

**European Community Directive
on the Conservation of Natural Habitats
and of Wild Fauna and Flora
(92/43/EEC)**

Supporting documentation for the
Third Report by the United Kingdom under
Article 17

on the implementation of the Directive
from January 2007 to December 2012
Conservation status assessment for

Species:

S1386 - Green shield-moss (*Buxbaumia viridis*)

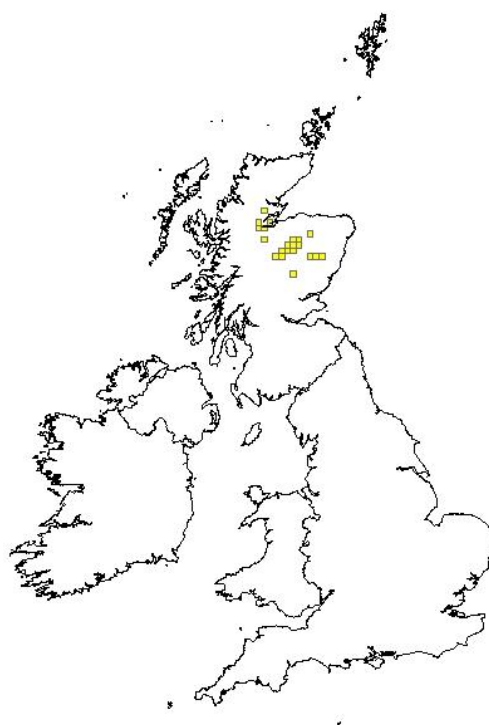
IMPORTANT NOTE – PLEASE READ

- The country-level reporting information contained in this document is a contribution to the Article 17 UK report for the habitat/species concerned.
- It has been provided by **Scottish Natural Heritage** and refers only to the state of the habitat/species in **Scotland** - it does not constitute an assessment for the whole of the UK.
- The Article 17 UK Approach document provides details on how this information has been used and, combined with information supplied by other Statutory Nature Conservation Bodies
- The format of the document is closely aligned to that set out by the European Commission for Member State reporting – as a result, some of the fields are not applicable at a country-level and have deliberately been left blank – in addition, the content of most fields is constrained by the EC reporting categories.

Reporting format on the 'main results of the surveillance under Article 11' for Annex II, IV & V species

<i>Field name</i>	<i>Brief explanations</i>	
0.2 Species	0.2.1 Species code	S1386
	0.2.2 Species scientific name	<i>Buxbaumia viridis</i>
	0.2.3 Alternative species scientific name Optional	
	0.2.4 Common name Optional	Green shield-moss

1.1 Maps		
1.1.1 Distribution map		Sensitive False
	<p>Species distribution data comes from a combination of the British Bryological Society: Bryophyte data for Great Britain from the British Bryological Society held by BRC, Stewart Taylor and SCM results. All data submitted to the NBN prior to reporting.</p> <p>The current distribution reflects a combination of real distribution and survey effort. However, All of the British sites are in north-east Scotland with the biggest cluster of sites and the largest populations in the Spey valley. Since 2000 it has been seen on 25 sites in 18 hectads but for most of the previous century it was known from just one site.</p> <p>The data range is appropriate given the recent increase in recording effort, and has been set to correspond to the previous two reporting periods. The moss has not been refound at its most southerly point in recent years and is likely to be extinct there.</p> <p>The known distribution is partly influenced by recorder effort.</p>	



1.1.2 Method used - map	Estimate based on partial data with some extrapolation and/or modelling
	On the basis of recent JNCC advice, this should be 2) Medium quality.
1.1.3 Year or period	1989-2011
1.1.4 Additional distribution map	False
1.1.5 Range map	

2.1 Biogeographical region & marine regions	ATL
2.2 Published sources	<p>"A full surveillance report is provided in Rothero, G. P. (2012) Surveillance of priority bryophytes in Scotland 2010-2013: Buxbaumia viridis. (unpublished at time of reporting but will appear at www.snh.gov.uk/publications-data-and-research/trends/scotlands-trends in 2013.</p> <p>References included in above report:</p> <p>European Committee for Conservation of Bryophytes (1995). Red Data Book of European Bryophytes. ECCB, Trondheim.</p> <p>Hodgetts NG, 2011. A revised Red List of bryophytes in Britain. Field Bryology 103 40-49.</p> <p>Preston CD, 2010. A revised list of nationally rare bryophytes. Field Bryology 100 32-40.</p>

	<p>Rothero, GP, 1993. Current Status of <i>Buxbaumia viridis</i> in Moniack Glen. SNH Research and Advisory Services Directorate Report, unpublished.</p> <p>Rothero, GP, 1999. The phenology of <i>Buxbaumia viridis</i> in Moniack Glen. SNH Research and Advisory Services Directorate Report, unpublished.</p> <p>Rothero, GP 2003. Priority bryophytes species dossier: <i>Buxbaumia viridis</i>. Unpublished report for SNH.</p> <p>Taylor S, 2010. <i>Buxbaumia viridis</i> in Abernethy Forest and other sites in northern Scotland. Field Bryology 100, 9-14.</p> <p>Wiklund K, 2002. Substratum preference, spore output and temporal variation in sporophyte production of the epixylic moss <i>Buxbaumia viridis</i>. Journal of Bryology, 24: 187-195."</p>
	<p>A full surveillance report is provided in Rothero, G. P. (2012) Surveillance of priority bryophytes in Scotland 2010-2013: <i>Buxbaumia viridis</i>. (unpublished at time of reporting but will appear at www.snh.gov.uk/publications-data-and-research/trends/scotlands-trends in 2013.</p> <p>References included in above report: European Committee for Conservation of Bryophytes (1995). Red Data Book of European Bryophytes. ECCB, Trondheim.</p> <p>Hodgetts NG, 2011. A revised Red List of bryophytes in Britain. Field Bryology 103 40-49.</p> <p>Preston CD, 2010. A revised list of nationally rare bryophytes. Field Bryology 100 32-40.</p> <p>Rothero, GP, 1993. Current Status of <i>Buxbaumia viridis</i> in Moniack Glen. SNH Research and Advisory Services Directorate Report, unpublished.</p> <p>Rothero, GP, 1999. The phenology of <i>Buxbaumia viridis</i> in Moniack Glen. SNH Research and Advisory Services Directorate Report, unpublished.</p> <p>Rothero, GP 2003. Priority bryophytes species dossier: <i>Buxbaumia viridis</i>. Unpublished report for SNH.</p> <p>Taylor S, 2010. <i>Buxbaumia viridis</i> in Abernethy Forest and other sites in northern Scotland. Field Bryology 100, 9-14.</p> <p>Wiklund K, 2002. Substratum preference, spore output and temporal variation in sporophyte production of the epixylic moss <i>Buxbaumia viridis</i>. Journal of Bryology, 24: 187-195.</p>

2.3 Range

2.3.1 Surface area Range	
2.3.2 Method used Surface area of Range	Estimate based on partial data with some extrapolation and/or modelling On the basis of recent JNCC advice, this should be 2) Medium quality. Gateway data: British Bryological Society GA000144 Extracted by JNCC 13/09/2012 and two additional records submitted by SNH. Data is a combination of SNH survey on SAC sites and an immense amount of volunteer recording effort, mainly by Mr S.Taylor MBE.
2.3.3 Short-term trend Period	2001-2012 Comparison of records between 2001 and 2006 with records between 2007 and 2012
2.3.4 Short term trend Trend direction	stable
2.3.5 Short-term trend Magnitude	a) Minimum NBN Gateway data: British Bryological Society GA000144 Extracted by JNCC 13/09/2012 and two additional records submitted by SNH. The calculated values will likely show that there has been an increase in the range of <i>Buxbaumia viridis</i> . However, this is likely due to an increase in recent survey effort and greater awareness of the species and its habitat requirements.
	b) Maximum
2.3.6 Long-term trend Period	
2.3.7 Long-term trend Trend direction	
2.3.8 Long-term trend Magnitude Optional	a) Minimum
	b) Maximum
2.3.9 Favourable reference range	a) Value in km²
	b) Operator for FRR
	c) FRR is unknown (indicated by) False

	"true")	
	d) Method used to set FRR	
	The current FRR is Unknown; however it is recommended that the current range value, that includes a large amount of recent survey effort, is used as a new baseline. The range has increased since the last report.	
2.3.10 Reason for change Is the difference between the reported value in 2.3.1 and the previous reporting round mainly due to...	a) Genuine change?	False
	b) Improved knowledge/more accurate data?	True
	c) Use of different method (e.g. "Range tool")?	False

2.4 Population		
2.4.1 Population size estimation (using individuals or agreed exceptions where possible)	a) Unit	number of individuals
	Sporophyte capsules	
	b) Minimum	1167
	c) Maximum	1167
	Unknown	
2.4.2 Population size estimation (using population unit other than individuals) Optional (<i>if 2.4.1 filled in</i>)	a) Unit	number of localities
	b) Minimum	22
	c) Maximum	22
	Unknown	
2.4.3 Additional information on population estimates / conversion Optional	a) Definition of "locality"	Definition varies depending on surveyor, but generally defines the woodland management unit.
	Definition varies depending on surveyor, but generally defines the woodland management unit.	
	b) Method to convert data	

	c) Problems encountered to provide population size estimation	Maximum population size by any definition is unknown
2.4.4 Year or period	2007-2012	
2.4.5 Method used Population size	<p>Estimate based on partial data with some extrapolation and/or modelling</p> <p>None of these options apply because there are undoubtedly unsurveyed areas of suitable habitat, i.e. we cannot report 3, there has been no extrapolation, i.e. we cannot report 2, and the estimate is not based on expert opinion other than to say the upper population estimate is unknown, ie. cannot report 1.</p> <p>Species distribution data comes from a combination of the British Bryological Society: Bryophyte data for Great Britain from the British Bryological Society held by BRC, Stewart Taylor and SCM results. All data submitted to the NBN prior to reporting.</p> <p><i>Buxbaumia viridis</i> is unique amongst the mosses in that, in the field, it can only be seen if it is producing sporophytes; the protonema may well be persistent in the habitat but there is as yet no practical way of recognising this. <i>Buxbaumia viridis</i> is essentially a ruderal species exploiting a habitat with a limited lifespan but one which can last a number of years. Re-visiting known sites cannot be a viable method in the long term but can provide useful information on sporophyte production. Because the habitat has a finite viability for the plant, <i>Buxbaumia viridis</i> depends on its ability to spread, through spore production, to new patches of suitable habitat. So any surveillance method has to take account of the loss of stands from habitat that has become unsuitable and the establishment of new stands on suitable habitat on the same site. Ideally, all patches of suitable habit on a site will need to be surveyed and not just the known stands but, in practice it may only be possible to look at a sample of patches of suitable habitat. It is clear now that suitable habitat includes not just well-rotted logs but a range of other organic substrates and it requires some experience to recognise these.</p> <ul style="list-style-type: none"> • Where a locality was visited on more than one occasion within the reporting period, the upper estimate of capsule numbers is given. The range could be used to give a minimum and maximum value, but this would be a false range because the data is not based on a complete survey of all potential habitat. • The population description is based on a number of paid and unpaid surveys. • The number of reported populations has increased markedly because a) expert surveys of suitable habitat in range by a dedicated volunteer (S.Taylor) b) increased awareness of the species and its habitat in the Highlands resulting in an increase in casual observations. • <i>Buxbaumia viridis</i> can only be recognised in the field by its sporophytes and sporophyte production can vary from year to year and even within a year as capsules are predated by molluscs. • <i>Buxbaumia viridis</i> is a ruderal species exploiting a habitat with a finite lifetime and which depends on spore production to move to fresh sites. 	

2.4.6 Short-term trend Period	2001-2012	
	Comparison of records between 2001 and 2006 with records between 2007 and 2012	
2.4.7 Short-term trend Trend direction	unknown	
	but see 2.4.15 which indicates that the real trend is x = unknown	
2.4.8 Short-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
2.4.9 Short-term trend Method used	Estimate based on expert opinion with no or minimal sampling	
	<p>A full surveillance report is provided in Rothero, G. P. (2012) Surveillance of priority bryophytes in Scotland 2010-2013: <i>Buxbaumia viridis</i>. (unpublished at time of reporting but will appear at www.snh.gov.uk/publications-data-and-research/trends/scotlands-trends in 2013.</p> <p>Species distribution data comes from a combination of the British Bryological Society: Bryophyte data for Great Britain from the British Bryological Society held by BRC, Stewart Taylor and SCM results. All data submitted to the NBN prior to reporting.</p> <ul style="list-style-type: none"> The number of recorded sporophyte capsules in 2001-2006 was 80 at 5 localities. The number of recorded sporophyte capsules in 2007-2012 was 1167 at 22 localities. <p>This could be taken to mean a 1459% increase based on capsule number or 440% increase based on locality. This is clearly not a real trend magnitude, which is why the figures haven't been reported above. The positive trend is reported based on the large increase in survey effort in the latter trend period.</p>	
2.4.10 Long-term trend – Period		
2.4.11 Long-term trend Trend direction	unknown	
2.4.12 Long-term trend Magnitude Optional	a) Minimum	

	b) Maximum	
	c) Confidence interval	
2.4.13 Long term trend Method used	0	
2.4.14 Favourable reference population	a) Number of individuals/agreed exceptions/other units	
	b) Operator	
	c) FRP is unknown indicated by "true"	True
	d) Method used to set FRP	
	As for population data above. The current FRP is Unknown; however it is recommended that the current range value, that includes a large amount of recent survey effort, is used as a new baseline. The recorded population, based on sporophyte capsule number and locality, has increased from the last report.	
2.4.15 Reason for change Is the difference between the value reported at 2.4.1 or 2.4.2 and the previous reporting round mainly due to:	a) Genuine change?	False
	b) Improved knowledge/more accurate data?	True
	Increase in volunteer survey effort	
	c) Use of different method (e.g. "Range tool")?	False

2.5 Habitat for the species			
2.5.1 Area estimation	<p><i>Buxbaumia viridis</i> usually grows on damp, dead wood. Most stands are on large logs (or logs that have been large at some point) or stumps, composed of well rotted wood that is easily penetrated with a knife blade. It will persist on the fragments that fall away from the log and may even continue to produce sporophytes when the log is no longer apparent, the moss appearing to grow on the humus of the woodland floor. A few sites are on dead wood that is still attached to a live tree and a number of recent sites on alder still have the bark in tact with the wood underneath dead but still hard. Many of the sites have a strong association with watercourses, usually being close to a river and often where this is incised, presumably giving buffering from changes in humidity. However some other sites are well away from water-courses although all are in sites that are quite humid, either because of aspect, canopy cover or proximity to damp ground. It is absent from those dry, dead trees typical of open pine woodland in the east of Scotland; these logs, which often look grey from a distance, have few if any bryophytes on them.</p> <p>It is unknown whether the amount of habitat in the UK is sufficient to support a viable population of the species. Unknown</p> <p>It is unknown whether the amount of habitat in the UK is sufficient to support a viable population of the species.</p>		
	2.5.2 Year or period	Unknown	
2.5.3 Method used	Absent data		
Habitat for the species			
2.5.4 Quality of the habitat	<table border="1"> <tr> <td>a) Habitat quality</td> <td>Moderate</td> </tr> </table>	a) Habitat quality	Moderate
	a) Habitat quality	Moderate	
	<p>Where the species occurs, habitat quality is generally moderate. It would be 'good' if there was clear evidence that there is continuity of large deadwood at extant sites. However, some sites have a single age class of large deadwood with little future deadwood habitat in the local area.</p>		
<table border="1"> <tr> <td>b) Assessment method</td> <td> <p>There has been no formal assessment and the above is based on casual observations. Within the core of the species' range, and within the Cairngorms SAC, a deadwood management plan is being implemented on the RSPB-owned land to increase the amount of large deadwood for a wide range of species. This will hopefully increase the quality of habitat for <i>Buxbaumia viridis</i> in the long-term.</p> </td> </tr> </table> <p>There has been no formal assessment and the above is based on casual observations. Within the core of the species' range, and within the Cairngorms SAC, a deadwood management plan is being implemented on the RSPB-owned land to increase the amount of large deadwood for a wide range of species. This will hopefully increase the quality of habitat for <i>Buxbaumia viridis</i> in the long-term.</p>	b) Assessment method	<p>There has been no formal assessment and the above is based on casual observations. Within the core of the species' range, and within the Cairngorms SAC, a deadwood management plan is being implemented on the RSPB-owned land to increase the amount of large deadwood for a wide range of species. This will hopefully increase the quality of habitat for <i>Buxbaumia viridis</i> in the long-term.</p>	
b) Assessment method	<p>There has been no formal assessment and the above is based on casual observations. Within the core of the species' range, and within the Cairngorms SAC, a deadwood management plan is being implemented on the RSPB-owned land to increase the amount of large deadwood for a wide range of species. This will hopefully increase the quality of habitat for <i>Buxbaumia viridis</i> in the long-term.</p>		

2.5.5 Short-term trend Period	2001-2012	
	Comparison of 2001 – 2006 with 2007 – 2012	
2.5.6 Short-term trend Trend direction	unknown	
	No suitable sources available In order to report on this attribute, a deadwood quality map would have to be combined with a climatic model to identify suitable sites. This information is not available to date.	
2.5.7 Long-term trend Period	1989-2012	
	Comparison of 1989 – 2000 with 2001 – 2012	
2.5.8 Long-term trend Trend direction	unknown	
	No suitable sources available In order to report on this attribute, a deadwood quality map would have to be combined with a climatic model to identify suitable sites. This information is not available to date.	
2.5.9 Area of suitable habitat for the species	a) Value in km²	0
	In order to report on this attribute, a deadwood quality map would have to be combined with a climatic model to identify suitable sites. This information is not available to date.	
	b) Absence of data indicated as '0'	
2.5.10 Reason for change Is the difference between the value reported at 2.5.1 and the previous reporting round mainly due to	a) Genuine change?	False
	b) Improved knowledge/more accurate data?	False
	c) Use of different method (e.g. "Range tool")?	False

2.6 Main pressures		
a) Pressure	b) Ranking	c) Pollution qualifier
	H = high importance M = medium importance L = low importance	
B02: Forest and Plantation management & use	H	
B06: grazing in forests/ woodland	M	
A05: livestock farming and animal breeding (without grazing)	L	

- As is so often the case, the most serious threat to *Buxbaumia viridis* is the loss or lack of habitat. In this case, this means the lack of a sufficient quantity of deadwood of the right size and at the right stage of decay within areas of woodland that offer sufficient buffering from rapid changes in humidity. Studies in Sweden have convincingly shown that areas of woodland with the greatest amount of suitable deadwood are those most likely to be occupied by *Buxbaumia viridis* (Wiklund, 2002). Despite the fact that it occurs on other organic substrates in Scotland, this remains true here also. Those occasional sites for *Buxbaumia viridis* in small patches of woodland, like the site at Kindrogan, with limited amounts of dead wood and little prospect of a continuous supply of suitable substrate are almost certainly going to be short-lived sites. In sustaining the population on any one site it is the continuity of supply of suitable logs that is crucial.
- Damage to logs by grazing livestock noted at a few sites by River Nethy.

Is anything being done? Yes:

- It is probable that as the trees that were planted, with grants and tax breaks, in the 1970s and 80s mature, more suitable habitat will appear and stands have already been found on cut logs of this era. The value of dead wood is now better understood in conservation terms and it is to be hoped that there will be less 'tidying up' of forests in the future and fallen trees will be left to rot. One possible problem is the surge in demand for firewood so that fallen trees become a valuable resource and are logged and cleared, legally or illegally, soon after falling.
- Log with capsules fenced off on Dell NNR. Need to monitor and see whether exclusion of all grazing is detrimental – ie extensive growth of vegetation could 'swamp' the log.

2.6.1 Method used – Pressures

based exclusively or to a larger extent on real data from sites/occurrences or other data sources

A full surveillance report is provided in Rothero, G. P. (2012) Surveillance of priority bryophytes in Scotland 2010-2013: *Buxbaumia viridis*. (unpublished at time of reporting but will appear at www.snh.gov.uk/publications-data-and-research/trends/scotlands-trends-in-2013).

SCM

References included in above report:

European Committee for Conservation of Bryophytes (1995). Red Data Book of European Bryophytes. ECCB, Trondheim.

Hodgetts NG, 2011. A revised Red List of bryophytes in Britain. Field Bryology 103 40-49.

Preston CD, 2010. A revised list of nationally rare bryophytes. Field Bryology 100 32-40.

Rothero, GP, 1993. Current Status of *Buxbaumia viridis* in Moniack Glen. SNH Research and Advisory Services Directorate Report, unpublished.

Rothero, GP, 1999. The phenology of *Buxbaumia viridis* in Moniack Glen. SNH Research and Advisory Services Directorate Report, unpublished.

Rothero, GP 2003. Priority bryophytes species dossier: *Buxbaumia viridis*. Unpublished report for SNH.

Taylor S, 2010. *Buxbaumia viridis* in Abernethy Forest and other sites in northern Scotland. Field Bryology 100, 9-14.

Wiklund K, 2002. Substratum preference, spore output and temporal variation in sporophyte production of the epixylic moss *Buxbaumia viridis*. Journal of Bryology, 24: 187-195.

2.7 Threats		
a) Threat	b) Ranking	c) Pollution qualifier
	H = high importance M = medium importance L = low importance	
G05: Other human intrusions and disturbances	M	
J03: Other ecosystem modifications	M	

- Lack of tenant/landowner knowledge to the importance/existence of these mosses on their lands.
- Firewood removal.
- Lack of habitat connectivity may be a problem but more data on the dispersal distance of *Buxbaumia viridis* is needed to confirm.

Is anything being done? Yes:

- Plantlife (Scotland) leaflet produced about *Buxbaumia* for land managers followed up with training courses.
- Meeting of land managers at Abernethy re deadwood and *B viridis*. Delegates found 2 new logs during afternoon excursion and a new site found on Deeside by one of delegates the next day.

2.7.1 Method used – Threats	expert opinion
------------------------------------	-----------------------

2.8 Complementary information

2.8.1 Justification of % thresholds for trends	
---	--

2.8.2 Other relevant information	
---	--

2.8.3 Trans-boundary assessment	
--	--

2.9 Conclusions (*assessment of conservation status at end of reporting period*)

Please refer to the United Kingdom assessment for this species.

3 Natura 2000 coverage & conservation measures - Annex II species (*only applies to species listed under Annex II of the Directive*)

3.1 Population		
3.1.1 Population size Estimation of population size included in the SAC network	a) Unit	number of individuals
	Sporophyte capsules	
	b) Minimum	941
	An immense increase in volunteer survey effort has greatly improved our understanding of this species habitat requirement and distribution on the two SAC sites. Capsule number has been carefully recorded and is therefore as good an estimate of population size as can be obtained. Capsules are however very variable in number because they are eaten by slugs which may mask larger gametophyte populations.	
	c) Maximum	941
3.1.2 Method used	Estimate based on partial data with some extrapolation and/or modelling	
	On the basis of recent JNCC advice, this should be 2) Medium quality.	
3.1.3 Trend of population size within the network (short-term trend)	unknown	
	X because we don't have comparative survey effort on which to base a trend SCM and volunteer survey accessed via NBN Gateway data: British Bryological Society GA000144 Extracted by JNCC 13/09/2012. See Rothero, G. P. (2012) for detailed summary of capsule counts.	

3.2 Conservation measures													
Conservation measures taken (i.e. already being implemented) within the reporting period and provided information about their importance, location and evaluation.													
3.2.1 Measure	3.2.2 Type					3.2.3 Ranking H = high importance M = medium importance L = low importance	3.2.4 Location where the measure is PRIMARILY applied			3.2.5 Broad evaluation of the measure			
	a) Legal/statutory	b) Administrative	c) Contractual	d) Recurrent	e) One-off		a) Inside	b) Outside	c) Both inside & outside	a) Maintain	b) Enhance	c) Long term	d) No effect

3.1: Restoring/improving forest habitats	Y			Y		H		Y	Y	Y	Y	Y	Y			
6.1: Establish protected areas/sites	Y					M					Y	Y				
6.3: Legal protection of habitats and species	Y					M				Y		Y				
6.4: Manage landscape features				Y		H			Y	Y	Y	Y				

Site Condition Monitoring, Rothero (2012), S. Taylor pers. com.
 Conservation measures are implemented through designation (SAC), statutory procedures, agri-environment schemes (SRDP) and management agreements (SNH).