

Report under The Conservation of Habitats and
Species Regulations 2017 (as amended),
Regulation 9A

2019-2024

Conservation status assessment for the species:

S1413 - Clubmosses

(Lycopodium spp.)

England



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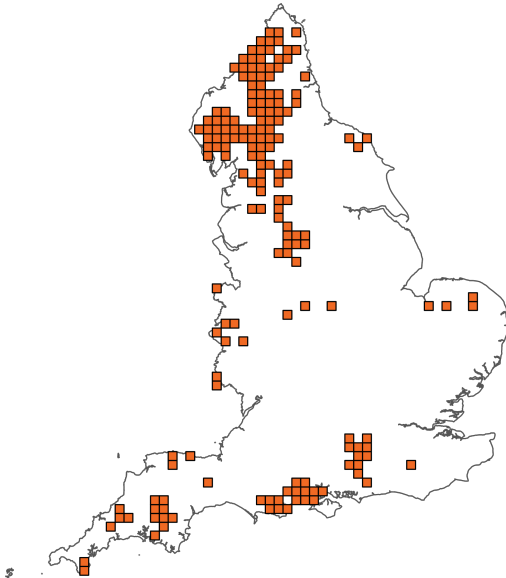
Important note - Please read

- The information in this document represents the England Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A, for the period 2019-2024.
- It is based on supporting information provided by Natural England, which is documented separately.
- The Habitats Regulations reporting 2019-2024 Approach Document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- Maps showing the distribution and range of the species are included.
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the assessments. Further underpinning explanatory notes are available in the related country reports.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was not relevant to this species (section 12 National Site Network coverage for Annex II species).

Further details on the approach to the Habitats Regulations Reporting 2019-2024 are available on the [JNCC website](#).

Assessment Summary: Clubmosses

Distribution Map



Range Map

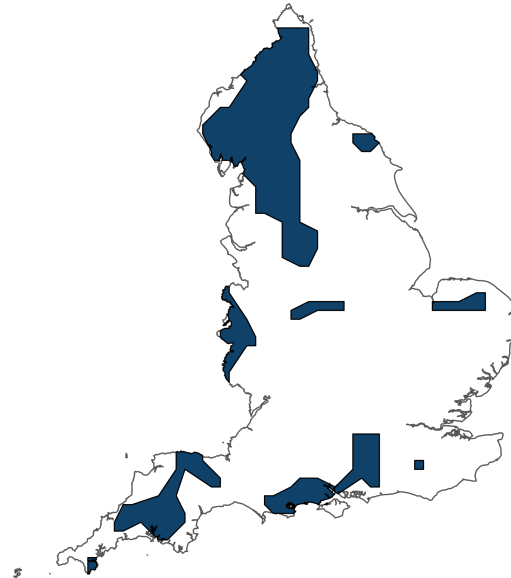


Figure 1: England distribution and range map for S1413 - Clubmosses (*Lycopodium* spp.). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. The 10km grid square distribution map is based on available species records within the current reporting period.

Table 1: Table summarising the conservation status for S1413 - Clubmosses (*Lycopodium* spp.). Overall conservation status for species is based on assessments of range, population, habitat for the species, and future prospects.

Overall Conservation Status (see section 11)

Unfavourable-inadequate (U1)

Breakdown of Overall Conservation Status

Range (see section 5)

Unfavourable-inadequate (U1)

Population (see section 6)

Unfavourable-inadequate (U1)

Habitat for the species (see section 7)

Unfavourable-inadequate (U1)

Future prospects (see section 10)

Unfavourable-inadequate (U1)

List of Sections

National Level	5
1. General information	5
2. Maps	5
3. Information related to Annex V Species	5
Biogeographical Level	7
4. Biogeographical and marine regions	7
5. Range	7
6. Population	9
7. Habitat for the species	12
8. Main pressures	13
9. Conservation measures	14
10. Future prospects	16
11. Conclusions	16
12. UK National Site Network (pSCIs, SCIs, SACs) coverage for Annex II species	17
13. Complementary information	18
14. References	19
Biogeographical and marine regions	19
Main pressures	20
15. Explanatory Notes	21

National Level

1. General information

1.1 Country	England
1.2 Species code	S1413
1.3 Species scientific name	<i>Lycopodium</i> spp.
1.4 Alternative species scientific name	<i>Lycopodium</i> spp.
1.5 Common name	Clubmosses
Annex(es)	V

2. Maps

2.1 Sensitive species	No
2.2 Year or period	2010-2024
2.3 Distribution map	Yes
2.4 Distribution map; Method used	Complete survey or a statistically robust estimate

2.5 Additional information

The time period 2010-2024 has been used to provide a more representative current distribution for all plant species in this reporting round. This is because the national dataset of botanical records (BSBI) could show a dip in records post 2019 for many species, which is an artefact of the relaxation in recording effort post production of the Plant Atlas 2020.

3. Information related to Annex V Species

3.1 Is the species taken in the wild / exploited?	No
3.2 What measures have been taken?	
a) Regulations regarding access to property	No
b) Temporary or local prohibition on the taking of specimens in the wild and exploitation	No

c) Regulation of the periods and/or methods of taking specimens	No
d) Application of hunting and fishing rules which take account of the conservation of such populations	No
e) Establishment of a system of licences for taking specimens or of quotas	No
f) Regulation of the purchase, sale, offering for sale, keeping for sale, or transport for sale of specimens	No
g) Breeding in captivity of animal species as well as artificial propagation of plant species	No
Other measures	No

Other measures description

3.3: Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)

a) Unit

Table 2: Quantity taken from the wild during the reporting period (see 3.3a for units). For species with defined hunting seasons, Season 1 refers to 2018/2019 (autumn 2018 to spring 2019), and Season 6 to 2023/2024. For species without hunting seasons, data are reported by calendar year: Year 1 is 2019, and Year 6 is 2024.

	Season/ year 1	Season/ year 2	Season/ year 3	Season/ year 4	Season/ year 5	Season/ year 6
b) Minimum	-	-	-	-	-	-
c) Maximum	-	-	-	-	-	-
d) Unknown	-	-	-	-	-	-

3.4: Hunting bag or quantity taken in the wild; Method used

3.5: Additional information

Clubmosses have some limited herbal and industrial uses but the inaccessibility of populations and low abundance of these species means it is unlikely that Clubmosses are exploited to any significant degree in England and there is no evidence of collection pressures in the wild. Exploitation was for the harvesting of spores for ‘Lycopodium powder’ from *Lycopodium* and *Diphasiastrum* spp., i.e. the subgenus *Lycopodioideae*, or *Lycopodium* as treated in the European Red-List (Garca Criado et al., 2017). It is possible that the presence of pharmaceutically important compounds such as alkaloids may see a wider range of taxa commercially exploited in future but even so the difficulty of extracting sufficient value from wild populations will remain an issue and cultivation would be a more likely way to enable commercial exploitation.

Biogeographical Level

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs ATL

4.2 Sources of information

See section 14 References

5. Range

5.1 Surface area (km²) 29,073.79

5.2 Short-term trend; Period 2013-2024

5.3 Short-term trend; Direction Decreasing

5.4 Short-term trend; Magnitude

a) Estimated minimum

b) Estimated maximum

c) Pre-defined range

d) Unknown

e) Type of estimate

f) Rate of decrease Decreasing >1% (more than one percent) per year on average

5.5 Short-term trend; Method used	Based mainly on extrapolation from a limited amount of data
5.6 Long-term trend; Period	2000-2024
5.7 Long-term trend; Direction	Decreasing
5.8 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Rate of decrease	
5.9 Long-term trend; Method used	Based mainly on expert opinion with very limited data
5.10 Favourable Reference Range (FRR)	
a) Area (km²)	
b) Pre-defined increment	
c) Unknown	Yes
d) Method used	
e) Quality of information	
5.11 Change and reason for change in surface area of range	
a) Change	Yes
b) Genuine change	Yes
c) Improved knowledge or more accurate data	Yes
d) Different method	
e) No information	
f) Other reason	
g) Main reason	Improved knowledge/more accurate data
5.12 Additional information	

The current range value for England is 29073.79 km² for all included species, for the period 2010-2024, and is derived from BSBI records (BSBI, 2025). In the 2013 reporting the Favourable Reference Range (FRR) was calculated as 98503.46 km² for the UK which was considered to be large enough to support a viable population and no lower than the range estimate when the Habitats Directive came into force in the UK, but no maps or range calculation were produced in 2019, partly due to the difficulties caused by the inclusion of additional taxa at that time. Therefore the difficulties continue into this reporting round as there is no disaggregated FRR value for England with which to compare the current range and no operator was recommended for this reporting round. However, there has been a clear decline in hectad occupation since the last reporting round. The current distribution map is derived from occupancy covering the period 2010-2024 and the best estimate is 164 hectads containing confirmed records during this period. Between reporting periods totals for all species are as follows: 176 hectads (2013-8) declining to 125 (2019-24). Whilst area of occupancy does not equate to range, there is data from the current red list review for Extent of Occurrence. Preliminary analyses of AOO and EOO data for all of the extant Clubmoss taxa present in >30 Hectads (i.e. all but *Diphasiastrum xissleri*, *Lycopodium lagopus* and *Huperzia* ‘boreal taxon’) suggest that levels of decline over the appropriate timescales are such that none would qualify as anything but Least Concern, i.e. while most have shown declines these are all less than 27%, the figure now adopted for Near Threatened status but with indication of continuing declines for the widespread species and this perhaps is more pronounced when England, as opposed to GB, is considered. This decline could be partly attributable to relaxation of recording effort following completion of the Plant Atlas 2020, but is unlikely to be entirely attributable to this effect (Rumsey, 2024) with environmental, climatic and land use factors also affecting the species. Hectad occupation can go some way towards explaining trends in population, as there is a relationship with range. The current number of hectads in England is 125 (2010-24) which curiously is the same as the tally for 1980-2000, the latter a much longer time period. There is a slightly confusing picture, that probably indicates genuine gains and losses have occurred, especially between different species, differences in recording effort has resulted in peaks, and conservation and recovery efforts have made some impact.

6. Population

6.1 Year or period 2019-2024

6.2 Population size (in reporting unit)

a) Unit number of map 10x10 km grid cells

b) Minimum	
c) Maximum	
d) Best single value	125
6.3 Type of estimate	Best estimate
6.4 Quality of extrapolation to reporting unit	moderate
6.5 Additional population size (using population unit other than reporting unit)	
a) Unit	
b) Minimum	
c) Maximum	
d) Best single value	
e) Type of estimate	
6.6 Population size; Method used	Based mainly on extrapolation from a limited amount of data
6.7 Short-term trend; Period	2013-2024
6.8 Short-term trend; Direction	Decreasing
6.9 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	Decreasing 26 - 50%
d) Unknown	No
e) Type of estimate	Best estimate
f) Rate of decrease	Decreasing >1% (more than one percent) per year on average
6.10 Short-term trend; Method used	Based mainly on extrapolation from a limited amount of data
6.11 Long-term trend; Period	2000-2024

6.12 Long-term trend; Direction	Decreasing
6.13 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Confidence interval	
d) Rate of decrease	
6.14 Long-term trend; Method used	
6.15 Favourable Reference Population (FRP)	
ai) Population size	
aii) Unit	
b) Pre-defined increment	Current population is less than 5% smaller than the FRP
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	moderate
6.16 Change and reason for change in population size	
a) Change	Yes
b) Genuine change	Yes
c) Improved knowledge or more accurate data	Yes
d) Different method	Yes
e) No information	
f) Other reason	
g) Main reason	Improved knowledge/more accurate data
6.17 Additional information	

Hectad level is the unit of measure for population considered here. Unfortunately there is no favourable reference value for population in previous reports with which to compare but the decline in occupied hectads is clear for most species. Per species hectad counts (from BSBI, 2024) are as follows: *Diphasiastrum alpinum* 21 (2013-8) declining to 16 (2019-24); *Diphasiastrum xissleri* no records in England either period, other than a single unconfirmed record from Staffordshire; *Huperzia selago* 72 (2013-8) declining to 57 (2019-24); *Lycopodiella inundata* 34 (2013-8) declining to 22 (2019-24); *Lycopodium annotinum* stable at 1 hectad across both periods; *Lycopodium clavatum* 48 (2013-8) declining to 29 (2019-24); *Lycopodium lagopus* no records in England for either period. Most losses for these species occurred prior to the 1930's, due to habitat loss in area and suitability. An FRP value for England could be taken as the probable number of occupied hectads in the Atlas period 1987-2000, largely corresponding to when the Directive came into force (year 2000). Since a single year of records (eg 2000) will not provide an adequate measure taking a date range of 1980-2000 yields 125 occupied hectads for all species, in England, which interestingly is equal to the estimated number of occupied hectads during the period 2019-24. This would indicate an increase post Atlas 2000 to 2013 with a following decline possibly related to relaxation of recording effort post Atlas, but not entirely attributable to this. To reflect this apparent fluctuation the FRP has been set as a suitable operator.

6.18 Age structure, mortality and reproduction deviation Unknown

7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat (for long-term survival)

a) Is area of occupied habitat sufficient? Unknown

b) Is quality of occupied habitat sufficient? Unknown

c) If No or Unknown, is there a sufficiently large area of unoccupied habitat of suitable quality? No

7.2 Sufficiency of area and quality of occupied habitat; Method used

a) Sufficiency of area of occupied habitat; Method used	Based mainly on expert opinion with very limited data
b) Sufficiency of quality of occupied habitat; Method used	Based mainly on expert opinion with very limited data
7.3 Short-term trend; Period	2013-2024
7.4 Short-term trend; Direction	Decreasing
7.5 Short-term trend; Method used	Based mainly on expert opinion with very limited data
7.6 Long-term trend; Period	
7.7 Long-term trend; Direction	
7.8 Long-term trend; Method used	
7.9 Additional information	

The species can form long lived clones (with shoots being to become separate individuals from the parent plant) occupying the same location for long periods of time provided habitat conditions are suitable. However being poor competitors with a requirement for openness, suitable habitat can be transient or dependent on other factors maintaining such conditions, for example forestry tracksides or the particular hydrology and exposure in upland bog situations. Habitat requirements have been studied for *Lycopodiella inundata* in south and south east lowland England by deploying trial management techniques to create suitable habitat conditions and monitoring the outcomes (Price 2023, 2024). Hydrology, vegetation cover, availability of bare ground have been shown to be key factors but also associations with mycorrhizal fungi likely to be important. Overall hectad occupancy indicates ongoing decline in the species which is largely attributable to insufficiency in quality of habitat, rather than area, so long term prospects for the survival of the species are unknown, some of the scarcer lowland species more precarious than others, and potentially more affected by fragmentation and climatic changes.

8. Main pressures

8.1 Characterisation of pressures

Table 3: Pressures affecting the species, including timing and importance/impact ranking. Pressures are defined as factors acting currently and/or during the reporting period (2019–2024). Rankings are: High

(direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Pressure	Timing	Ranking
PA01: Conversion into agricultural land (excluding drainage and burning)	Ongoing and likely to be in the future	Medium (M)
PA07: Intensive grazing or overgrazing by livestock	Ongoing and likely to be in the future	High (H)
PL05: Modification of hydrological flow (mixed or unknown drivers)	Ongoing and likely to be in the future	High (H)
PA13: Application of natural or synthetic fertilisers on agricultural land	Ongoing and likely to be in the future	Medium (M)
PA22: Drainage for use as agricultural land	Ongoing and likely to be in the future	Medium (M)
PB01: Conversion to forest from other land uses, or afforestation (excluding drainage)	Ongoing and likely to be in the future	Medium (M)
PJ10: Change of habitat location, size, and / or quality due to climate change	Ongoing and likely to be in the future	Medium (M)

8.2 Sources of information

See section 14 References

8.3 Additional information

No additional information

9. Conservation measures

9.1: Status of measures

a) Are measures needed?

Yes

b) Indicate the status of measures

Measures identified and taken

9.2 Main purpose of the measures taken

Expand the current range of the species (related to 'Range')

9.3 Location of the measures taken

Both inside and outside National Site Network

9.4 Response to measures

Medium-term results (within the next two reporting periods, 2025–2036)

9.5 List of main conservation measures

Table 4: Key conservation measures addressing current pressures and/or anticipated threats during the next two reporting periods (2025–2036). Measures are ranked by importance/impact: High (direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Conservation measure	Ranking
MA05: Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning)	Medium (M)
MK03: Restoration of habitats impacted by multi-purpose hydrological changes	High (H)
MA07: Restoration of Annex I agricultural habitats (incl. re-establish and improve)	Medium (M)
MA14: Other measures related to agricultural practices	Medium (M)
MB05: Adapt/change forest management and exploitation practices	Medium (M)
MG12: Restoration of habitats to address modifications of hydrological conditions for marine and freshwater aquaculture	Medium (M)
MS02: Reintroduce species from the directives	Medium (M)

9.6 Additional information

The decline in number of occupied hectads for most species within this group indicates that the habitat is insufficient in quality, and the degree of contraction in range indicates that it is also now insufficient in area to maintain viable and sustainable populations, with increasing fragmentation reducing resilience to the ongoing pressures on the environments that these species occupy. Some improvements have been made for example concerted conservation efforts have been directed at *Lycopodiella inundata* (Price, 2020-24) including detailed resurvey of known sites, restoration of habitat, trial propagation and conservation translocations resulting in some populations being restored. Ongoing habitat management will be required to ensure the habitat remains suitable to ensure these populations of *L.inundata* are self sustaining in the long term.

Restoration projects which are otherwise aimed at heathland and peat bogs may result in improved quality of habitat for the species.

10. Future prospects

10.1a Future trends of parameters

ai) Range	Unknown
bi) Population	Negative - decreasing $\leq 1\%$ (one percent or less) per year on average
ci) Habitat for the species	Negative - slight/moderate deterioration

10.1b Future prospects of parameters

aii) Range	Poor
bii) Population	Poor
cii) Habitat for the species	Poor

10.2 Additional information

Pressures on the species are ongoing and leading to declines in populations but are less to do with the collection threat, the reason for inclusion of the group on Annex V and more to do with environmental, climatic and habitat management factors. Whilst some species such as *Lycopodiella inundata* have received conservation interventions addressed at a landscape scale (Price, 2024), for others individual site management has been the modus operandi and is subject to the vagaries of resourcing, incentives and continuity. Many lowland heaths have been lost or fragmented and hydrology altered such that the remnants can no longer sustain the species and even in the uplands changes to land use, such as forestry and moorland management, and climate change are likely impacting the species.

11. Conclusions

11.1 Range	Unfavourable-inadequate (U1)
11.2 Population	Unfavourable-inadequate (U1)
11.3 Habitat for the species	Unfavourable-inadequate (U1)
11.4 Future prospects	Unfavourable-inadequate (U1)

11.5 Overall assessment of Conservation Status

Unfavourable-inadequate (U1)

11.6 Overall trend in Conservation Status

Deteriorating

11.7 Change and reason for change in conservation status

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

11.7 Change and reason for change in conservation status trend

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

11.8 Additional information

Previously unfavourable-inadequate or unknown across all conservation parameters due to paucity of reference values between 2013-2019 and addition of taxa causing difficulties in 2019. However, BSBI records data are reasonably comprehensive across all the relevant time periods and has allowed more accurate predictions to be made in this report such that the conservation status is unfavourable-inadequate across all parameters. The decline in hectad occupation and ongoing pressures on habitats, especially at England level suggest that area and quality of habitat is insufficient and populations are likely below what would be estimated to be the favourable reference values. Collection however is not deemed to be a significant at this time for Lycopodiaceae in England.

12. UK National Site Network (pSCIs, SCIs, SACs) coverage for Annex II species

12.1 Population size inside the pSCIs, SCIs and SACs network

a) Unit

b) Minimum

c) Maximum

d) Best single value

12.2 Type of estimate

12.3 Population size inside the network; Method used**12.4 Short-term trend of population size within the network; Direction**

12.5 Short-term trend of population size within the network; Method used

12.6 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Direction

12.7 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Method used**12.8 Additional information**

No additional information

13. Complementary information**13.1 Justification of percentage thresholds for trends**

No justification information

13.2 Trans-boundary assessment

No trans-boundary assessment information

13.2 Other relevant information

No other relevant information

14. References

Biogeographical and marine regions

4.2 Sources of information

BSBI Distribution database (Accessed October 2024)

García Criado, M., Väre, H., Nieto, A., Bento Elias, R., Dyer, R., Ivanenko, Y., Ivanova, D., Lansdown, R., Molina, J.A., Rouhan, G., Rumsey, F., Troia, A., Vrba, J. and Christenhusz, M.J.M. 2017 'European Red List of Lycopods and Ferns.' Brussels, Belgium: IUCN. ISBN: 978-2-8317-1855-2

JNCC 2019 'Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S1413 - Clubmosses (*Lycopodium* spp.) UNITED KINGDOM'. <https://jncc.gov.uk/jncc-assets/Art17/S1413-UK-Habitats-Directive-Art17-2019.pdf>

Jermy, A. C., 1993 'Illustrated Field Guide to Ferns and Allied Plants of the British Isles', Published by The Stationery Office, ISBN 10: 0113100094 / ISBN 13: 9780113100095

Martin, J., 2019 'Evidence to support the UK report on *Lycopodium* spp. (*Lycopodiaceae*) (Annex V)', unpublished report, Natural England.

Price, D., 2020 'Marsh Clubmoss (*Lycopodiella inundata*) The Lake District, 2020 Species Report', The Species Recovery Trust, report for the Species Recovery Programme, Natural England.

Price, D., 2021 'Marsh Clubmoss (*Lycopodiella inundata*), 2021 Species Report', The Species Recovery Trust, report for the Species Recovery Programme, Natural England.

Price, D., 2023 'Marsh Clubmoss (*Lycopodiella inundata*) Proposals for historic site re-introductions in the South-east 2023-2033', The Species Recovery Trust, report for the Species Recovery Programme, Natural England.

Price, D., 2024 'Marsh Clubmoss Translocation Project Dorset/West Hampshire 2023-2024' A project part-funded by Natural England and Dorset Wildlife Trust, report by the Species Recovery Trust.

Price, D., 2024 'Wisley Common - Marsh Clubmoss Habitat Assessment and Reintroduction Proposals January 2024', Species Recovery Trust, a report for the Species Recovery Programme Natural England.

Prouall & Benallick, I., 2024 Clubmosses in Cornwall

Rumsey, Dr. F., 2012 'Diphasisatrum tristachyum (Pursh) Holub (LYCOPODIACEAE: LYCOPODIOPHYTA) – An Overlooked Extinct British Native', FERN GAZ. 19(2):55-62. 2012

Rumsey, Dr, F., 2024 'Briefing note to accompany 2024 Article 17 Clubmoss reporting', unpublished report for Natural England.

Main pressures

8.2 Sources of information

No sources of information

15. Explanatory Notes

Field label	Note
1.4: Alternative species scientific name	<p>Lycopodiaceae (Clubmosses) are considered here, comprising three genera: <i>Huperzia</i>, <i>Lycopodiella</i> and <i>Lycopodium</i>. The intention of inclusion on Annex V was to protect <i>Lycopodium</i> and <i>Diphasiastrum</i> spp., i.e. the subgenus <i>Lycopodioideae</i>, or <i>Lycopodium</i> as treated in the European Red-List (Garca Criado et al., 2017) from exploitation. In the 2013 reporting round the UK interpreted 'Lycopodium spp.' strictly, only including the species (that were then) within the genus <i>Lycopodium</i> and not the other genera in the Lycopodiaceae. These were the two well-known species <i>L. clavatum</i> and <i>L. annotinum</i>. A further species <i>L. lagopus</i> (syn. <i>L. clavatum</i> subsp. <i>monostachyon</i>) first described as British by Rumsey (2007) was not fully included in the 2013 UK assessment and has never been recorded in England and is not reported here.</p> <p><i>Lycopodium alpinum</i> has the following synonyms: <i>Diphasiastrum alpinum</i> (L.) Holub; <i>Diphasiastrum complanatum</i> ssp. <i>alpinum</i> (L.) Jermy; <i>Diphasium alpinum</i> (L.) Rothm. <i>Lycopodium complanatum</i> has the following synonyms: <i>Diphasiastrum complanatum</i> (L.) Holub; <i>Diphasium complanatum</i> (L.) Rothm. <i>Huperzia selago</i> has the following synonyms: <i>Lycopodium selago</i> L. <i>Lycopodiella inundata</i> has the following synonyms: <i>Lepidotis inundata</i> (L.) P. Beauv.; <i>Lycopodium inundatum</i> L. <i>Lycopodium annotinum</i> & <i>L. clavatum</i> have no synonyms.</p> <p>In the 2019 round all constituent taxa of the Lycopodiaceae then recognised were included in the assessment, which brought in an additional four taxa that were not considered in 2013. The genera <i>Lycopodiella</i> and <i>Huperzia</i>, both then believed to consist of single species, and two additional taxa in the genus <i>Diphasiastrum</i> (but which were included within the genus <i>Lycopodium</i> on the EU Red-List, Garca Criado et al., 2017). Of these, <i>D. complanatum</i> was</p>

	<p>inaccurately applied as a name to the fertile hybrid <i>D. ×issleri</i> (<i>D. complanatum</i> × <i>D. alpinum</i>). This was presumably as a consequence of the treatment by Jermy (1993) of this plant as <i>D. complanatum</i> subsp. <i>issleri</i>. This was misleading as <i>D. complanatum</i> has never been present in Great Britain and Ireland. Study of specimens attributed to the hybrid <i>D. ×issleri</i> did however reveal the evidence of the past occurrence of a third <i>Diphasiastrum</i> taxon, <i>D. tristachyum</i> in England (Rumsey, 2012). Accepted as a native by the GB Species Status Assessment group, this is considered to have become Regionally extinct (RE) prior to 1900 (Rumsey, 2023).</p>
2.1: Sensitive species	<p>Not regarded as sensitive as there is no evidence of exploitation in the wild in England where remaining populations tend to be in the uplands and at low abundance and therefore not productive in terms of collection for herbal or industrial purposes.</p>
2.3: Distribution map	<p>Taxa comprising Lycopodiaceae have been mapped collectively. Data held will only be a partial record of the distribution, with some systematic biases, for example the taxa are now more likely to occur in remote upland areas which receive less intensive recording due to difficult terrain, but on a more positive note, they are relatively easily recognised at least at the generic level. Also due to taxonomic revisions the distribution is not necessarily complete for each currently recognised taxon. However, there has been consistent recording effort alongside conservation measures for some species such as <i>Lycopodiella inundata</i> and the data for this species is considered good and complete.</p>
2.2: Year or Period	<p>Data from BSBI Distribution database (Accessed January 2025) with date range 2010-2024 has been used to provide the most representative current distribution maps and range calculation, in order to account for a possible dip in records post 2019 for many species, which is an artefact of the relaxation in recording effort post production of the Plant Atlas 2020.</p>

2.4: Distribution map; Method used	Species records search included: <i>Lycopodium</i> ; <i>L. annotinum</i> ; <i>Lycopodiella inundata</i> ; <i>Huperzia selago</i> ; <i>Lycopodium clavatum</i> ; <i>Diphasiastrum alpinum</i> ; <i>Diphasiastrum alpinum x complanatum</i> = <i>D. x issleri</i> ; <i>Huperzia selago</i> (boreal taxon); <i>Huperzia selago</i> subsp. <i>selago</i> ; <i>Lycopodium lagopus</i> ; <i>Diphasiastrum tristachyum</i> and <i>Huperzia selago</i> subsp. <i>arctica</i> . Note that no records were returned for <i>D.x issleri</i> , apart from one unconfirmed from Staffordshire, and none for <i>Lycopodium lagopus</i> in England.
5.1: Surface area	Current range value for England is 29073.79 km ² for all included species for the period 2010-2024 and is derived from BSBI records (BSBI, 2025).
5.10: Favourable Reference Range (FRR)	Favourable Reference Range (FRR) was calculated in 2013 as 98503.46 km ² for the UK and was considered to be large enough to support a viable population and no lower than the range estimate when the Habitats Directive came into force in the UK. A disaggregated FRR for England has been not calculated, but is recommended for future reporting and would be possible using BSBI records data, with the period set as 1980-2000, which largely equates to when the Directive came into force.
5.11: Change and reason for change in surface area of range	Comparisons with previous reporting cycles is difficult due to the widening of the taxonomic scope between 2013 and 2019; and the fact that no distribution map or range calculation was produced for the 2019 reporting round and no figures provided for range, or population. It is known that losses, and continuing declines, are more pronounced in England (Rumsey, 2024), especially the lowlands, but the patterns will be obscured by losses and gains amongst the component species, some of which are more widespread than others. Despite the lack of previous range to compare with, there is data from the current vascular plant red list review for modelled Extent of Occurrence and a fairly comprehensive dataset of records from the BSBI Database, plotted on the Plant Atlas 2020 for different time periods that enables judgements to be made on range trends in England. For all species occurring in England

there has been a decline in hectads occupied over the short and long term time periods, except *Lycopodium annotinum*, which has remained static at one hectad. The current range value for England is 29073.79 km² for all included species, for the period 2010-2024, and is derived from BSBI records (BSBI, 2025).

6.2: Population size

Rumsey (2024) provides explanation for the pragmatic choice of using 10km grid square as the measure of population. Number of individuals is problematic for this species, as even if numerical data was available for the clubmosses (which in most taxa is lacking) there remains the difficulty of deciding what constitutes an individual in these fragmenting clonal organisms. This is particularly so for the far-creeping *Lycopodium* and *Diphasiastrum* species, but also for *Lycopodiella*. Counting discrete, functionally isolated ramets /patches is best but not always feasible. Counts of strobili, as a simpler to achieve proxy for number of individuals, has been employed for *Lycopodiella* monitoring is inaccurate, although it does provide informative about plant performance. Area of occupancy per site, combined with some measure of density and performance may be easier to document but such detailed population and site level data are also often lacking, particularly at the centres of distribution where there may be less local conservation concerns. Less detailed still would be some measure of the number of sites occupied by a species, but again the definition of what constituted a site (and how this is perceived by different recorders) makes even assembling this data a challenge (see comments in Species Recovery Trust, 2023). While lacking in detail the easiest measure to use to assess change is presence/absence in a defined mapped area, which has recently become more prevalent at monad scale. However it is difficult to compare recent distributions at monad scale with earlier less granular data which tended to be at hectad level, hence hectads are the unit of measure for population used here.

6.15: Favourable Reference Population (FRP)

No FRP was given in 2013 and 2019, even for total UK population, the reason given insufficient information available, plus there were additional difficulties in the changes in the taxa included. For this reporting round records data are considered adequate to derive an FRP for England based on occupancy of hectads, albeit as an operator. Accordingly in England there were 125 occupied hectads during the period 1980-2000 which approximates to when the Directive came into force, and an operator based on this figure has been proposed. This reflects the mixed picture of occupied hectads depending on time frames and with losses and gains within and between species and the noticeable effects of recorder effort.

6.17: Additional information

In the 2013 report, a proxy for Population was given as recorded occupancy of 10x10 km squares: 678 (minimum) to 727 (maximum) for the UK and not disaggregated for England, and that time it was considered uncertain whether it was large enough to be viable and the short term trend was unknown. In the following 2019 reporting no figures were given for population or trends at that time and it was deemed not possible to compare with 2013, partly due to the addition of taxa. For this reporting round records data are considered adequate to derive an FRP for England based on occupancy of hectads in England during the period 1980-2000 which approximates to when the Directive came into force and is recommended to facilitate future reporting. Analysis of population size and trends has been attempted using BSBI hectad occupancy data as proxy for population.

8.3: Additional information

There is no evidence that collection is occurring in the wild in England but there are several pressures and threats to the species group which are considered to be significant and are not fully addressed by any existing conservation measures, such as habitat management and land use practices in the uplands where the majority of extant populations occur. Many threats are likely to be site specific, and since detailed information is lacking about many populations it is uncertain if existing conservation

measures cover these. Information is available on conservation measures for *Lycopodiella inundata* in south and south east England (Price, 2024) where habitat management and conservation translocations are being trialled to re-establish populations.

9.6: Additional information

Conservation measures are only required to be reported for Annex II species and this group of species is only Annex V, however since there are drivers of change in the distribution and status of the species, other than collection, the other pressures and measures have been elucidated in this report.