

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

**Second Report by the United Kingdom under
Article 17**

**on the implementation of the Directive
from January 2001 to December 2006**

Conservation status assessment for :

S1386: *Buxbaumia viridis* - Green shield-moss

Please note that this is a section of the report. For the complete report visit <http://www.jncc.gov.uk/article17>

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S1386 *Buxbaumia viridis* Green shield-moss

Audit trail compiled and edited by JNCC and the Plant Conservation Working Group

This document is an audit of the data and judgements on conservation status in the UK's report on the implementation of the Habitats Directive (January 2001 to December 2006) for this species. Superscript numbers accompanying the headings below, cross-reference to headings in the corresponding Annex B reporting form. This supporting information should be read in conjunction with the UK approach for species (see 'Assessing Conservation Status: UK Approach').

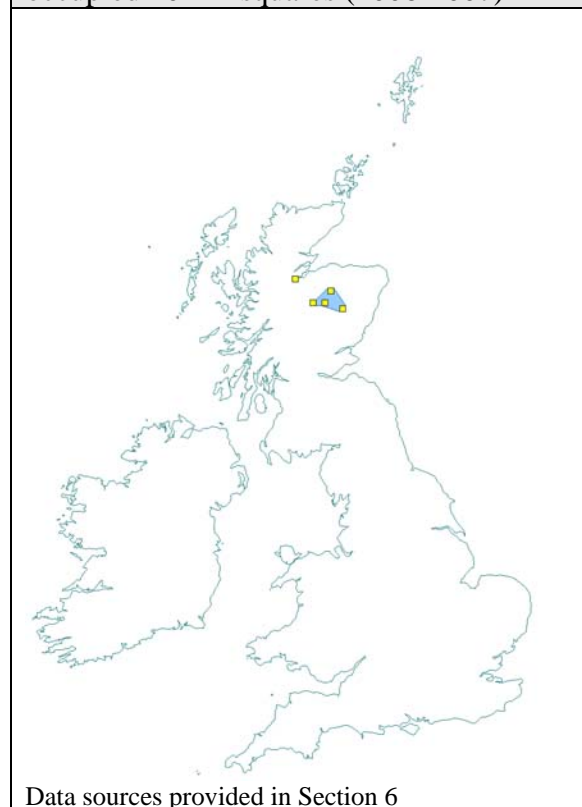
1. Range Information^{2,3}

1.1 Surface area of range^{2,3,1}

1,440km²

The above estimate was calculated within alpha hull software, using extent of occurrence as a proxy measure for range (as shown in Map 1.1 below). The value of alpha was set at 20 km to reflect the dispersal capacity of this species, and it was clipped to include terrestrial areas only.

Map 1.1 Current extent of occurrence and occupied 10-km squares (2006-2007)



1.2 Date of range determination^{2,3,2}

2006 – 2007

All known sites were surveyed in 2006, and a new site was identified in early 2007.

1.3 Quality of range data^{2.3.3}

Moderate

Where known, *Buxbaumia viridis* has been well surveyed. However, it is a small plant and under-recording is likely to have been (and continue to be) a problem. Data are therefore reported as moderate, on the basis that it may exist outside the reported range, but has not yet been found.

1.4 Range trend^{2.3.4} & Range trend magnitude^{2.3.5}

Stable

With the exception of records at one current site (found in the 1950s), there were no further records until 1999 when the species was found at Kindrogan. Since 1999, evidence suggests that, overall, its range has been stable; although the Kindrogan population has not been seen since 2001, other populations have recently been discovered.

1.5 Range trend period^{2.3.6}

1999 – 2006

Reasonable population and range data exist from 1999 onwards, and this time period has been used for the trend. Prior to that data are too patchy for confidence in the trend. It is felt that, at present, this time period best reflects the status of this species.

1.6 Reasons for reported trend in range^{2.3.7}

Not applicable

1.7 Favourable Reference Range^{2.7.1}

1,440km² (Equal to current)

The decision tree in Note 1 has been used as a guide in determining the favourable reference range estimate (see 'Assessing Conservation Status: UK Approach').

The favourable reference range has been set as equal to the current range. This provides sufficient area to maintain enough sites for the species, and there is no evidence that it needs to be larger for viability. The stable range has been maintained without intensive conservation care.

Historically, *B. viridis* extended further east than is currently shown. However it has not been found on these former sites for more than a hundred years (1847-1887), and the area of this former range is unknown. Historic sites may have been lost due to habitat loss from direct human influence. However there is no direct evidence to support this. Furthermore, it is possible that *B. viridis* may have been present at modern sites since before 1900 but have just not been found. The reason for historic losses is therefore unknown, and they have not been factored in to the favourable reference range.

1.8 Range Conclusion^{2.8}

Favourable

From the data available, range appears to be stable, and the current surface area estimate has been set as the favourable reference range. Therefore, in accordance with Annex C, the range assessment is Favourable.

2 Population of the species^{2.4}

2.1 Population estimate^{2.4.1}

88+ sporophytes

From the Site Condition Monitoring programme, run by Scottish Natural Heritage, there are known to be:

43 sporophytes in 7 populations at Abernethy;
22 sporophytes in 2 populations at Rothiemurchus;
18 sporophytes in 2 populations at Moniack Gorge; and
5 sporophytes in 1 population at Deeside.

The population at Bridge of Brown is unknown

Kindrogan was formally known to have 5 sporophytes in 1 population (Church *et al.*, 2004), but this has not been found in a number of years.

2.2 Date of population estimate^{2.4.2}

2006

2.3 Method of population estimate^{2.4.3}

3 = from comprehensive inventory

The current population estimate is derived from the Site Condition Monitoring programme, run by Scottish Natural Heritage.

2.4 Quality of population data^{2.4.4}

Moderate

All known populations have been well-surveyed. However, since under-recording is likely to be an issue with this species (due to its small size), data are reported as moderate.

2.5 Population trend^{2.4.5} & Population trend magnitude^{2.4.6}

Stable

The population is considered stable because, although highly variable, population counts have not changed significantly since 2000.

2.6 Population trend period^{2.4.7}

2000 – 2006

The best available (modern) data are provided by the Site Condition Monitoring run by Scottish Natural Heritage, and this commenced in 2000.

2.7 Reasons for reported trend in population^{2.4.8}

Not applicable

2.8 Justification of % thresholds for trends^{2.4.9}

Not applicable

2.9 Main pressures^{2.4.10}

944 storm, cyclone - flooding

954 drying out

971 competition

170 general forest management

166 removal of dead and dying trees

The impermanent nature of the habitat (decaying logs) means that populations at a site will naturally decline or migrate as the logs decay. The critical aspect is that there should always be a sufficient supply of logs in the vicinity to allow colonisation.

2.10 Threats^{2.4.11}

944 storm, cyclone - flooding

954 drying out

971 competition

170 general forest management

166 removal of dead and dying trees

Key threats include the loss of old deadwood habitat continuity, and changes in humidity due to changes in woodland canopy structure. With regard to Kindrogan, inappropriate forestry operations adjacent to the site have caused its condition to decline, and it may be this that has caused the apparent loss of *B. viridis* in recent years.

2.11 Favourable Reference Population^{2.7.2}

100 sporophytes (Current is less than 25% below the favourable reference population)

The decision tree in Note 1 has been used as a guide in determining the favourable reference population estimate (see 'Assessing Conservation Status: UK Approach').

Despite the current population being stable on average, the absolute population level is very low, and is considered at risk from stochastic events. At any one site, it is preferable to have at least two colonised logs at any time in order to guard against chance events (as have occurred – a log was washed away in 2002). Also vital for long term survival is successful spore dispersal. Expert opinion suggests that the current total population size is not viable in the long-term, as it is too prone to chance events leading to catastrophic declines. A suggested average population size (taking into account poor years for sporophyte production) would be 10 sporophytes (including grazed stalks) per log/population. Therefore the favourable reference population will be 5 sites x 2 'logs' x 10 sporophytes = 100 sporophytes on average.

2.12 Population Conclusion^{2.8}

Unfavourable – Inadequate

Current measures suggest that the *B. viridis* population is below the favourable reference population, but within 25% of it, and population counts appear to be relatively stable. Therefore, in accordance with Annex C guidelines, the population has been assessed as Unfavourable – Inadequate.

3 Habitat for the species in the Biogeographic region or sea^{2.5}

B. viridis has very specific habitat requirements in the UK. It is associated with Caledonian pine forest. However the principal requirement is for the microhabitat; the necessary microhabitat is 30-60 year old decaying logs in shady/humid microclimate. There does not appear to be particular substrate specificity with regard to the log, with records from decaying birch, alder and pine.

3.1 Surface area of habitat^{2.5.2}

Unknown

3.2 Date of estimation^{2.5.3}

Not applicable

3.3 Quality of data on habitat area^{2.5.4}

Poor

The type of microhabitat required by this species is more precise than the type of habitat surveyed by the NVC standard. Hence, the current estimate is unknown.

3.4 Habitat trend^{2.5.5}

Stable

Although historically Caledonian pine forest has declined and become fragmented, the habitat is now stable and management for dead wood habitat is good.

3.5 Habitat trend period^{2.5.6}

1986 – 2006

The best information on habitat quality has been available since the current SSSI locations were designated in 1986.

3.6 Reasons for reported trend in habitat^{2.5.7}

Not applicable

Historic declines may be because of destruction of, and commercial forestry practices in, semi-natural coniferous woodland.

3.7 Suitable habitat for the species (in km²)^{2.7.3}

Unknown

It is possible for the range of this species to be expanded within the current extent of Caledonian pine forest. Also, SNH currently have a plan for a survey of potential sites in Deeside and Donside that will also measure substrate characteristics at current, past and potential locations.

3.8 Habitat conclusion^{2.8}

Favourable

Expert opinion is that the area of habitat is sufficiently large (and stable), and habitat quality is suitable for the survival of the species for the foreseeable future. Therefore, in accordance with Annex C, the assessment for this parameter is Favourable.

4. Future Prospects^{2.6}

Good prospects

Species expected to survive and prosper.

The main problem faced by the species in the long-term is that there are currently insufficient sporophytes for viability. Prospects for either natural colonisation or introduction are uncertain, but if Caledonian pine forest continues to be managed well, then natural expansion of range could be possible. Dead-wood management is good (although there are some

concerns over a possible break in continuity), and it is hoped that natural expansion of populations will be possible as habitat becomes available.

4.1 Future prospects conclusion^{2,8}

Unfavourable – Inadequate but improving

Despite good future prospects, the species is reported as Unfavourable – Inadequate due to uncertainties in how to achieve a long-term viable population for the species. Prospects are considered to be improving due to the good dead-wood management now practised.

5. Overall Conclusion^{2,8}

Unfavourable – Inadequate but improving

This species is known from relatively few sites but this number is likely to increase as bryologists become more aware of the species and its habitat requirements. The population size at current sites is variable, but appears constant over the assessment period. Although a potential break in the continuity of old decaying logs is a slight concern, better dead wood management is likely to expand the future area of specific habitat required by this species.

Table 5.1. Summary of conclusions

Parameter	Judgement	Grounds for Judgement (in accordance with Annex C)	Reliability*
Range	Favourable	Current range is stable, and not smaller than the favourable reference range.	2
Population	Unfavourable – Inadequate	Current population is below the favourable reference population, but within 25% of it. Population counts appear to be relatively stable.	2
Habitat	Favourable	Area of habitat is sufficiently large (and stable or increasing) and habitat quality is suitable for the long term survival of the species.	3
Future Prospects	Unfavourable – Inadequate but improving	There are still an insufficient number of sporophytes for long-term viability, and prospects for either natural colonisation or introduction are uncertain. If Caledonian pine forest continues to be managed well, then natural expansion of populations could be possible.	3
Overall Assessment	Unfavourable – Inadequate but improving	One or more Unfavourable – Inadequate but no Unfavourable – Bad .	2

*1=High, 2=Moderate, 3=Low

High – Expert opinion is that the concluding judgement accurately reflects the current situation based on survey data, and a professional understanding of the species. For range, population, and habitat, quality of data used to establish the current estimate has been identified as “good”; data used to inform trends is comprehensive and up to date.

Moderate – A greater understanding of the feature, or the factors affecting it, is required before a confident concluding judgement can be made by experts. For range, population, and habitat, the current estimate and/or

trend are based on recent, but incomplete or limited survey data; or alternately, a comprehensive, but outdated (pre-1994) review.

Low – Confidence in the assessment is low; judgements, and comprising estimates, are based predominately on expert opinion.

N/A – Assessment conclusion is “unknown”, on the basis of insufficient reliable information .

6. References

CHURCH, J. M., HODGETTS, N. G., PRESTON, C. D. & STEWART, N. F. 2004. British Red Data Books: mosses and liverworts. Joint Nature Conservation Committee

ROTHERO, G. *Species Dossier: Greenshield moss Buxbaumia viridis*. 2nd Edition Scottish Natural Heritage.

Map Data Sources

Threatened Bryophyte Database, British Bryological Society (via the NBN Gateway); SNH Site Condition Monitoring; British Bryological Society survey.