

LIMESTONE PAVEMENTS (UK BAP PRIORITY HABITAT)



Summary

The vegetation of Limestone pavements ranges from scrubby woodland and willow scrub to mountain avens *Dryas octopetala* heath, species-rich grasslands, fern communities and wet flushes. There is a range of characteristic woody species, herbs and bryophytes in these limestone habitats including in the deep, shaded, damp, and shallower, sunny crevices.

Limestone pavements is an uncommon habitat in Scotland, formed when horizontally-bedded sheets of limestone are exposed by glaciation and then chemically weathered by rain. This results in the distinctive level surface dissected into blocks and ridges by a series of eroded cracks. Most of it occurs in the areas of Durness limestone in Wester Ross, West Sutherland and Skye, but there are outliers on the Dalradian limestone of Lismore and in central Perthshire.

Notable species in Limestone pavements include whortle-leaved willow *Salix myrsinites*, *Dryas octopetala*, holly fern *Polystichum lonchitis*, dark-red helleborine *Epipactis atrorubens*, herb paris *Paris quadrifolia*, rock sedge *Carex rupestris* and the moss *Orthothecium rufescens*.

Light grazing is the best form of management. Damaging activities that should be avoided are tree felling, quarrying limestone for use as roadstone or in garden rockeries, and grazing so hard that woody species are eliminated.

What is it?

This priority habitat includes plant communities that occur on and around exposures of horizontally-bedded limestone. They include a range of calcareous grasslands, heaths and scrubby woodland.

The most common type of vegetation associated with limestone pavements in Scotland is herb-rich, calcicolous grassland with a sward of sheep's fescue *Festuca ovina*, red fescue *F. rubra*, common bent *Agrostis capillaris*, sweet vernal grass *Anthoxanthum odoratum* and, more locally, quaking grass *Briza media* and meadow oat-grass *Avenula pratensis*. The sward is interwoven with wild thyme *Thymus polytrichus* and enriched with an array of small herbs and sedges such as meadow buttercup *Ranunculus acris*, self-heal *Prunella vulgaris*, ribwort plantain *Plantago lanceolata*, purging flax *Linum catharticum*, alpine lady's mantle *Alchemilla alpina*, smooth lady's mantle *A. glabra*, glaucous sedge *Carex flacca*, spring sedge *C. caryophyllea* and flea sedge *C. pulicaris*. Some swards have a similar flora growing in a carpet of *Dryas octopetala*.

Trees and shrubs grow out of crevices in the limestone, where they are protected from browsing. The most common are ash *Fraxinus excelsior*, rowan *Sorbus aucuparia*, blackthorn *Prunus spinosa* and hawthorn *Crataegus monogyna*. A woodland ground flora can develop in the deeper cracks, where the plants are sheltered, shaded, and out of the reach of grazing animals. Typical species are ferns such as male fern *Dryopteris filix-mas* and broad buckler fern *D. dilatata* and woodland herbs such as sanicle *Sanicula europaea*, herb robert *Geranium robertianum*, wood crane's-bill *G. sylvaticum*, dog's mercury *Mercurialis perennis* and ramsons *Allium ursinum*.

Limestone pavements in north-west Scotland is a notable habitat for *Salix myrsinites* montane willow scrub.

Although the rocks themselves form a dry habitat, flushes can arise amongst the exposures with species such as carnation sedge *Carex panicea*, dioecious sedge *C. dioica*, common yellow-sedge *C. viridula* ssp. *oedocarpa*, common butterwort *Pinguicula vulgaris* and the mosses *Palustriella commutata*, *Campylium stellatum*, *Blindia acuta*, *Scorpidium scorpioides* and *Drepanocladus revolvens*.

On flushed ground among the outcrops of limestone there may also be taller swards with species such as purple moor-grass *Molinia caerulea*, meadowsweet *Filipendula ulmaria*, flag *Iris pseudacorus* and marsh hawk's-beard *Crepis paludosa*.

In the cracks and crevices are assemblages of small ferns such as maidenhair spleenwort *Asplenium trichomanes*, wall-rue *A. ruta-muraria* and green spleenwort *A. viride*. Bryophytes growing on the rocks and among vegetation include *Tortella tortuosa*, *Homalothecium lutescens*, *H. sericeum*, *Ctenidium molluscum*, *Hypnum lacunosum*, *Didymodon ferrugineus*, *Ditrichum gracile*, *Encalypta streptocarpa* and *Neckera crispa*.

How do I recognise it?

Differentiation from other priority habitats

The Limestone pavements habitat is differentiated from Upland calcareous grassland, Upland flushes, fens and swamps, Inland rock outcrop and scree habitats, Mountain heaths and willow scrub, and Upland mixed ashwoods by its exposures and outcrops of limestone other than cliffs and scree.

Definition in relation to other habitat classifications

Classification	Habitat types belonging to this UK BAP priority habitat
NVC	The Limestone pavements priority habitat can include the following NVC communities: CG9-10, CG13-14, M10, M26-27, OV38-40, W9, W20-22 (note: CG9 and OV38 are not recorded in Scotland). All of these communities except CG9, OV38 (both unknown in Scotland) and OV39 are included in the Scottish Biodiversity List.
Phase 1	The Limestone pavements priority habitat belongs within one (broader) Phase 1 habitat type: I1 (only limestone pavement examples included here; the remainder belong in the Inland rock outcrop and scree priority habitat type).
UK BAP broad habitat	All of the Limestone pavements priority habitat in Britain belongs in the UK BAP broad habitat – Inland Rock.

Definition in relation to legislative classifications

Classification	Habitat types belonging to this UK BAP priority habitat
Habitats Directive Annex I	The Limestone pavements priority habitat equates to one Annex I habitat: H8240.
SNH SSSI habitat features	The Limestone pavements priority habitat equates to one SSSI habitat feature: Limestone pavement.

Where is it?

Limestone is largely made of calcium or magnesium carbonate and is weakly soluble in water. The action of rainwater percolating over the stone is to dissolve the lines of weakness, cutting the original mass of rock into a network of interconnecting channels. It is this close juxtaposition of exposed, sub-baked rock and deep, cool, shaded channels that makes the flora so varied and interesting. Limestone pavements in Scotland varies in appearance. Horizontally-bedded strata exposed by glacial action and subsequently dissected by rainwater form level, table-like landforms. There is a good example at Inchnadamph in Sutherland. Those that have been eroded by water while still under a covering of topsoil have a more rounded, massive form. Most of the limestone exposures on Skye, in West Sutherland, Wester Ross, Lismore and Perthshire are of this form.

Deep pockets of damp humus and soil can accumulate in the crevices and contrast starkly with the dry cracks and well-drained surrounding soils.

The vegetation adjacent to the limestone outcrops and their immediate environs can vary from woodland to dwarf shrub heath, blanket bog and grassland. Where the bedrock is covered with a layer of peat it is common to have abrupt ecotones between acid heath and bog vegetation, and highly calcicolous grassland and heath. Where limestone outcrops are emerging from under the soil there can be interesting mixtures of vegetation with shrubs such as bearberry *Arctostaphylos uva-ursi* and crowberry *Empetrum nigrum* growing with calcicoles such as common rock-rose *Helianthemum nummularium*, *Briza media* and yellow saxifrage *Saxifraga aizoides*, as on Schiehallion in Perthshire.

Limestone pavements is one of the least widespread habitats in Scotland. It is recorded in 23 10-km squares (Ellis and Munro 2004) scattered widely through the Durness and

Dalradian limestones in the Highlands and Inner Hebrides with one record in Ayrshire. No total area measurement is available.

Limestone pavements is common and locally extensive in northern England and western Ireland. It occurs widely throughout the world in limestone areas, though only in western Europe is the vegetation similar to ours.

What is special about it?

Some species of special conservation status recorded in this priority habitat in Scotland are listed below.

Group	Common name	Latin name	UK BAP priority list	EC Habitats Directive Annex II	Scottish Bio-diversity List	Red Data List	Wildlife and Countryside Act (1981)
butterflies	northern brown argus	<i>Aricia artaxerxes</i>	y		y		y
ferns	holly fern	<i>Polystichum lonchitis</i>	y		y	y	
flowering plants	frog orchid	<i>Coeloglossum viride</i>	y		y	y	
flowering plants	eyebright	<i>Euphrasia ostenfeldii</i>	y		y	y	
fungi	stalked puffball	<i>Tulostoma niveum</i>	y		y		

As a calcicolous habitat this has a rich flora including some notable species. *Dryas octopetala* and the willow *Salix myrsinites* are the most characteristic of these, being more common on Limestone pavements than in any other habitat in Scotland. Other interesting plants recorded in the habitat include *Epipactis atrorubens*, *Polystichum lonchitis*, *Paris quadrifolia*, *Carex rupestris* and alpine cinquefoil *Potentilla crantzii* and the mosses *Orthothecium rufescens* and *Ditrichum gracile*.

Rare lichens of Limestone pavements include *Ionaspis melanocarpa* and *Placynthium lismorensense* (Gilbert 2000).

How do we manage it?

Limestone pavements is a rare, important and non-renewable habitat. Although most of the plants in the sheltered crevices are protected from grazing, the surrounding calcicolous heaths and grasslands can often be grazed hard. Unless the grazing is so intensive that *Dryas octopetala* cannot survive, this is generally not a problem as the grasslands have been produced and are maintained by grazing. Without it, a layer of humus would accumulate and the vegetation would likely develop into acid grassland or dwarf shrub heath. Quarrying the limestone for use in gardens or as roadstone is not sustainable and should avoided.

References, links and further reading

Averis, A., Averis, B., Birks, J., Horsfield, D., Thompson, D., and Yeo, M. 2004. An Illustrated Guide to British Upland Vegetation. Peterborough, JNCC
<http://jncc.defra.gov.uk/page-2463>

Ellis, N.E. and Munro, K. 2004. A preliminary review of the distribution and extent of BAP priority habitats across Scotland. Scottish Natural Heritage Commissioned Report No.044 (ROAME No. F00NA02).
<https://www.nature.scot/information-library-data-and-research/information-library>

Rodwell, J.S. (Ed.) (1991 et seq.). British Plant Communities. 5 volumes: Vol. 1 (1991) - Woodlands and Scrub; Vol. 2 (1991) - Mires and Heaths; Vol. 3 (1992) - Grasslands and montane communities; Vol. 4 (1995) - Aquatic communities, swamps and tall-herb fens; Vol. 5 (2000) - Maritime Cliffs, Sand Dunes, Saltmarshes and Other Vegetation. Cambridge University Press, Cambridge. <http://jncc.defra.gov.uk/page-4268>

Rodwell, J.S., Dring, J.C., Averis, A.B.G., Proctor, M.C.F., Malloch, A.J.C., Schaminee, J.H.J. and Dargie, T.C.D. 1998. Review of coverage of the National Vegetation Classification. Joint Nature Conservation Committee contract report F76-01-170. Coordinated by the Unit of Vegetation Science, Lancaster University.

UK BAP 2008. http://jncc.defra.gov.uk/pdf/UKBAP_BAPHabitats-23-LimestonePavements.pdf

Usher, M.B., Bain, C. and Kerr, A. eds. 2000. Action for Scotland's Biodiversity. Scottish Biodiversity Group. Edinburgh, The Scottish Executive and The Stationery Office.

Common Standards Monitoring guidance <http://www.jncc.gov.uk/page-2199>

Countryside Survey: <http://www.countrysidesurvey.org.uk>

National Biodiversity Network (NBN) Gateway <https://data.nbn.org.uk/>

Scottish Government website – information about agricultural grants, subsidies and services: <http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/grants/A-Z/Intro>

Scottish Natural Heritage website: <http://www.nature.scot>

UKBAP information on JNCC website: <http://jncc.defra.gov.uk/default.aspx?page=5155>