

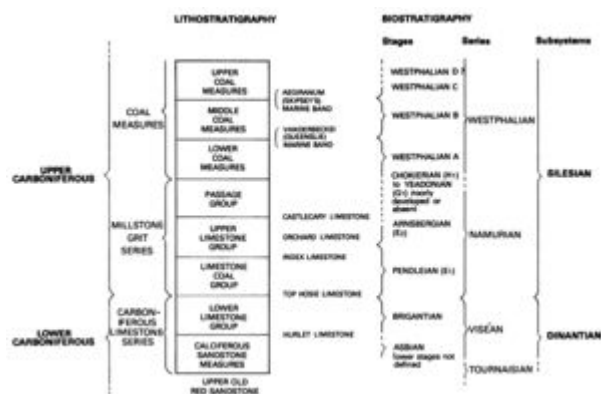
# Carboniferous of the Midland Valley of Scotland

From Earthwise

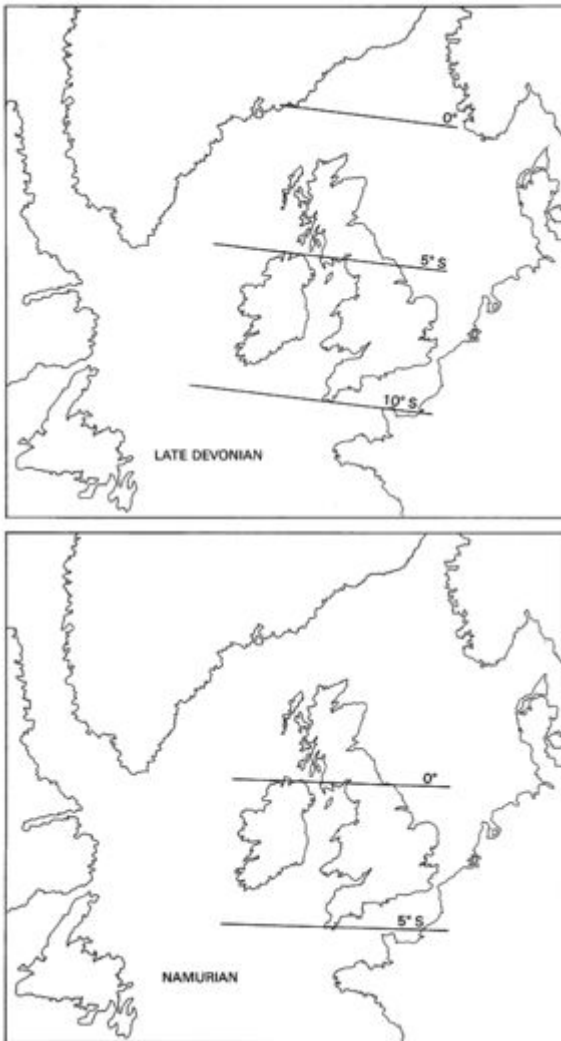
[Jump to navigation](#) [Jump to search](#)

Cameron, I B, and Stephenson, D. 1985. British regional geology: The Midland Valley of Scotland. Third edition. Reprint 2014. Keyworth, Nottingham: British Geological Survey.

## Carboniferous of the Midland Valley of Scotland



Subdivision and classification of the Carboniferous succession in the Midland Valley. P915556.



Palaeolatitudes for the British Isles during the late Devonian and Namurian (after Smith and others, 1981). P915526.

Rocks of Carboniferous age underlie the major part of the Midland Valley. The subdivisions and classification of the sequence are shown on [P915556](#). Descriptions of the sediments are given in the Dinantian, Namurian and Westphalian chapters and the palaeontology and igneous rocks are also treated in individual chapters.

The presence of Carboniferous rocks in central Scotland played a fundamental part in the industrial development of the region. The location of the iron and steel industry and the consequent developments in heavy engineering were in large part due to the existence of seams of coal, ironstone and limestone in the Carboniferous rocks. Although ironstone mining has long since finished, coal-mining remains an important, though shrinking industry. The mining, quarrying and sinking of boreholes associated with the exploration and exploitation of these minerals has resulted in a vast amount of detailed knowledge of the Carboniferous rocks in the region, particularly in the coalfield areas.

The basal Carboniferous strata in the region show a transition from the red sediments of the Upper Devonian deposited in fluvial and lacustrine regimes to the predominantly grey, fluvio-deltaic and shallow-marine beds of the Carboniferous. This change of facies reflects a major change of climate and depositional environment. The terrestrial, arid or semi-arid conditions during the Devonian gave way to a humid environment in the Carboniferous with deposition in a fluvio-deltaic system adjacent to and periodically transgressed by the sea. The formation of the numerous coal seams in the

succession resulted from luxuriant plant growth suggesting wet and warm or tropical conditions. Palaeomagnetic evidence indicates a northward drift of the British Isles across equatorial latitudes during the Carboniferous period ([P915526](#)).

The red coloration of the Upper Coal Measures, the youngest Carboniferous sediments preserved in the region, points to a return to semiarid conditions towards the end of the period.

In Carboniferous times the Midland Valley lay near the northern edge of a platform on the south side of the North American-North European continent. Clastic sediments derived from the Caledonian Mountains in the north interdigitated with thin marine sediments deposited during periodic incursions by the sea. The acme of marine conditions occurred at the close of Dinantian times during the deposition of the Lower Limestone Group and marine sediments are also well developed in the Upper Limestone Group in the Namurian. Repeated movements on deep fractures caused differential subsidence over the region which led to lateral variation in thickness and facies of the sediments.

The area now occupied by the Southern Uplands was probably above sea level for most of the Carboniferous except for gaps in the Loch Ryan and Sanquhar-Thornhill areas and possibly on the Berwickshire coast. Within the Midland Valley the thick subaerial accumulation of the Clyde Plateau volcanic rocks formed a barrier to sedimentation in Lower Carboniferous times and this barrier was not completely submerged until late in the Dinantian.

The Carboniferous sediments consist mainly of sandstones, siltstones and mudstones with beds of limestone, coal, fireclay and lesser amounts of ironstone and oil-shale. They are all shallow-water deposits and despite the great variation in total thickness in different areas, the depositional surface was never far from sea level and subsidence and sedimentation more-or-less kept pace.

Throughout much of the succession the sediments are arranged in cyclic sequences with a complete cycle represented by an upward passage from marine limestone or mudstone through non-marine mudstones and sandstones to seat-bed and coal, followed by a return to a marine member. This cyclicity is usually imperfect with one or more members of the cycle missing. The cycles can be up to 30 m thick but the average thickness is about 10 m. The marine members of the cycles are of primary importance in the correlation of sequences from different areas. In general, the number of cycles in a succession increases in direct proportion with increase in thickness and more cycles tend to be complete in thicker successions.

Several explanations for the cyclicity exhibited in the deposition of Carboniferous sediments have been proposed. These include eustatic changes in sea level, pulsed subsidence and purely sedimentary processes inherent in delta construction. No single explanation finds universal acceptance and it is likely that several mechanisms were interacting during the Carboniferous.

In international classification the base of the Carboniferous, i.e. the base of the Dinantian (Lower Carboniferous), is defined by the presence of certain marine fossils. As these fossils have not been found in Scotland, an accurate definition of the base of the Carboniferous in the region cannot be drawn. Plant miospores are the only fossils present in the lowest Carboniferous beds in the region which give some indication as to where the horizon should be placed. These minute fossils have been used to subdivide the Dinantian into a number of assemblage zones. In this zonation, the Cementstone Group, the lowest undoubted Carboniferous strata in the Midland Valley are placed in the CM Zone. In southern England and elsewhere, however, there are at least two lower zones present below the CM Zone. As the Cementstones overlie the Upper Old Red Sandstone in apparent conformable sequence, there is a strong inference that the Devonian-Carboniferous boundary lies at an horizon within the Upper Old Red Sandstone.

The top of the Dinantian Subsystem, and therefore the base of the Silesian Subsystem, is drawn about a metre below the Top Hosie Limestone where the lowest occurrence of the goniatite *Cravenoceras* has been recorded.

The Dinantian is subdivided into two series, the Tournaisian and the Viséan. The presence of the former has been deduced solely from miospore evidence and is not well defined. The bulk of the Lower Carboniferous rocks of the region are of Viséan age.

The overlying Silesian strata present in the region are subdivided into the Namurian and Westphalian series which in turn are composed of stages as shown in [P915556](#). The base of the Westphalian is defined in Western Europe by the presence of the goniatite *Gastrioceras subcrenatum*. This species has not been found in Scotland and spore evidence suggests that the base of the Westphalian lies within the upper part of the Passage Group. This lack of faunal control has resulted in the base of the Coal Measures being drawn at locally convenient horizons in the various coalfield areas. Deposits of the youngest stage of the Silesian in Europe, the Stephanian, have not been recognised in Scotland.

Some of the Namurian and Westphalian stages are defined by the presence of diagnostic goniatites but for others the evidence is lacking. For descriptive purposes it is more convenient to use the classification based on lithology shown on the left hand side of [P915556](#).

## Bibliography

Belt, E. S., Freshney, E. C. and Read, W. A. 1967. Sedimentology of Carboniferous cementstone facies, British Isles and eastern Canada. *J. Geol.*, Vol. 75, pp. 711-721.

Brand, P. J. 1977. The Fauna and Distribution Of The Queenslie Marine Band (Westphalian) In Scotland. *Rep. Inst. Geol. Sci.*, No. 77/18.

Brand, P. J. 1983. Stratigraphical palaeontology of the Westphalian of the Ayrshire Coalfield, Scotland. *Trans. R. Soc. Edinburgh: Earth Sci.*, Vol. 73, pp. 173-190.

Brand, P. J. , Armstrong, M. and Wilson, R. B. 1980. The Carboniferous strata at the Westfield Opencast Site, Fife, Scotland. *Rep. Inst. Geol. Sci.*, No. 79/11.

Bott, M. H. P. and Johnson, G. A. L. 1967. The controlling mechanism of Carboniferous cyclic sedimentation. *Q.J. Geol. Soc. London*, Vol. 122, pp. 421-441.

Browne, M. A. E. 1980. Stratigraphy of the lower Calciferous Sandstone Measures in Fife. *Scott. J. Geol.*, Vol. 16, pp. 321-328.

Currie, E. D. 1954. Scottish Carboniferous goniatites. *Trans. R. Soc. Edinburgh*, Vol. 62, pp. 527-602.

Davies, A. 1972. Carboniferous rocks of the Muirkirk, Gass Water and Glenmuir areas of Ayrshire. *Bull. Geol. Surv. G.B.*, No. 40, pp. 1-49.

Davies, A. 1974. The Lower Carboniferous (Dinantian) sequence at Spilmersford, East Lothian, Scotland. *Bull. Geol. Surv. G.B.*, No. 45, pp. 1-38.

Forsyth, I. H. 1978. The lower part of the Limestone Coal Group in the Glasgow district. *Rep. Inst. Geol. Sci.*, No. 78/29.

- Forsyth, I. H. 1979. The Lower Coal Measures of central Glasgow. Rep. Inst. Geol. Sci., No. 79/4.
- Forsyth, I. H. 1982. The stratigraphy of the Upper Limestone Group (E1 and E2 stages of the Namurian) in the Glasgow district. Rep. Inst. Geol. Sci., No. 82/4.
- George, T. N. 1978. Eustasy and tectonics: sedimentary rhythms and stratigraphical units in British Dinantian correlation. Proc. Yorkshire Geol. Soc., Vol. 42, pp. 229-254.
- George, T. N., Johnson, G. A. L., Mitchell, M., Prentice, J. E., Ramsbottom, W. H. C., Sevastopulo, G. D. and Wilson, R. B. 1976. A correlation of Dinantian rocks in the British Isles. Spec. Rep. Geol. Soc. London, No. 7.
- Goodlet, G. A. 1957. Lithological variation in the Lower Limestone Group of the Midland Valley of Scotland. Bull. Geol. Surv. G.B., No. 12, pp. 52-65.
- Greensmith, J. T. 1965. Calciferous Sandstone Series sedimentation at the eastern end of the Midland Valley of Scotland. J. Sediment. Petrol., Vol. 35, pp. 223-242.
- Hill, D. 1938-41. Carboniferous rugose corals of Scotland. Palaeontogr. Soc. (Monogr.) Lumsden, G. I. 1964. The Limestone Coal Group of the Douglas Coalfield Lanarkshire. Bull. Geol. Surv. G.B., No. 21, pp. 37-71.
- Hill, D. 1965. The base of the Coal Measures in the Douglas Coalfield, Lanarkshire. Bull. Geol. Surv. G.B., No. 22, pp. 80-91.
- Hill, D. 1967. The Carboniferous Limestone Series of Douglas, Lanarkshire. Bull. Geol. Surv. G.B., No. 26, pp. 1-22.
- Hill, D. 1967. The Upper Limestone Group and Passage Group of Douglas, Lanarkshire. Bull. Geol. Surv. G.B., No. 27, pp. 17-48.
- Hill, D. and Calver, M. A. 1958. The stratigraphy and palaeontology of the Coal Measures of the Douglas Coalfield. Bull. Geol. Surv. G.B., No. 15, pp. 32-70.
- Hill, D. and Wilson, R. B. 1978. Stratigraphical classification of the Carboniferous succession of central Scotland. C.R. 8e Congr. Int. Stratigr. Geol. Carbonif., Vol. 2, pp. 27-36.
- McLean, A. C. and Deegan, C. E. 1976. A synthesis of the solid geology of the Firth of Clyde region. In McLean, A. C. and Deegan, C. E. (editors). The solid geology of the Clyde sheet (55°N/6°W). Rep. Inst. Geol. Sci., No. 78/9.
- Monro, S. K., Loughnan, F. C. and Walker, M. C. 1983. The Ayrshire bauxitic clay: an allochthonous deposit? In Residual Deposits, pp. 47-58. Wilson, R. C. L. (editor). Spec. Publ. Geol. Soc. London, No. 11.
- Muir R. O. 1963. Petrography and provenance of the Millstone Grit of central Scotland. Trans. Edinburgh Geol. Soc., Vol. 19, pp. 439-485.
- Mykura, W. 1960. The replacement of coal by limestone and the reddening of Coal Measures in the Ayrshire Coalfield. Bull. Geol. Surv. G.B., No. 16, pp. 69-109.
- Mykura, W. 1967. The Upper Carboniferous rocks of south-west Ayrshire. Bull. Geol. Surv. G.B., No. 26, pp. 23-48.

- Neves, R., Read, W. A. and Wilson, R. B. 1965. Note on recent spore and goniatite evidence from the Passage Group of the Scottish Upper Carboniferous succession. *Scott. J. Geol.*, Vol. 1, pp. 185-188.
- Neves, R., Gueinn, K. J., Clayton, G., Ioannides, N. S., Neville, R. S. W. and KruszeWska, K. 1973. Palynological correlations within the Lower Carboniferous of Scotland and northern England. *Trans. R. Soc. Edinburgh*, Vol. 69, pp. 23-70.
- Ramsbottom, W. H. C. 1977. Major cycles of transgression and regression (Mesothems) in the Namurian. *Proc. Yorkshire Geol. Soc.*, Vol. 41, pp. 261-291.
- Ramsbottom, W. H. C. 1977. Correlation of the Scottish Upper Limestone Group (Namurian) with that of the North of England. *Scott. J. Geol.*, Vol. 13, pp. 327-330.
- Ramsbottom, W. H. C., Calver, M. A., Eagar, R. M. C., Hodson, F., Holliday, D. W., Stubblefield, C. J. and Wilson, R. B. 1978. A correlation of Silesian rocks in the British Isles. *Spec. Rep. Geol. Soc. London*, No. 10.
- Read, W. A. and Dean, J. M. 1967. A quantitative study of a sequence of coal-bearing cycles in the Namurian of central Scotland, 1. *Sedimentology*, Vol. 9, pp. 137-156.
- Read, W. A. and Cole, A. J. 1971. Some Namurian (E2) paralic sediments in central Scotland: an investigation of depositional environment and facies changes using iterative-fit trend-surface analysis. *J. Geol. Soc. London*, Vol. 127, pp. 137-176.
- Smith, A. G., Hurley, A. M. and Briden, J. C. 1981. *Phanerozoic palaeocontinental world maps.* (Cambridge: Cambridge University Press.)
- Thomson, M. E. 1978. IGS Studies of the geology of the Firth of Forth and its approaches. *Rep. Inst. Geol. Sci.*, No. 77/17.
- Weir, J. and Leitch, D. 1936. The zonal distribution of the non-marine lamellibranchs in the Coal Measures of Scotland. *Trans. R. Soc. Edinburgh*, Vol. 57, pp. 697-751.
- Wilson, R. B. 1966. A study of the Neilson Shell Bed, a Scottish Lower Carboniferous marine shale. *Bull. Geol. Surv. G.B.*, No. 24, pp. 105-128.
- Wilson, R. B. 1967. A study of some Namurian marine faunas of central Scotland. *Trans. R. Soc. Edinburgh*, Vol. 66, pp. 445-490.
- Wilson, R. B. 1974. A study of the Dinantian marine faunas of south-east Scotland. *Bull. Geol. Surv. G.B.*, No. 46, pp. 35-65.
- Wilson, R. B. 1979. The base of the Lower Limestone Group (Viséan) in North Ayrshire. *Scott. J. Geol.*, Vol. 15, pp. 313-319.
- Wilson, R. B. 1983. Note on the correlation of the Upper Limestone Group (Namurian) in south Ayrshire. *Scott. J. Geol.*, Vol. 19, pp. 183-188.

Retrieved from

[http://earthwise.bgs.ac.uk/index.php?title=Carboniferous\\_of\\_the\\_Midland\\_Valley\\_of\\_Scotland&oldid=34737](http://earthwise.bgs.ac.uk/index.php?title=Carboniferous_of_the_Midland_Valley_of_Scotland&oldid=34737)

Category:

- [Midland Valley of Scotland](#)

# Navigation menu

## Personal tools

- Not logged in
- [Talk](#)
- [Contributions](#)
- [Log in](#)
- [Request account](#)

## Namespaces

- [Page](#)
- [Discussion](#)

## Variants

## Views

- [Read](#)
- [Edit](#)
- [View history](#)
- [PDF Export](#)

## More

## Search

## Navigation

- [Main page](#)
- [Recent changes](#)
- [Random page](#)
- [Help about MediaWiki](#)

## Tools

- [What links here](#)
- [Related changes](#)
- [Special pages](#)
- [Permanent link](#)
- [Page information](#)

- [Cite this page](#)
- [Browse properties](#)

• This page was last modified on 1 February 2018, at 13:00.

- [Privacy policy](#)
- [About Earthwise](#)
- [Disclaimers](#)

