
3.4.3 Strathclyde Group rocks

The Strathclyde Group is a varied sequence of rocks, sedimentary and volcanic, characterised by the presence of carbonaceous beds, including coal, oil-shale and limestone. The local Strathclyde Group strata are assigned to the Arthur's Seat Volcanic, Gullane and West Lothian Oil-shale formations (Figure 1)B, (Figure 2).

Outcrops of Strathclyde Group rocks comprise approximately 19,966 hectares, or 46.3% of the surface area of West Lothian. They crop out in a broad area covering most of the eastern half of West Lothian, from the coast at Abercorn Society to the southern slopes of the Pentland Hills at Colzium and Crosswood (Figure 21).

The Arthur's Seat Volcanic Formation, at the base of the group in the Lothians, is 342 Ma old. The sedimentary rocks were laid down between 345 Ma and 326 Ma. Deposition of the Strathclyde Group marks a lithological change from concretionary limestone and dolostone-bearing strata typical of the Inverclyde Group to a coal-bearing sequence in which volcanic rocks may be common.

The group is largely fluvial and lacustrine in origin, with a few marine incursions from time to time. The palaeoclimate during deposition of the Strathclyde Group was mainly humid (coals, oil-shales and sideritic mud grade palaeosols) but the presence of calcretes and calcareous mudstones ('marls') in the West Lothian Oil-shale Formation point to periods of semi-arid climatic conditions.

The Arthur's Seat Volcanic Formation consists of extrusive igneous rocks belonging to a suite of mildly alkaline basaltic lavas which is recognised across the Midland Valley and is chemically distinct from the Lower Devonian igneous rocks of the Pentlands. Volcaniclastic rocks known as tuffs and lapilli-tuffs also occur; these may be air-fall or water-lain in origin. The formation is up to 200 m thick in this area and absent in places.

The Gullane Formation consists of a cyclical sequence predominantly of pale-coloured, fine- to coarse-grained sandstones interbedded with grey mudstones and siltstones. Subordinate lithologies are coal, seatearth, ostracod-rich limestone and dolostone, sideritic ironstone and, rarely, marine beds with low diversity faunas lacking for example corals. The depositional environment was predominantly fluviodeltaic, into lakes that only occasionally became marine. Desiccation cracks, soft sediment deformation textures and bioturbation are sedimentological features typical of this formation.

The West Lothian Oil-shale Formation is characterised by several, well-developed distinctive seams of oil-shale (see section 3.2.1.2 for historical significance) within a cyclical sequence dominated by pale-coloured sandstones interbedded with grey siltstones and mudstones. Sections in most parts of the formation can be seen on the coast from South Queensferry to Blackness. Subordinate lithologies are coal, ostracod-rich limestone (see section 3.2.1.4 for economic geology) and dolostone, sideritic ironstone and beds of fossiliferous mudstone deposited in a marine environment, including limestones with rich and relatively diverse faunas. Thick, pale green-grey or grey argillaceous, calcareous beds containing supposed volcanoclastic detritus described as 'marl' are also present and may have formed on extensive semi-arid plains. The 'marl' can rest directly on the mud-cracked top of an oil shale. The maximum thickness of the formation is in excess of 1120 m in West Lothian.

The environment of deposition was of fluvial lacustrine deltas, subject to periodic inundation by incursions of marine water, with large freshwater lagoons rich in algae and other organic matter in which accumulated oil-shales and, less commonly, but significantly, limestones. The East Kirkton Limestone represents a world famous, development of non-marine limestone

3.4.3.1 Soils, habitats and land use

Compared to the Kinnesswood Formation sandstone of the Inverclyde Group, the relatively soft rocks of the Strathclyde Group rock have been easily eroded by the successive Quaternary ice-sheets leaving thick deposits of glacial till. Most soils are thus derived from this glacial till parent material with the dominant soil types being imperfect to poorly-drained

non-calcareous gleys and brown forest soils with gleying. Extensive blanket Peat is developed in the south between Cobbingshaw and Harperrig reservoirs and soil complexes are common in the north, around East Calder and north-west of Winchburgh (Figure 6). The middle of the outcrop is extensively urbanised with major population centres at Livingston and Broxburn. North of Broxburn mixed arable and ley grassland predominate, while to the south of Livingston, the land use is a mix of plantation forestry, ley grassland and rough pasture.

3.4.3.2 Biodiversity

Conservation biodiversity interest is concentrated in the biological SSSIs (Figure 12) at: the intermediate bog at Cobbinshaw Moss [NT 03 57]; Hermand Birchwood [NT 031 618]; Herman Quarry [NT 028 635]; Linhouse Valley [NT 07 64]; Calderwood [NT 07 66]; the raised bog at Tailend Moss [NT 00 67] (see section 3.4.10.10) and Philpstoun Muir [NT 06 76].

The foreshore between the mouth of the Midhope Burn [NT 080 793] at the West Lothian boundary just east of Blackness [NT 056 798] is part of the mixed geological and biological Firth of Forth SSSI. The biodiversity interest comprises an extensive mosaic of intertidal and coastal habitats. Extensive mudflats make up much of the intertidal area, with areas of sand, shingle, rock and boulders. Associated coastal habitats include saltmarsh, grassland and sand dunes. The mudflats are invertebrate rich and form important feeding grounds for the abundant waders and wildfowl in the Forth. Mussel beds occur on the lower shores in some areas and marine algae such as *Fucus*, *Ascophyllum* and *Enteromorpha* species, and eelgrass *Zostera* species are supported on these mudflats. The site is also a Ramsar site and an SPA .

Great Crested Newt (Scotland) sites also occur at: Easter Inch Moss [NT 003 664] and Almondell and Calder Wood [NT 077 675], [NT 078 674].

There are also a number of Listed Wildlife Sites (Figure 12): The River Almond and its tributaries Breich Water, Harwood Water, Murieston Water and Linhouse Water; The Union Canal; Old Philpstoun Bing [NT 054 770]; Hopetoun Estate [NT 088 789].

The following are also Wildlife Sites (Figure 12): Addiewell Ponds [NT 003 626]; Almond Pools [NT 021 663]; Almondell Country Park [NT 089 689]; Bangour Reservoir [NT 012 719]; Bellsquarry Wood [NT 050 652]; Canal Wood [NT 079 761]; Cobbingshaw Main Reservoir [NT 019 583]; Crosswood Reservoir [NT 060 575]; Easter Inch Moss [NT 003 664]; Faucheldean Bing [NT 084 742]; Harperrig Reservoir [NT 092 610]; Hermand Birchwood [NT 032 618]; Linhouse Valley [NT 072 643]; Mains Burn [NT 033 735]; North Addiewell Bing [NT 001 630]; Pumpherston Pond [NT 071 692]; Roman Camp Meadows [NT 071 706]; Skivo Quarry [NT 051 640]; Tailend Moss [NT 009 678].

Strathclyde Group rocks also host the following Scottish Wildlife Reserves: Addiewell Bing [NT 001 630]; Hermand Birchwood [NT 031 618]; Linhouse Glen [NT 072 643]. There are also numerous areas of Ancient and Semi-Natural Woodland (Figure 12).

High Priority Wildflower Grasslands (Figure 12) are present at: Hermand Quarry [NT 028 636]; Linhouse Water [NT 066 643]; Muriestone Estate [NT 059 646]; Ochiltree Place [NT 042 750]; Parkhead [NT 085 781]; Seafield [NT 004 664]; Uphall Station [NT 066 702].

3.4.3.3 West Lothian Geodiversity Sites

The Strathclyde Group is well represented by geodiversity sites, though the best of these are located in the centre and north of the outcrop (Figure 21).

[4 East Kirkton Quarry](#)

[5 Five Sisters](#)

[6 Seafield Law](#)

[7 Greendykes](#)

[8 Almond Valley Heritage Centre](#)

[9 Murieston Water 2](#)

[10 Almondell and Calder Wood](#)

[11 Upper Uphall](#)

[12 Union Canal, Winchburgh](#)

[13 Hopetoun Obelisk Quarry](#)

[14 Society East Shore](#)

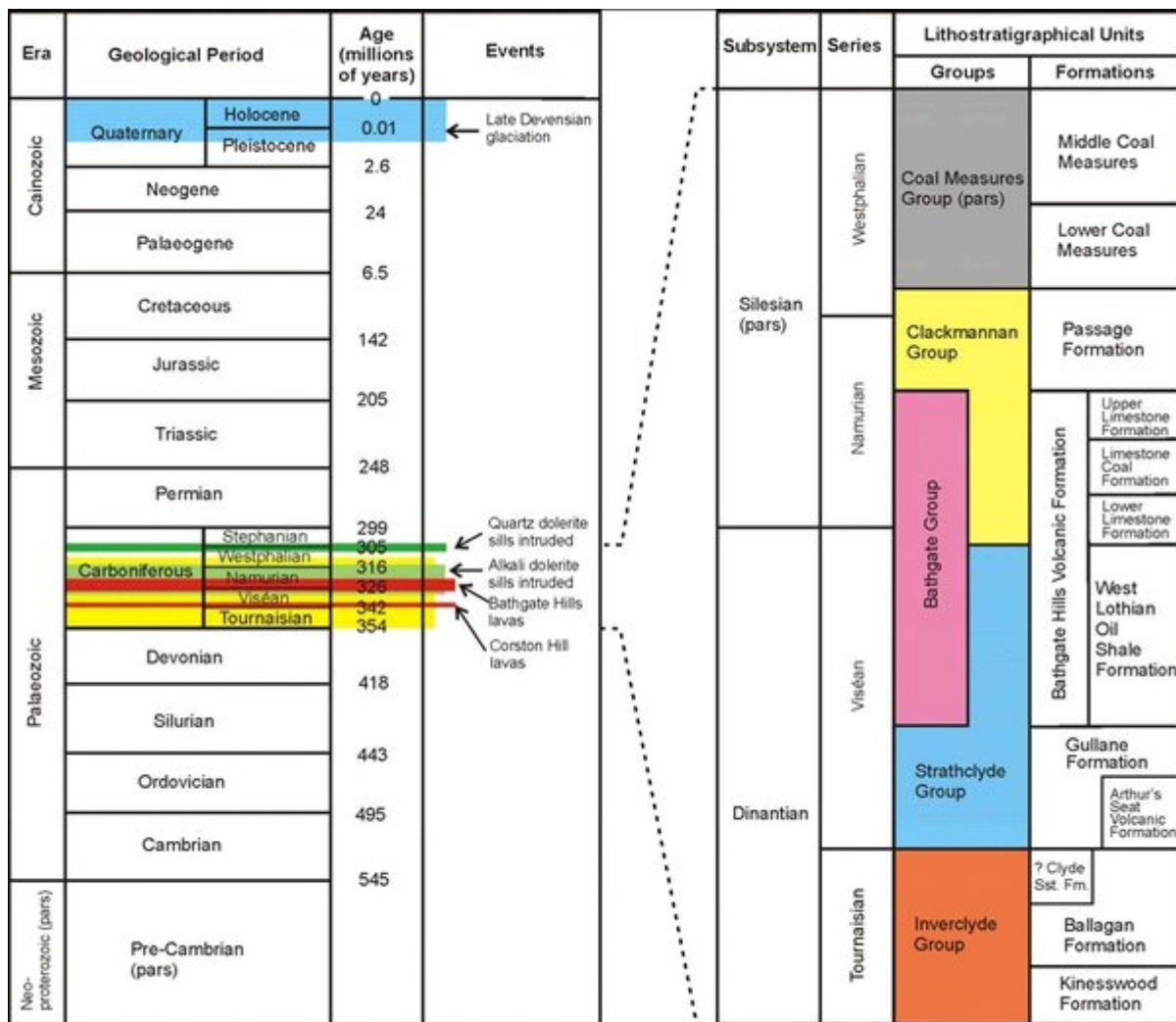
[15 Society Point](#)

[16 Society Shore](#)

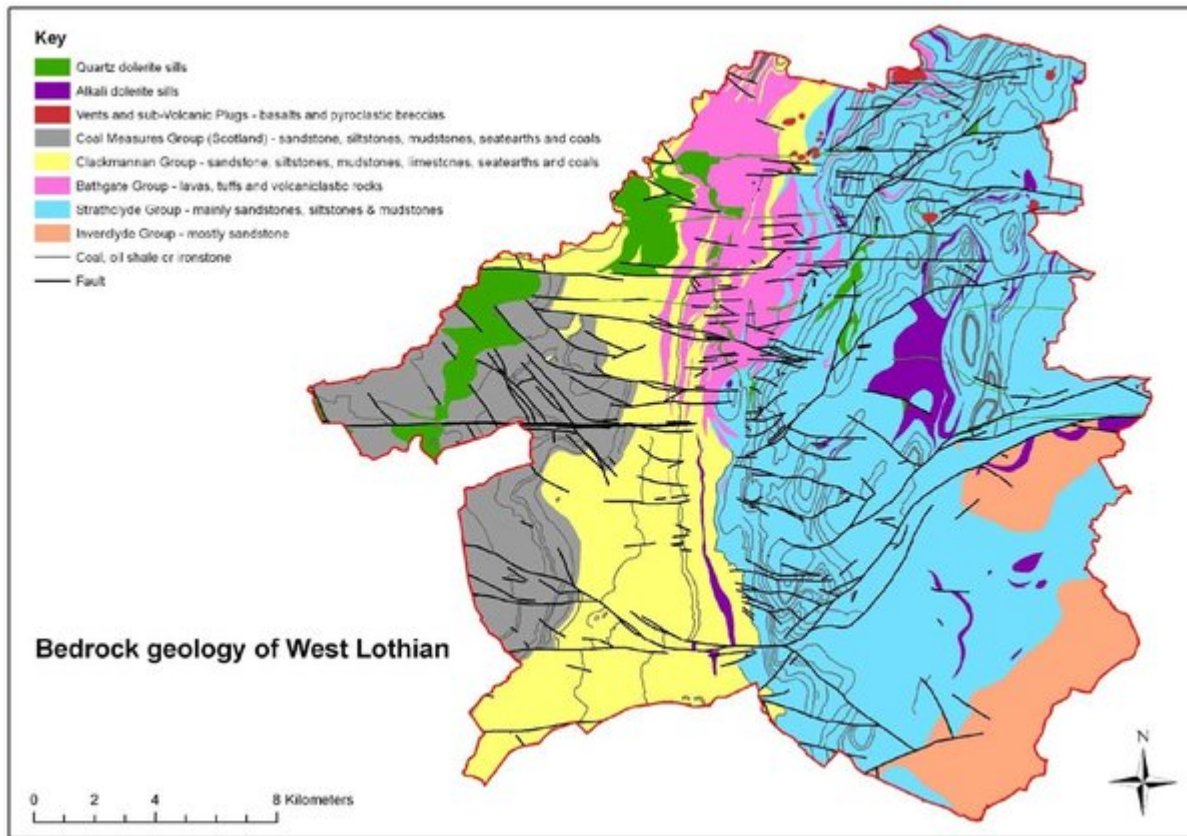
[17 Hopetoun Shore](#)

[18 Abercorn Point](#)

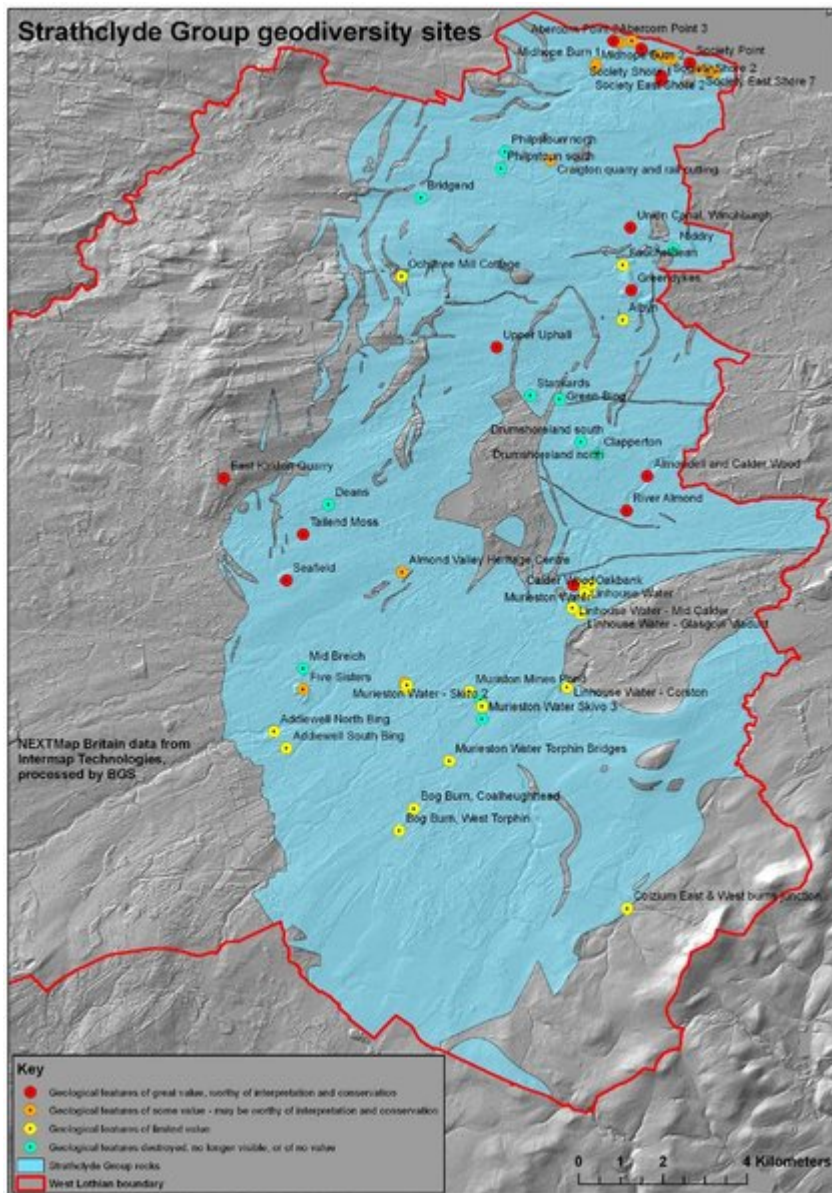
[19 Midhope Burn](#)



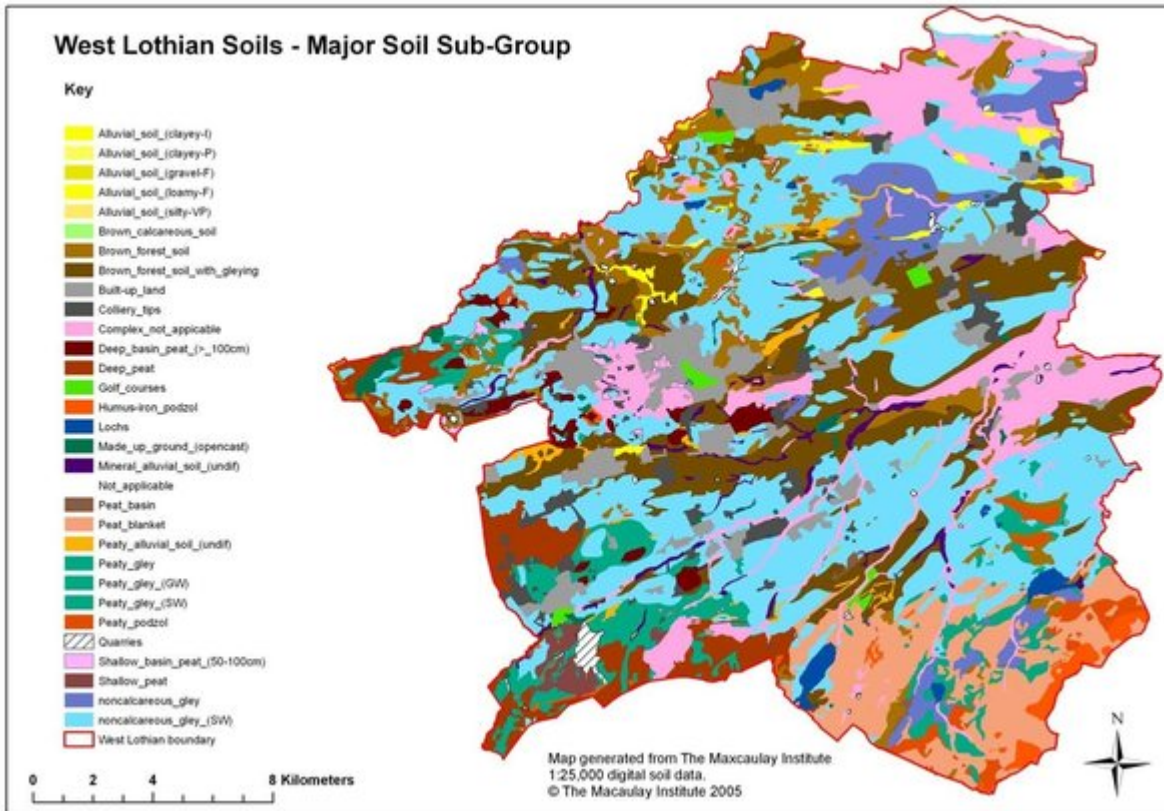
(Figure 1) A: Part of the geological timescale with colour bars representing the rocks of West Lothian. Yellow bar = Carboniferous sedimentary rocks; red bars = extrusive igneous rocks; green bars = intrusive igneous rocks. B: Classification of Carboniferous strata in West Lothian.



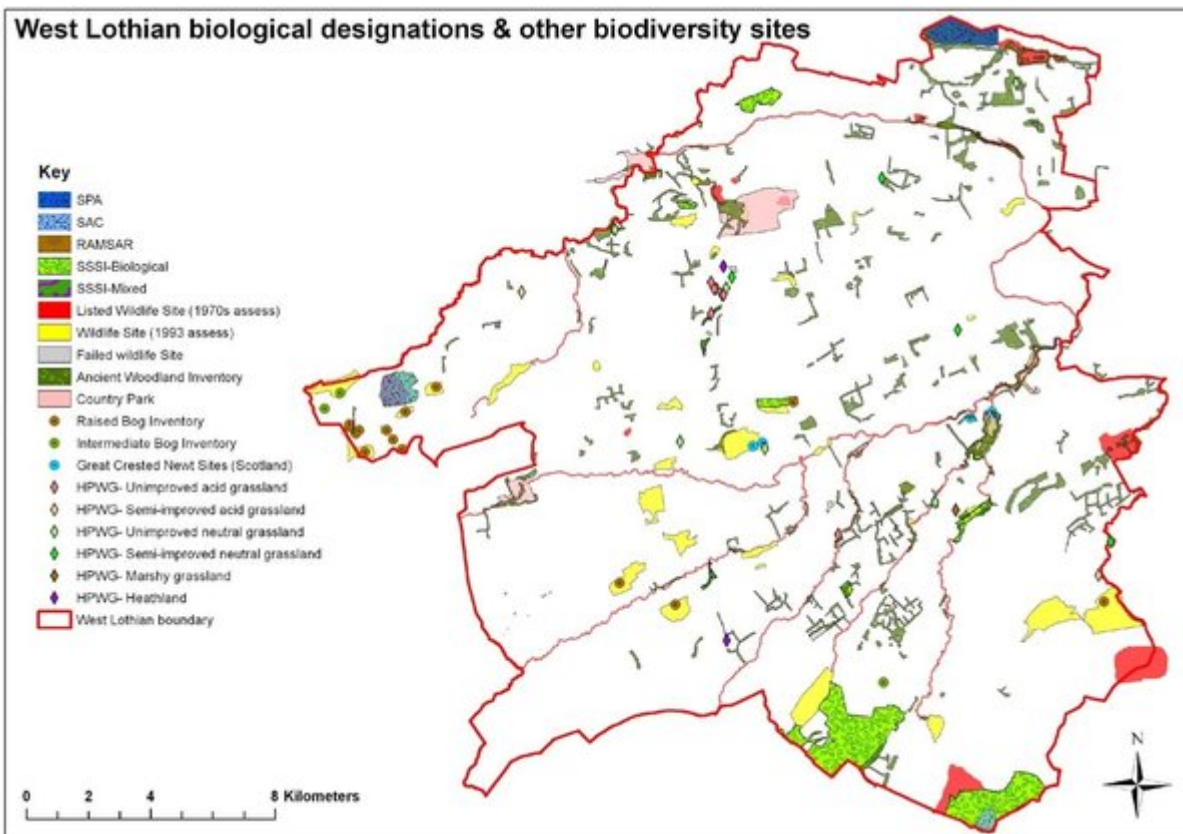
(Figure 2) Bedrock geology of West Lothian.



(Figure 21) Strathclyde Group geodiversity sites of West Lothian.



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



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