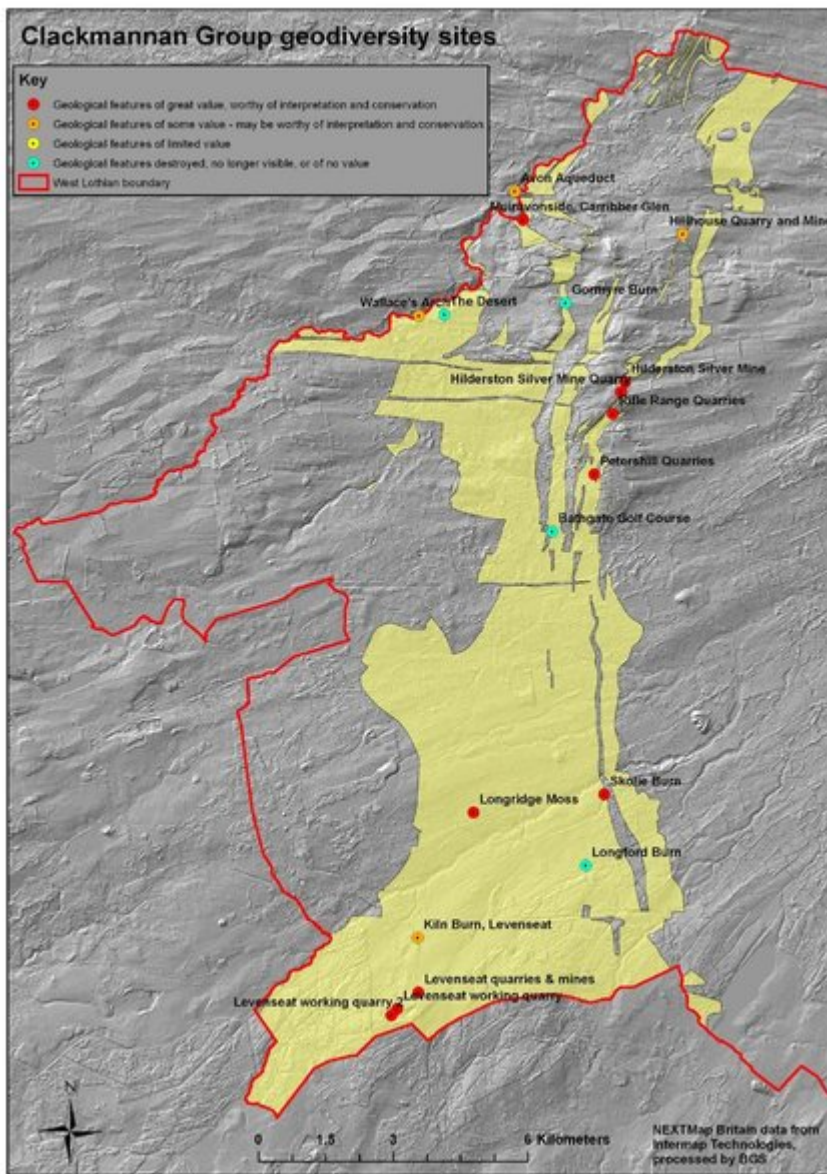
[26 Petershill Quarries](#)

[27 Rifle Range Quarries](#)

[28 Hilderston Silver Mine Quarry](#)

[29 Hilderston Silver Mine](#)

[30 Hillhouse Quarry and Mine](#)



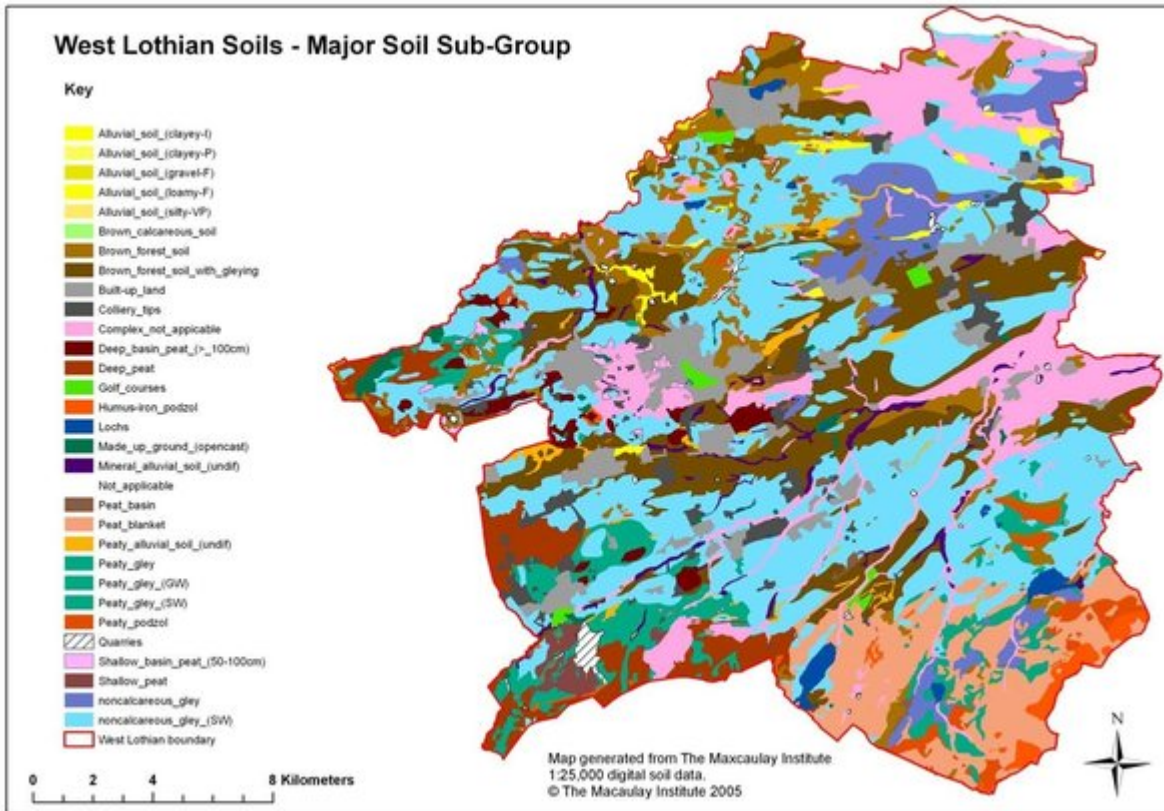
(Figure 76) Clackmannan Group geodiversity sites of West Lothian.



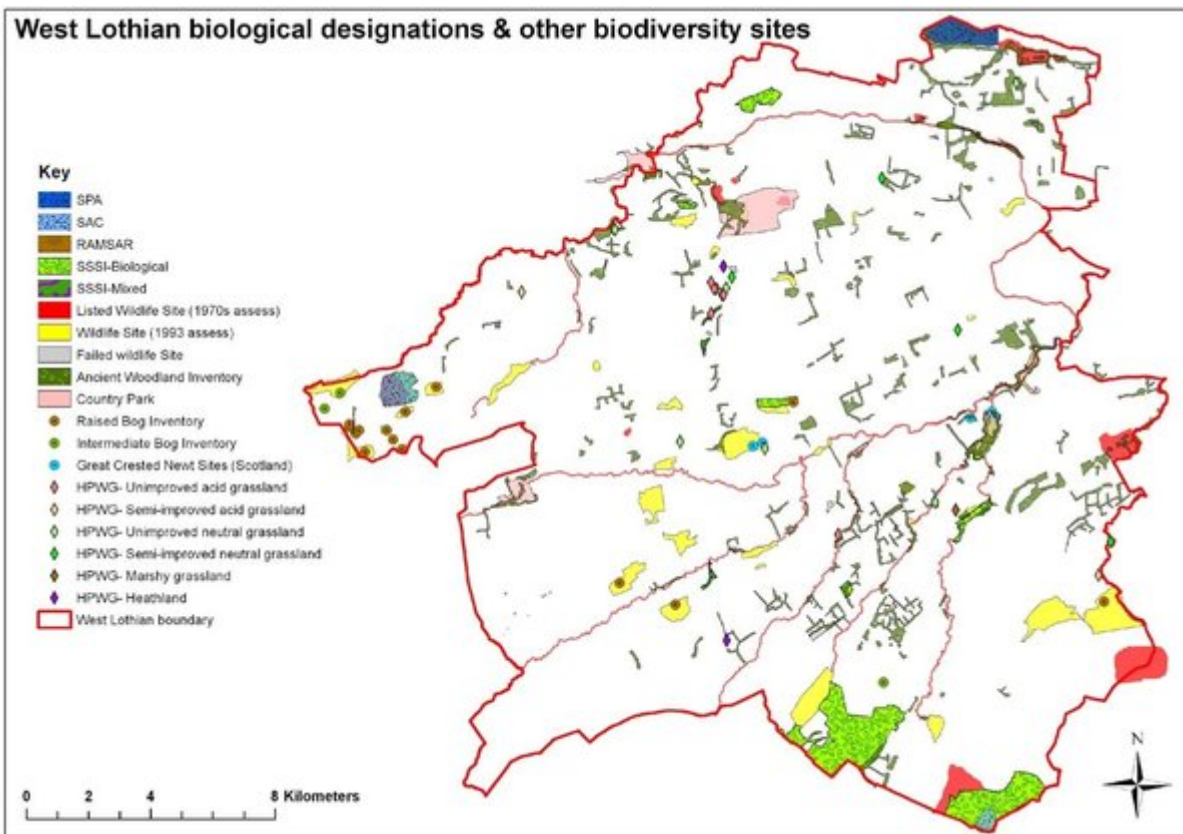
(Figure 71) Main quarry face at Wairdlaw Quarry. Wairdlaw Limestone ((Lower Limestone Formation, Clackmannan Group) above lava of Bathgate Hills Volcanic Formation [NS 9952 7313] (WLGS 21).



(Figure 74) Siphonodendron coral fossil in the Wairdlaw Limestone at Wairdlaw Quarry [NS 9952 7313] (WLGS 21).



(Figure 6) Major Soil Sub-Groups of West Lothian. © The Macaulay Institute 2005.



(Figure 12) Biological designations and other biodiversity sites of West Lothian.



(Figure 65) Stone circle and burial cairn on Cairnpapple Hill, viewed from the south-west. Rock types used are mainly local — basalt from the Bathgate Hills Volcanic Formation and quartz-dolerite from nearby intrusions [NS 9872 7174] (WLGS 20).



(Figure 125) Panoramic view east to south-east from The Knock (305 m) [NS 9906 7114] (WLGS 38) towards Edinburgh and the Pentland Hills.