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# Impacts of nitrogen on vegetation

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- All participants in the European moss survey 2005/6 who have submitted N data;
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## *Executive summary*

In this study the following scientific objectives were addressed:

1) To assess the evidence for the impacts of nitrogen (N) on vegetation in areas of Europe with high N deposition by:
    a) Identifying locations of sensitive 'Heathland' and 'Grassland' EUNIS classes with likelihood of exceedance of empirical critical loads of N for the EMEP domain (SEI York);
    b) Developing a meta-database describing National surveys on N impacts on vegetation and summary of main findings (SEI-York and CEH Bangor);
2) To analyse spatial trends in the N concentration of mosses in relation to N deposition maps and comparison with critical load exceedances, both at the UK and EMEP scale (CEH Bangor).

**Identifying locations of sensitive 'Heathland' and 'Grassland' EUNIS classes with likelihood of exceedance of empirical critical loads of N for the EMEP domain**

<u>Approach</u>

The methodology developed to investigate objective 1(a) was applied to 'Heathland, scrub and tundra habitats' (EUNIS class F; to level 2) and 'Grasslands and tall Forbs habitats' (EUNIS class E, to level 3). In 2002, empirical critical load ranges for N were allocated to the EUNIS E and F categories at the UNECE workshop in Berne. The LRTAP Convention Harmonised Land Cover Map, however, does not show all these categories. Therefore this project focussed on a more limited range of EUNIS categories and in some cases, it was necessary to condense two empirical critical load ranges, e.g. for wet and dry heathlands, using expert judgement.

The spatial distribution of the EUNIS categories from the LRTAP land cover map was first combined with EMEP total N deposition data using a GIS overlay procedure. Minimum, mean and maximum values for the deposition in each area were compared with minimum, mean and maximum values from the relevant empirical critical load ranges. An uncertainty (± 30%) was attached to the EMEP modelled N deposition values, based on a comparison of modelled and monitored deposition fluxes of sulphur and N to ICP Forests sites in Europe. The area of each ecosystem type for a given critical load where there is 'very likely exceedance' (i.e. minimum EMEP deposition exceeds critical load), 'likely exceedance' (i.e. mean EMEP deposition exceeds critical load), 'possible exceedance' (i.e. maximum EMEP deposition exceeds critical load), or 'no exceedance' was determined. This assessment was made for each EMEP grid square (50 x 50 $km^2$); the LRTAP Convention Harmonised Land Cover Database also provides the area of the habitat of interest in each grid square. The results were then expressed for each country as percentage areas of each habitat in each category of exceedance. The base year for EMEP deposition estimates used in this study is 2005. Results were also calculated at the individual national scales for the 2010 Gothenburg Protocol emissions targets. The uncertainty analysis was carried out for all the countries in the EMEP modelling domain except those that presented technical difficulties at the time of the study, i.e. the Russian Federation, Turkmenistan and Luxemburg.

<u>Likelihood of exceedance</u>

Across the EMEP domain, grassland and tundra dominate the area of semi-natural habitat. Mesic grasslands, the grassland ecosystem type studied that had the highest critical load range (20-30 kg $ha^{-1}$ $y^{-1}$), showed no exceedance at all for 2005 and 2010. In contrast, the Alpine and sub-alpine grasslands

(E4) and Arctic, alpine and sub-alpine scrub habitats (F2) had the greatest exceedance, even though their total area is much lower. Although these arctic and alpine habitats show significant areas of likely or possible exceedance using the mean critical load value, it is the lower critical load of 5 kg $ha^{-1}$ $y^{-1}$ for these vegetation types that shows substantial exceedance. This result highlights these as critical habitats for further assessment, as the evidence base for the empirical critical load range that is currently used is quite limited. For the UK the EMEP deposition data currently indicate very little exceedance for the studied habitats, however, when a similar exercise was conducted using national deposition data (2003-2005) based on a 5 x 5 $km^2$ grid scale and using the UK Land Cover Map, considerable exceedances (up to 63% area) were calculated using mean deposition and mean empirical critical loads.

Interpretation in relation to 2010 Gothenburg Protocol targets

There is relatively little additional benefit in terms of critical load exceedance from reaching the 2010 Gothenburg Protocol emission targets; this is largely because deposition in 2005 in most countries was already at, or close to, those under the Protocol. However, across the modelled domain, some reductions in the area of 'very likely' or 'likely' exceedance would be achieved for the most sensitive habitats with implementation of the Gothenburg Protocol targets. When these targets are met, the results suggest that little exceedance will remain if the mean of the critical load range is applied, but for sensitive habitats, substantial exceedance is likely to remain if the minimum of the critical load range is applied. There is an urgent need for improved understanding of how to apply the general guidance of empirical N critical loads for EUNIS classes to make informed choices about appropriate critical load mapping values.

**Developing a meta-database describing National surveys on N impacts on vegetation and summary of main findings**

In December 2007, a questionnaire and covering letter was circulated to 71 members of the N deposition effects on vegetation research community known to the project team and their network of colleagues across Europe. The returns (24) were sorted by major ecosystem type and assessed to produce a summary of the main findings. Analysis of results was carried out by comparing what is already known about the response of major ecosystem types in Europe to enhanced N deposition inputs to evidence emerging from the meta-database of survey results. This was carried out using the information contained in the report of the workshop on empirical N critical loads, Berne, 2002.

Forest Habitats (EUNIS class G, 16 responses received)

The range of received responses indicates the potential for increasing the evidence base for the empirical critical loads for forest, and possibly for a further review of whether these critical loads need revision. However, a significant number of responses describe either variables which will be of little direct value (e.g. the N concentration in mosses), or relate to studies which do not yet have a long enough time series for interpretation. For example, the ICP Forests has a large number of Level II monitoring plots across Europe and the potential to integrate effects assessments over a large area, but the wide range of forest types covered makes effects of N deposition difficult to disentangle from other factors, and the time series is not yet long enough to provide sufficient analytical power.

Heathland, scrub and tundra habitats (EUNIS class F, 2 responses received*)*

A response from Scotland includes *Racomitrium* heath and montane habitats which are thought to be very sensitive to increased N deposition. The second response relates to experiments on heathland restoration in the Netherlands. The control plots in these studies could provide interesting information on effects of decreasing N deposition since 1990 in the Netherlands.

Grasslands and tall forb habitats (EUNIS class E, 2 response received)
One response related to acid grassland habitats in the UK, which provided important new evidence relating spatial variation in species composition and diversity to modelled N deposition. The other response is a repeated study showing evidence of N impacts to rare and diverse grassland in Hungary.

Mire, bog and fen habitats (EUNIS class D, 3 responses received)
Work reported from Hungary and Sweden provides evidence of changes in species composition, but has not been explicitly linked to modelled N deposition. The results of a Swedish experimental study would be valuable in any review of empirical critical loads.

Other habitats (5 responses received)
Three important responses from major surveys covering many different habitats in three countries were received: Germany, the Netherlands and the UK. Assessment of the consistency of the results from these different countrywide databases would be of considerable value but would also be a major methodological challenge. Regarding the ICP Vegetation European moss survey, to date this survey has focussed on the N concentration in ectohydric mosses, and not on changes in species composition. Its value may lie more in increasing our understanding of small-scale variation in N deposition and concentration in mosses to complement the large-scale EMEP model data than in setting critical loads. There is a need to link the N concentrations in mosses with N impacts on vegetation.

Summary of main findings
Although field survey data have been identified regarding N impacts on vegetation, countrywide or European-wide surveys indicate that impacts of N deposition are difficult to separate from other factors. Some surveys indicate increases in species with higher Ellenberg N values or a reduction in species richness with an increase in N deposition. Future work should focus on further analysis of the existing meta-database, identification of additional field surveys, in particular in areas which are currently under-represented (e.g. Mediterranean) and linking databases on for example changes in species composition with measured or modelled N deposition data.

**Spatial analysis of the N concentration in mosses in relation to N deposition maps and comparison with critical load exceedances, both at the UK and EMEP scale**

National-scale analysis for the UK
In the UK, the moss sites with lower percent N, the lowest N deposition and small or no critical load exceedance are found in northern Scotland, whilst sites with high percent N, high N deposition and high exceedance are found in central and eastern England. However, not all sites conform to this spatial pattern, with variability from one site to another resulting in a lot of scatter in the data, reflected in the relatively low $R^2$ values obtained when plotting the N deposition ($N_{total}$, $N_{ox}$ or $N_{red}$) or critical load exceedance versus the N concentration in mosses. One reason for the low correspondence between the datasets may be the resolution of the deposition data; these values were taken from the national CBED (Concentration-Based Estimated Deposition) maps that assume deposition is constant across each 5 x 5 km grid square. Deposition values may vary considerably within such an area due to topography, local climate and vegetation. Using habitat-specific deposition values appropriate for the CORINE land cover class at each site (i.e., where moorland or woodland deposition velocities are used to estimate the dry deposition component) improved the relationships compared to using the grid average deposition for all vegetation types.

EMEP deposition values for the UK were lower than CBED deposition values and the relationship between EMEP N deposition values and N concentration in mosses showed similar scatter as shown for

CBED deposition values. In addition to the resolution of the deposition data there are other uncertainties to be considered, such as uncertainties in: a) measurement and calculation of emissions and deposition; b) empirical critical load values; c) assignment of empirical critical load values based on information on CORINE land cover; d) measurement of N concentration in mosses, and e) interspecies differences in N concentration in mosses.

Analysis of EMEP domain data

The spatial distribution of the EMEP modelled N deposition and the average N concentration in mosses per 50 x 50 km grid square showed similar patterns (except in eastern Europe) with high values in central Europe and the lowest values in northern Finland and northern Scotland. In eastern Europe, the N concentration in mosses was relatively higher than the EMEP modelled N deposition. However, when plotted against each other, the data showed a lot of scatter and the N concentration in mosses appears to saturate at N deposition values above ca. 10 kg $ha^{-1}$ $y^{-1}$. One reason for the low correspondence between the datasets may be the resolution of the deposition data; these values were taken from the EMEP maps that assume deposition is constant across each 50 x 50 km grid square. Deposition values vary considerably within such an area due to topography, local climate and vegetation. This could explain the significant country effect on top of the deposition effect on the total N concentration in mosses.

## Future research challenges

*Likelihood-based approach to assess critical load exceedance across Europe*

- This preliminary exercise needs to be extended to cover the full range of semi-natural habitats, assuming the location of specific EUNIS classes can be mapped with an appropriate level of certainty. Inclusion of bogs and mires, for example, which are particularly sensitive to N deposition, would be an important development;
- There is a need to compare the results of this study with a similar approach using national deposition data and land cover maps to identify any discrepancies;
- As the choice of mapping value within the empirical critical load range has a very large effect on the judgement as to whether the deposition rates under Gothenburg Protocol emission targets are adequate to protect sensitive ecosystems, there is an urgent need for improved understanding of how to apply the general guidance to make choices about appropriate critical load mapping values. Further development of the decision support matrix for selecting appropriate critical load values would be one approach to this problem, but more observational and experimental evidence is also needed.

*N meta-database*

- Further identification of other survey information to increase the size of the meta-database. This should be focussed on habitats and regions of Europe (e.g. Mediterranean countries) for which there is no information to date;
- Further analysis of the existing information with complete data sets to begin to assess the strength of evidence of impacts of N deposition in different habitats;
- Collaboration to extend studies that have information on changes in vegetation composition so that they include modelled N deposition and can be analysed in terms of the impacts of N deposition;
- Use of the database should be explored by interested parties such as e.g. dynamic modellers.

*European N in mosses survey*

- There is a need to further investigate the general applicability of mosses as biomonitors of atmospheric N deposition. In particular site-specific relationships between the N concentration in mosses and measured atmospheric N deposition rates, and the impacts of local variables such as climate, vegetation and topography on such a relationship, should be examined further;
- To extend the European N in mosses database, we encourage more countries to determine the N concentration in mosses in future moss surveys;
- There is the need to conduct interspecies calibration exercises regarding the N concentration in mosses and investigate the impacts of N deposition on moss growth and physiology;
- Linking the moss database with other databases on e.g. climate, land cover and topography will provide further insight into factors (other than deposition) affecting the N concentration in mosses;
- To be able to use the moss database in the critical load approach, there is the challenge to relate the N concentration in mosses with N impacts on vegetation.

# Contents

## *1. Objectives*

In this study the following scientific objectives were addressed:

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    a) Identifying locations of sensitive 'Heathland' and 'Grassland' EUNIS classes with likelihood of exceedance of empirical critical loads of N for the EMEP domain (SEI York);
    b) Developing a meta-database describing National surveys on N impacts on vegetation and summary of main findings (SEI-York and CEH Bangor);
2) To analyse spatial trends in the N concentration of mosses in relation to N deposition maps and comparison with critical load exceedances, both at the EMEP and UK scale (CEH Bangor).

## *2. Identifying locations of sensitive 'Heathland' and 'Grassland' EUNIS classes with likelihood of exceedance of critical loads of N for the EMEP domain.*

There has been one significant change in the approach to this work compared to the original work plan. The original plan was to create maps to show the location of areas of each habitat where critical loads were exceeded. However, the areas of many of these habitats are very small, and hence it would not be possible on a map of Europe to display both the locations and degree of exceedance in a way which could be readily understood and interpreted by the reader. This issue is exacerbated by the decision to provide a more detailed analysis taking account of the uncertainties of both the critical load and the deposition. It was therefore decided that it would be better to focus on a more detailed tabular analysis, which would convey the required information in a form which clearly identifies both areas of exceedance for each class but also how sensitive this is to uncertainty in both deposition and critical load.

### (i) Methods

The methodology developed below was applied to 'Heathland, scrub and tundra habitats' (EUNIS class F; to level 2) and 'Grasslands and tall Forbs habitats' (EUNIS class E, to level 3). The Berne report (Bobbink et al. 2003) allocates the critical load ranges these EUNIS categories as shown in Table 1.

The LRTAP Convention Harmonised Land Cover Map (Cinderby et al., 2007), however, does not show all these categories. Therefore this project focussed on a more limited range of EUNIS categories, as shown in Table 2. In some cases, it was necessary to condense two empirical critical load ranges, e.g. for wet and dry heathlands, using expert judgement. These are indicated by the notes in Table 2.

**Table 1: Critical Load ranges from the Berne report allocated to EUNIS classes.**

Key:-## reliable; # quite reliable; (#) expert judgement
Notes: a. use towards the high end of range at P limitation, and twards lower end if P not limiting
b. use towards high end if sod cutting practiced, use lower end of range with low intensity management

| EUNIS Class | | CL min | CL max | CL mean | Reliability | Notes: |
|---|---|---|---|---|---|---|
| F1 | Tundra | 5 | 10 | 7.5 | # | a |
| F2 | Arctic, alpine and subalpinescrub habitats | 5 | 15 | 10 | (#) | a |
| F4.11 | Northern Wet Heath | | | | | |
| F4.11 | U' Calluna-dominated wet heath (upland moorland) | 10 | 20 | 15 | (#) | a |
| F4.11 | L' Erica tetralix dominated wet heath | 10 | 25 | 17.5 | (#) | a,b |
| F4.2 | Dry heaths | 10 | 20 | 15 | ## | a,b |
| | | | | | | |
| E1.26 | Sub-atlantic semi-dry calcareous grassland | 15 | 25 | 20 | ## | |
| E1.7 | Non-med dry acid and neutral closed grassland | 10 | 20 | 15 | # | |
| E1.94 | Inland dune pioneer grasslands | 10 | 20 | 15 | (#) | |
| E1.95 | Inland dune siliceous grasslands | 10 | 20 | 15 | (#) | |
| E2.2 | Low and medium altitude hay meadows | 20 | 30 | 25 | (#) | |
| E2.3 | Moutain hay meadows | 10 | 20 | 15 | (#) | |
| E3.5 | Moist and wet oligotrophic grasslands | | | | | |
| E3.51 | Molinia Caerulea meadows | 15 | 25 | 20 | (#) | |
| E3.52 | Heath (Juncu) meadows and humid (Nardus stricta) swards | 10 | 20 | 15 | # | |
| E4.3 | Alpine and subalpine grasslands | 10 | 15 | 12.5 | (#) | |
| E4.4 | Alpine and subalpine grasslands | 10 | 15 | 12.5 | (#) | |
| E4.2 | Moss ansd lichen dominated mountain summits | 5 | 10 | 7.5 | # | |

**Table 2: Critical Load ranges allocated to EUNIS classes available in LRTAP Land Cover Map.**

| EUNIS Class | | CL min | CL max | CL mean | Notes: |
|---|---|---|---|---|---|
| F1 | Tundra | 5 | 10 | 7.5 | |
| F2 | Arctic, alpine and subalpinescrub habitats | 5 | 15 | 10 | |
| F4 | Wet and dry | 10 | 20 | 15 | Takes lower range of F4.11 and F 4.2 |
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 15 | 25 | 20 | |
| E1.7 | Non-med dry acid and neutral closed grassland | 10 | 20 | 15 | |
| E 1.9 | Inland Dunes | 10 | 20 | 15 | Combines two dune systems with similar sensitivity |
| E 2 | Mesic grasslands | 20 | 30 | 25 | |
| E2.3 | Moutain hay meadows | 10 | 20 | 15 | |
| E 3 | Seasonally wet and wet grasslands | 10 | 20 | 15 | Takes lower range of E3.5, 3.51, 3.52 |
| | | | | | |
| E 4 | Alpine and subalpine grasslands + Moss and lichen dom | 5 | 15 | 10 | range accounts for sensitivity of E4.2 on moutain summits |

An important new element of the analysis which was undertaken in this project was to incorporate the uncertainty which is implicit in any assessment of whether a critical load is exceeded. This needs to consider firstly the uncertainty in the appropriate critical load value within the range shown in Table 2, which should be applied to a particular area of habitat within a particular country. Bobbink et al. (2003) provide guidance on how data on climate, soil, and vegetation may indicate whether the upper or lower end of the critical load range is used. In this study, we aim to explore the sensitivity of the decision on whether a critical load is exceeded to the choice of critical load. The second uncertainty is in the modelled rates of nitrogen deposition. This can be due both to systematic bias (because, for example, for key processes being omitted or inadequately parameterised in the model) or uncertainty due to comparing a 50 km grid average from the EMEP model with a specific habitat in a specific location within that grid square. This uncertainty is increased when the habitat of interest only occupies a small proportion of the grid square, as is often the case for the habitats of concern in this study.

Using EUNIS F4 (wet and dry heathlands) in Austria as a worked example, the uncertainty analysis used in this study is shown in Table 3. The spatial distribution of the EUNIS categories from the LRTAP land cover map is first combined with EMEP total N deposition data (see below for details) using a GIS overlay procedure. Minimum, mean and maximum values for the deposition in each area are compared with minimum, mean and maximum values from the relevant critical load ranges from Table 2. The area of each ecosystem type for a given critical load where there is 'very likely exceedance', 'likely exceedance', 'possible exceedance' or 'no exceedance' according to the key shown in Table 3 is determined. This assessment is made for each grid square; the database of Cinderby et al. (2007) also provides the area of the habitat of interest in each grid square. The results are then expressed for the whole country as percentage areas of each habitat in each category in the format shown in Table 4.

**Table 3: Method of assessing uncertainty in exceedance calculations e.g. EUNIS F4 Austria.**

| | Area km$^2$ | EMEP N dep Range (kg N/ha/yr) | | | Critical Load Range Used | | | Risk of Exceedance | | |
|---|---|---|---|---|---|---|---|---|---|---|
| EUNIS CODE list | | Min Dep (-30%) | Mean Dep | Max Dep (+30%) | Min. CL | Mean CL | Max CL | Min. CL | Mean CL | Max CL |
| F4 | 1.3 | **7.3** | **10.4** | **13.5** | 10 | 15 | 20 | L | N | N |
| F4 | 4.3 | **6.6** | **9.4** | **12.2** | 10 | 15 | 20 | P | N | N |
| F4 | 0.2 | **8.6** | **12.3** | **16.0** | 10 | 15 | 20 | L | P | N |
| F4 | 6.0 | **3.5** | **4.9** | **6.4** | 10 | 15 | 20 | N | N | N |
| F4 | 5.9 | **6.3** | **8.9** | **11.6** | 10 | 15 | 20 | P | N | N |
| **Key:-** | | | | | | | | | | |
| Very likely exceedance | D | if lowest N dep exceeds critical load | | | | | | | | |
| Likely Exceedance | L | if mean N dep exceeds critical load | | | | | | | | |
| Possible Exceedance | P | if max N dep exceeds critical load | | | | | | | | |
| No Exceedance | N | if no value N Dep > CL | | | | | | | | |

The base year for EMEP deposition estimates used in this study is 2005 (which are the most recent available) and calculations are documented in EMEP status report 1/2007. The EMEP model has 20 vertical layers for use at European scale with a horizontal resolution of 50 x 50 km$^2$ (at 60°N) on a polar stereographic grid. Deposition data modelled for the EMEP area consist of total (dry + wet) N deposition to semi-natural land (dry deposition is converted to mg N/m$^2$ semi-natural land).

The uncertainty (± 30%) attached to the EMEP modelled N deposition values is based on a comparison of modelled and monitored deposition fluxes of sulphur and N to ICP-Forests sites in Europe (Simpson et al., 2006a and b). Differences in mean values between modelled and observed $SO_4^{2-}$, $NO_3^-$ and $NH_4^+$ total and wet deposition were within 20% in 1997 and 30% in 2000, with the EMEP model showing slightly lower values than the observations. Total deposition was only estimated for S deposition as it is only possible to compare modelled and observed N deposition in precipitation, because canopy exchange (uptake) of N affects the chemical composition of throughfall.

Simpson et al. (2006b) state that more good-quality measurements of the gas and particle-phase components of total nitrate and $NH_3$ + $NH_4^+$ in air, and a better understanding of precipitation scavenging (and possible sub-grid and orographic effects), will clearly be required to understand the reasons for overestimation of N in air and underestimation of N in precipitation. It is concluded that, despite these problems, the EMEP model captures the concentrations of gaseous N species (except ammonia) and of wet deposition of N components to within 30%. In general, the main uncertainties associated with EMEP deposition estimates lie in the lack of knowledge of gaseous nitric acid versus particulate nitrate, and possibly in the deposition rates of particles, as well as in ammonia emission and deposition (David Simpson, *pers. comm.).*

Results for running the model with the national 2010 Gothenburg Protocol targets for emissions are also calculated, using the average value for five different meteorological years; the calculations are documented in EMEP status report 1/2006.

## (ii) Results

The uncertainty analysis was carried out for all the countries in the UNECE modelling domain except those that presented technical difficulties at the time of the study i.e. Russia, Luxemburg and Turkmenistan. Results for Austria (Table 4) and Great Britain (Table 5) are shown in detail here as examples of national analysis (see Annex 3 for results other countries) and the results for each ecosystem type across the UNECE domain are shown in Table 6. It should be noted that EUNIS classes E1.7 and E1.9 are not separated on the land cover map and so the total area of 430,000 km$^2$ is for both combined and as the critical load ranges are the same for each the results of the uncertainty analysis are also identical. EUNIS classes F1, E1.2, E1.7 and E1.9 habitats did not feature in the analysis for Austria and high altitude, tundra and alpine ecosystems (F1, F2, E2.3 and E4) did not feature in Great Britain.

**Table 4: Uncertainty analysis results for Austria.**

| | | | | 2005 | | | 2010 | | |
|---|---|---|---|---|---|---|---|---|---|
| EUNIS CODE | | Area km$^2$ | | Min CL | Mean CL | Max CL | Min CL | Mean CL | Max CL |
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 5,842 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 5,459 | D | 3% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 33% | 0% | 0% | 10% | 0% | 0% |
| | | | P | 33% | 23% | 0% | 52% | 0% | 0% |
| | | | N | 31% | 77% | 100% | 38% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 79 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 5% | 0% | 0% | 2% | 0% | 0% |
| | | | P | 62% | 2% | 0% | 53% | 0% | 0% |
| | | | N | 34% | 98% | 100% | 45% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and lichen dominated mountain | 6,219 | D | 79% | 1% | 0% | 67% | 0% | 0% |
| | | | L | 20% | 17% | 0% | 33% | 2% | 0% |
| | | | P | 1% | 48% | 13% | 0% | 59% | 0% |
| | | | N | 0% | 35% | 87% | 0% | 38% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 3,202 | D | 94% | 1% | 0% | 81% | 0% | 0% |
| | | | L | 6% | 43% | 0% | 19% | 5% | 0% |
| | | | P | 0% | 38% | 16% | 0% | 67% | 0% |
| | | | N | 0% | 17% | 84% | 0% | 28% | 100% |
| F4 | Wet and dry heathlands | 18 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 8% | 0% | 0% | 1% | 0% | 0% |
| | | | P | 57% | 1% | 0% | 65% | 0% | 0% |
| | | | N | 34% | 99% | 100% | 34% | 100% | 100% |

**Table 5: Uncertainty analysis results for Great Britain.**

| EUNIS CODE | | Area $km^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 3 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 602 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 602 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 82,077 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 20,090 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and lichen dominated mountain | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 30,212 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |

## (iii) Discussion

For Austria, the results for the application of the uncertainty analysis (Table 4) show that the value selected within the critical load range can make a big difference to the result. This is clearly demonstrated for sensitive communities with lower critical load ranges such as Arctic, Alpine and subalpine scrub (F2) and Alpine and subalpine grasslands (E4) where using the lower end of the critical load range rather than the mean increases the area of exceedance in the 'very likely' class from 1 to 93 and 1 to 79%, respectively. F2 and F4 categories had significant areas, providing a total of about 10,000 ha. This reflects the very low critical load value (of 5 kg $ha^{-1}$ $yr^{-1}$) at the low end of the range. The ecosystem type with the highest critical load range, mesic grasslands (20-30), shows no exceedance at all in our analysis for 2005 and 2010.

For Great Britain (Table 5), there is very little exceedance. This was primarily due to ecosystems with a minimum critical load of 5 kg N $ha^{-1}$ $yr^{-1}$ being absent from the analysis. If ecosystems such as bogs and Racomitrium heaths were included, then the level of exceedance would increase. There is also a strong possibility that the EMEP model is underestimating the deposition at high elevation sites, through exclusion of orographic and rainfall gradient effects. In addition, although the EMEP model captures ammonia emissions from agricultural sources, the 50 x 50 km$^2$ scale does not account for sub grid 'hotspots' often caused by these emissions.

When a similar exercise was conducted for Great Britain using national deposition data (2003-2005) based on a 5 x 5 km$^2$ grid scale and using the UK Land Cover Map, considerable exceedances (percent area) were calculated using mean deposition and mean empirical critical loads:

- Acid grassland (E1.7 & E3.5): 59%;
- Calcareous grassland (E1.26): 63%;
- Dwarf shrub heath (F4.11 & F4.2): 29%.

We advise that other countries also compare the results of this study with a similar approach using national deposition data and land cover maps and report on any discrepancies.

**Table 6: Area and 'uncertainty' of exceedance for each EUNIS category summed across all countries in the database (except Russia, Turkmenistan and Luxemburg).**

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 507,751 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 or 1.9 | Non-med dry acid and neutral closed grassland or inland dunes | 429,684 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 912,064 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 61,508 | D | 3% | 0% | 0% | 2% | 0% | 0% |
| | | | L | 12% | 1% | 0% | 13% | 1% | 0% |
| | | | P | 30% | 7% | 1% | 28% | 4% | 1% |
| | | | N | 55% | 91% | 99% | 58% | 94% | 99% |
| E3 | Seasonally wet and wet grasslands | 521,207 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 98% | 100% | 100% | 99% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and lichen | 48,102 | D | 56% | 3% | 0% | 46% | 3% | 0% |
| | | | L | 24% | 18% | 1% | 34% | 9% | 2% |
| | | | P | 5% | 26% | 10% | 7% | 27% | 7% |
| | | | N | 16% | 53% | 88% | 14% | 61% | 91% |
| F1 | Tundra | 311,509 | D | 2% | 1% | 0% | 3% | 1% | 0% |
| | | | L | 7% | 1% | 1% | 3% | 1% | 1% |
| | | | P | 4% | 2% | 1% | 5% | 2% | 2% |
| | | | N | 87% | 97% | 98% | 89% | 96% | 97% |
| F2 | Arctic, alpine and subalpine scrub habitats | 49,766 | D | 42% | 2% | 0% | 33% | 3% | 0% |
| | | | L | 18% | 13% | 1% | 25% | 8% | 2% |
| | | | P | 5% | 20% | 7% | 8% | 18% | 5% |
| | | | N | 34% | 65% | 92% | 34% | 72% | 94% |
| F4 | Wet and dry heathlands | 81,083 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 3% | 1% | 0% | 1% | 0% | 0% |
| | | | N | 96% | 99% | 100% | 99% | 100% | 100% |

Across the UNECE domain, grassland and tundra dominate the area of semi-natural habitat that has been included in this analysis. However, it is the Mountain hay meadows (E2.3), Alpine and subalpine grasslands (E4) and Arctic, alpine and subalpine scrub habitats (F2) that show the greatest exceedance, even though their total area is much lower. As was shown for Austria, it is the lower critical load of 5 kg $ha^{-1}$ $yr^{-1}$ that is crucial, although these arctic and alpine habitats also show substantial areas of likely or possible exceedance using the mean critical load value. This result highlights these as critical habitats for further assessment, as the evidence base for the empirical critical load range that is currently used is quite limited.

Table 6 suggests that there is relatively little additional benefit in terms of critical load exceedance from reaching the Gothenburg Protocol emission targets; this is largely because deposition in 2005 in most countries was already at, or close to, that under the Protocol. However, across the modelled domain, some reductions in the area of 'very likely' or 'likely' exceedance would be achieved for the most sensitive habitats with the Gothenburg Protocol targets. When these targets are met, the results suggest that little exceedance will remain if the mean of the critical load range is applied, but for sensitive habitats, substantial exceedance is likely to remain if the minimum of the critical load range is applied.

This work is complementary to the work carried out by Hettelingh et al. (2007) for the CCE Progress Report 2007 on Critical Loads of Nitrogen and Dynamic Modelling entitled 'Tentatively exploring the likelihood of exceedances: Ensemble Assessment of Impacts (EAI)'. The CCE study considers the robustness of exceedances on a scale ranging from 'unlikely' to 'virtually certain' by using an EAI approach based on the guidance notes to lead authors of the Fourth Assessment Report (IPCC-AR4) on addressing uncertainties. The EAI is derived from the ensemble modelling approach where pooling of different model results is employed to improve the accuracy of predictions (e.g. Builtjes, 2004). The CCE study is a preliminary application of the IPPC AR4 approach, deliberately kept simple by including just the two critical load approaches (empirical and modelled critical loads) and by assuming that the propagation of uncertainties of emissions and dispersion modelling is a non-quantified constraint. The study takes EMEP ecosystem specific deposition values ($NO_x$ + $NH_y$, aggregated to three ecosystem types, using five year average meteorology on a 50 by 50 $km^2$ grid) as an unchallenged starting point. The variation of the distribution as well as the magnitude of deposition is a sole result of emission reduction scenarios from RAINS/GAINS modelling (which incorporates the EMEP atmospheric transfer model). It is assumed that each set of critical loads in each EMEP grid is representative for the population of all ecosystems and the distribution of empirical and modelled critical loads and the exceedances are independent of one another. The probability of exceedance is assumed to be reflected by the percentage of the ecosystem area in the EMEP grid that is exceeded (at risk). The likelihood of exceedance, expressed as the Average Accumulated Exceedance (AAE) > 0, is defined as 'likely', 'very likely', or 'virtually certain' if the square root of the product (i.e. the geometric mean) of the exceedance percentages based on empirical and modelled critical loads are in the ranges 0-33%, 33-67% and > 67% respectively. The likelihood is 'unlikely' or 'as likely as not' if the two percentages for the critical loads are zero or exceeded in just one case respectively.

The approach presented in this report is different to that of the CCE as it focuses on whether specific ecosystem types are exceeded in each grid rather than on whether there is exceedance in a grid or not. It also differs in that it considers the uncertainty associated with both the N deposition and the empirical critical loads and has the advantage that the magnitude of exceedance can be estimated by determining if minimum, mean or maximum critical loads within a range are exceeded by the minimum, mean or maximum N deposition estimates.

A second study reported in the 2007 CCE Progress Report (de Bakker et al., 2007) describes a process of producing a default empirical critical load map for Europe based on the harmonised land cover map. This entailed assigning empirical critical load values to all non-forest EUNIS land cover classes using expert judgement. The resulting map was based on the minimum critical load value within the range, justified by application of a precautionary approach. A further development was the division of Europe into two biogeographical regions based on a map of the length of the growing season; lower values of empirical critical loads were assigned to regions with a short growing season. This approach again is different from that developed in this study in that it focuses on providing a default map for European wide risk assessment, whereas our approach aims to assess the areas of specific habitat which have different degrees of likelihood of critical load exceedance.

## (iv) Conclusions and future research needs

This analysis is very much a preliminary exercise to develop a likelihood-based approach to assessment of critical load exceedance across Europe, which takes account of the uncertainties in both empirical critical load values and deposition rates. It needs to be extended to cover the full range of semi-natural habitats, assuming the location of specific EUNIS classes can be mapped with an appropriate level of certainty. Inclusion of bogs and mires, for example, which are particularly sensitive to N deposition, would be an important development. This analysis also assumes there is no significant bias in EMEP deposition estimates – it is quite possible that these under-estimate deposition rates to some sensitive habitats and regions, and this would also change the conclusions of the analysis significantly. There is a need to compare the results of this study with a similar approach using national deposition data and land cover maps to identify any discrepancies.

The results highlight that a high proportion of 'likely' or 'very likely' exceedance of the critical load is focussed primarily on a small number of sensitive habitats, or those which the empirical critical load range extends below 10 kg $ha^{-1}$ $yr^{-1}$. It is therefore clear that the choice of mapping value within the critical load range has a very large effect on the judgement as to whether the deposition rates under Gothenburg Protocol emission targets are adequate to protect sensitive ecosystems. While the need to apply lower critical values in colder climates with low nitrogen availability is generally understood, there is an urgent need for improved understanding of how to apply the general guidance provided by Bobbink et al. (2003) to make choices about appropriate critical load mapping values. Further development of the decision support matrix which was developed under the UK 'Terrestrial Umbrella' contract for selecting appropriate critical load values would be one approach to this problem, but more observational and experimental evidence is also needed.

## 3. Developing a meta-database describing National surveys on N impacts on vegetation and summary of main findings

In a policy context, evidence to demonstrate that critical load exceedance is associated with significant changes in species composition and loss of species of conservation value is of great importance. Although such evidence was considered, alongside experimental studies, in developing the currently recommended empirical critical loads of N, there has been no systematic collation and assessment of the evidence of impacts of N deposition in the field. Current evidence suggests that enhanced N deposition might cause large-scale loss of species and changes in species composition, but that the effects are slow and cumulative, and hence a particularly important source of evidence is that from repeated surveys which assess whether there has been long-term change in species composition over recent decades which is consistent with the impacts of N deposition. Hence, the WGE of the LRTAP Convention and other bodies under the Convention would benefit from an inventory of such evidence of effects across Europe, in particular for further developing and validating the N critical loads work.

### (i) Methods

A questionnaire and covering letter (see Annex 1) was circulated to 71 members of the N deposition effects on vegetation research community known to the project team (CEH, Bangor and SEI, York) and their network of colleagues across Europe. The returns were then sorted by major ecosystem type and assessed to produce a summary of the main findings.

### (ii) Results

A summary of the results is shown in Tables 7 to 12 by ecosystem type and a list of the 24 respondents is shown in Annex 2. Analysis of results was carried out by comparing what is already known about the response of major ecosystem types in Europe to enhanced N deposition inputs to evidence emerging from the meta-database of survey results. This was carried out using the information contained in the Berne report of 2003 (Bobbink et al. 2003) that was used to determine the critical loads of the major ecosystem types.

### (iii) Main findings for major habitats

**Forest Habitats (G)**

Field surveys were an important element of the assessment which led to the recommendation of the empirical critical load. Although a critical load range of 10-20 kg $ha^{-1}$ $yr^{-1}$ was recommended for forest ecosystems overall, it is important to note that a lower and narrower range of 10-15 kg $ha^{-1}$ $yr^{-1}$ was suggested based on evidence of effects on ground flora and on epiphytic lichens and algae (Bobbink et al., 2003).

In terms of free-living algae and lichens, the critical evidence to support this critical load came from field studies in Scandinavia, and for boreal forests only. This included evidence of changes in abundance over time of sensitive lichen species in Finland

In terms of effects on forest ground vegetation, the review of Bobbink et al. (2003) included a large number of studies in different forest ecosystems in northern and central Europe. The majority of these were comparisons of historical surveys with a more recent survey (i.e. were for two points in time) and the results consistently provide evidence of loss of sensitive species and an increase in nitrophilous species.

Table 7 summarises the response received for forest ecosystems. The range of these responses indicates the potential for increasing the evidence base for these critical loads, and possibly for a further review of whether these critical loads need revision. However, a significant number of these responses describe either variables which will be of little direct value (e.g. the plots sampled mainly for moss N content), or relate to studies which do not yet have a long enough time series for interpretation. Of particular importance in this respect is the work of ICP Forests Level II monitoring plots (Seidling et al., in press). While this survey has a large number of plots across Europe and the potential to integrate effects assessments over a large area, the wide range of forest types covered makes effects of N deposition difficult to disentangle from other factors, and, as noted in the response, the time series is not yet long enough to provide sufficient analytical power. Other responses relate to specific national surveys within the ICP Forests programme, or just describe monitoring at one location; the latter data would need integration with other datasets to be of great value. Of the remaining responses:

- Some studies offer the potential for further analysis if modelled deposition data were added. This would be particularly useful where deposition rates are relatively low (e.g. the data from Finland, Latvia and Poland)

- Some are new studies in areas from which the review of Bobbink et al. (2003) had no information, and could add significantly to that information (e.g. the study in the Carpathian mountains of Poland)

- Some are studies which were used by Bobbink et al. (2003) but for which additional information might be available. For example, the work of Strengborn (2003) was considered, but the experimental evidence would strengthen interpretation of this study. The work of Sabine Braun and colleagues in Switzerland was only considered in terms of growth, stand density and disease, by Bobbink et al., 2003. The additional information on changes in Ellenburg N value would add to this important source of information.

**Heathland, scrub and tundra habitats (F)**

In the case of heathlands, scrub and tundra, the evidence used by Bobbink et al. (2003) to set critical loads was primarily from experimental manipulation studies. In the case of dry heathlands only, observational data on loss of dominance by ericaceous species in areas with high N deposition is mentioned, but the studies are not rigorous measurements of cover of all species repeated using a consistent methodology.

Only two responses were received related to this habitat (Table 8). The first was for Scotland, and includes Racomitrium heath and montane habitats which are thought to be very sensitive to increased N deposition. The results of this study will be significant. The second relates to experiments on heathland restoration. The control plots in these studies could provide interesting information in effects of decreasing N deposition, since the period since the studies were established in 1990 has been one when there has been a significant decline in deposition in the Netherlands. To our knowledge, such information has not been available to date from field surveys, as opposed to experimental studies.

**Grasslands and tall forb habitats (E)**

As for heathlands, the evidence used to recommend critical loads by Bobbink et al. (2003) was primarily based on experimental studies rather than field surveys. Only two responses were received for this habitat (Table 9). One related to the well-known study of Stevens et al. (2006) in acid grassland habitats in the UK which provided important new evidence relating spatial variation in species composition and diversity to modelled N deposition. The other a repeated study showing evidence of N impacts to rare and diverse grassland in Hungary.

**Mire, bog and fen habitats (D)**

The primary evidence used by Bobbink et al. (2003) to set critical loads for this habitat was from experimental studies but this was reinforced by some important long-term field surveys showing changes in the balance between moss species and vascular plants. Three responses were received for this habitat (Table 10). The work reported from Hungary (Nagy et al. 2007) and Sweden (Gunnarsson & Flodin, 2007) provides evidence of changes in species composition, but has not been explicitly linked to modelled N deposition, and this would be valuable for future analysis. The Swedish response from Wiedermann et al. (2007) relates to an experimental study, so is not directly relevant, although the results would be valuable in any review of empirical critical loads.

**Other habitats**

No responses were received for inland surface water habitats (C), coastal habitats (B) or marine habitats (A). Table 11 summarises three important responses from major surveys covering many different habitats in three countries: Germany, the UK, and the Netherlands. These are somewhat different in character. While the UK survey is a systematic repeat survey of the same locations, the Dutch and German databases provide more a collation of survey data from different locations and time periods, and also covering a longer historical period. Assessment of the consistency of the results from these different countrywide databases would be of considerable value but would also be a major methodological challenge. Currently, CEH, University of York and the Wageningen group are collaborating on a joint project to compare evidence of differential effects of reduced and oxidised N in the UK and Dutch databases; the results of this work will be valuable in considering the potential for combined analysis of different types of survey data.

In addition, two responses were received related to the ICP Vegetation moss survey. To date, this survey has focussed on the N concentration in moss species, and not on changes in species composition. Its value may lie more in increasing our understanding of small-scale variation in N deposition and accumulation to complement the large-scale EMEP model data than in setting critical loads. The challenge for the future will be to try to relate the N concentration in mosses with N impacts on vegetation.

## (iv) Conclusions and future research needs

This short and limited exercise has been of considerable value in identifying the availability of a significant new body of field survey data which would be valuable in understanding the impacts of N deposition and setting critical loads in Europe. Countrywide or European-wide surveys indicate that impacts of N deposition are difficult to separate from other factors. Some surveys indicate increases in species with higher Ellenberg N values or a reduction in species richness with an increase in N deposition. We are aware that many other surveys exist in the UK, and the same situation may apply in other countries. It would therefore seem valuable to extend this work in three ways:-

- Further identification of other survey information to increase the size of the meta-database. This should be focussed on habitats and regions of Europe (e.g. Mediterranean countries) for which there is no information to date.

- Further analysis of the existing information with complete data sets to begin to assess the strength of evidence of impacts of nitrogen deposition in different habitats

- Collaboration to extend studies that have information on changes in vegetation composition so that they include modelled N deposition and can be analysed in terms of the impacts of deposition.

We envisage that this first stage of the meta-database will be useful to interested parties, who might wish to contact participants for possible use of data in e.g. dynamic modelling. Further extension and use of the database should be explored.

**Table 7: Forests**

| Location | Forest Type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **1. Austria**, Northern Limestone Alps.: N 47°50'30", E 14°26'30" | Beechand spruce forest, Reichramingr Hintergebirge, Zöbelboden. partly logged 100 years ago. | Integrated Monitoring Zöbelboden. Repeated survey - 30 monitoring plots | 1992, 2003 cont. Every five years. Epiphytic and terrestrial bryophytes. Presence/absence and abundance. IM methods for epiphytes: presence absence, coverage - line method; digital photography put into GIS, All deposition data incl. occult deposition, water chemistry, soil chemistry and biology, geochemical flux measurements, data on lichens and vascular plants and many more. | Changes in species composition and abundance, indicator species. | Available to collaborators, e.g. joint publications. Dr. Harald G. Zechmeister, University of Vienna, Althanstr. 14, 1090 Vienna, ++43 1 8792994; harald.zechmeister@univie.ac,at | Zechmeister et al. 2007; Krommer et. al. 2007;. Koranda et al. 2007; Solga et al. 2005. |
| **2. Czech Republic**, all regions. | "Cultural" coniferous forests, Picea abies most abundant. Management n.a. too short bio-monitoring period. | Nitrogen in moss. A large-scale biomonitoring, Pleurozium schreberi, Scleropodium purum, (Brachythecium rutabulum) 250-288 "permanent monitoring plots". Set of the sampling plots ca15×15 km | Start 2000, until 2005. Sampled every fifth year. Moss analyses ready, other plant species are being analyses for N content. Content of 30-40 elements. About 20 sampling plots are being situated very close to stations measuring N deposition rates (bulks). Geomorplology, annual precipitation, mother rocks, land-use (wooded and urbanised area in a 5-km radius)- explanatory factors of the element accumulation. | None. May be that the fast lichen recolonization in process (after 2003) of the sampling plots will be recorded by some way (?) in the next bio-monitoring campaign 2010. | Available for partners in joint research activities. Ivan Suchara, Silva Tarouca Research Institute for Landscape and Ornamental Gardening, Kvetnove nam. 391, CZ-25243 Pruhonice, Czech Republic, tel.: +420-296528284, fax: +420-267750023, e-mail: suchara@vukoz.cz | Suchara et al. 2007. |
| **3. Europe** | Forest plots - all major forest types in Europe excluding mire and swamp forests. Information on management partly available. | ICP Forests Level II vegetation data, 700 plots Europe. | Ongoing from mid 1990s. Intensive monitoring, 400 sqm, repetition in 5 yr interval (not synchronized). Vascular plants, terricolous bryophytes and lichens. % cover per species in four layers (moss, herb, shrub, tree). Around one third of the plots have nitrogen throughfall deposition is measured continuously. Soil solid phase, partly soil solution, partly deposition, forest growth, tree foliage chemistry. | Some weak but significant relations between DCA axis interpreted as N axis and deposition. Time series not yet long enough to show changes in species composition. | Freely available upon request; geographical coordinates only with individual country permissions Dr. Martin Lorenz, Richarad Fischer, vTI Institute for world forestry, PCC of ICP Forests, Leuschnerstrasse 91, 21031 Hamburg, Germany, martin.lorenz@vti.bund.de richard.fischer@vti.bund.de | Seidling et al. (in press). |

| Location | Forest Type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **4. Finland**, whole country: 60o - 70o N, 21o - 31o E. | All habitats on forestry land, mainly boreal forest vegetation (the most important classes are: Picea taiga woodland G 3.A, Pinus taiga woodland G3.B, Eurasian boreal birch woods G1.918, Raised bogs D1.1, and Aapa mires D3.2). Most of the stands are semi-natural managed forests. | NFI vegetation database 1985-1995. Repeated survey. | 1985-1995, sampled twice. Trees, shrubs and understorey vegetation including vascular plants, bryophytes and lichens. Occurrence on a 400 m2 sample plot, % cover on four 2 m2 quadrats. The usual tree parameters. No N deposition data, but modelled data could be used. Other data available on site characteristics. | None given. | Available to collaborators. The database contains a total of 3000 sample plots from a systematic sample. Information on location of the sample plots is at a degree and minute level. Tiina Tonteri, Finnish Forest Research Institute, Vantaa Research Unit, P.O. Box 18, FI-01301 Vantaa, Finland. Tiina.Tonteri@metla.fi | Reinikainen et al. (eds.) 2000; Tonteri et al. 1990; Mäkipää & Heikkinen 2003; Korpela, L. 2004 |
| **5. Finland**, whole country: 60o - 70o N, 21o - 31o E. | All habitats on forestry land, mainly boreal forest vegetation. (the most important classes are: Picea taiga woodland G 3.A, Pinus taiga woodland G3.B, Eurasian boreal birch woods G1.918, Raised bogs D1.1, and Aapa mires D3.2). Most of the stands are semi-natural managed forests. | BioSoil database 2006 | One-off survey 2006. Trees, shrubs and understorey vegetation including vascular plants. Occurrence on a 400 m2 sample plot. The usual tree parameters. No N deposition data, but modelled data could be used. Data on the site. Extensive soil data. | None given. | Available to collaborators. The database contains a total of 630 sample plots. The sample plots are a subset of the NFI vegetation sample (1985-1995). For details of the measurements, see the BioSoil manuals. Information on location of the sample plots is at a degree and minute level. Tiina Tonteri, Finnish Forest Research Institute, Vantaa Research Unit, P.O. Box 18, FI-01301 Vantaa, Finland. Tiina.Tonteri@metla.fi | None yet. |

| Location | Forest Type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **6. Finland**, whole country: 60o-70o N, 21-31o E.. Four plots in strict nature conservation areas. | Boreal coniferous forest vegetation (Picea taiga woodland G3.A, Pinus taiga woodland G3.B). Most of the stands are semi-natural, managed forests. | ICP Forest/Level II: Ground vegetation. Repeated survey. Understorey vegetation on 27 sample plots studied two times. | 1998-2003, every 5 years. Bryophytes, lichens and vascular plants, shrubs & trees. Occurrence on a 400 m2 sample plot, cover % on 16 2 m2 quadrats, height. N deposition measured on 16 plots. Quality of deposition (bulk and throughfall) and soil water on 16 plots. Soil chemistry and stand structure on 27 plots. Site information at degree and min level. | Low N deposition may cause changes in species composition. See publication attached. | Available to collaborators or with permission. Dr. Maija Salemaa, Finnish Forest Reserach Institute, Vantaa Res. Unit, P.O. Box 18, FI-01301 Vantaa, Finland | Salemaa & Hamberg 2007; Salemaa et al. 2008 (a and b). |
| **7. Hungary**, Pannonic, continental. Kiskun Lter, Vulcan Site: 46,88 dec.d./ 9,38dec.d. | Sand forest-steppe, mosaic of juniper-poplar woodland and dry sand grasslands /Juniperus communis, Polulus alba, Festuca vaginata, Stipa borysthenica (34 A sand steppes, 41.8.Mixed thermophilous forests, 41.87Pnnonic juniper-poplar steppe woods). Under nature conservation since 1975. | Climate simulation experimental site. | Start 2001, ongoing, annual vegetation sampling. All higher and lower plants. Composition and abundance of higher and lower plants, foliar chemistry recorded in only two years. Data of the Met. Service are used. Data on micrometeorology, soil temperature, soil moisture, soil solution, plant ecophysiology, soil respiration. | Low N deposition is characteristic, no evidence of N impacts. | Published papers and contact: Edit Kovács-Láng, Institute of Ecology and Botany, Hung. Acad. Sci. H-2163 Vácrátót, Hungary, 00,36,28 360 122,, lange@botanika.hu | Kovács-Lánget al. 2005. |
| **8. Latvia** Seaside Lowland (IM Rucava) and Vidzeme Hill (IM Zoseni): 56o11', 21o07' (IM Rucava) and 57o10', 25o41' (IM Zoseni) | Zoseni: pine Pinus sylvestris stand with solitary spruces Picea abies and birches Betula pendula classified as Vaccinio myrtilli-Pinetum var. typicum community. Vaccinium myrtillus, V.vitis-idaea, and Melampyrum pratense dominate in ground layer and Hylocomium splendens, Pleurozium schreberi, Dicranum polysetum dominate in moss layer.<br><br>Rucava: Pinus sylvestris stand with solitary birches Betula pendula classified as Vaccinio | ICP Integrated Monitoring database. Coniferous woodlands, broadleaved deciduous woodland, mixes deciduous and coniferous woodland. | Annual 1994-2006. All higher and lower plants. N wet deposition data measured on the sites. Air quality and deposition data; soil quality data; soil water, runoff and groundwater quality data. Vegetation, forest damage, trunk epiphytes, green algae, foliage, literfall and mosses chemistry | Changes in species frequencies: increase in frequency of Vaccinium myrtillus, Scleropodium purum, and Cirriphillum piliferum, and decrease in frequency of Vaccinium vitis-idaea, Calluna vulgaris, Dicranum scoparium. Deschampsia flexuosa is often reported to be an indicator of nitrogen deposition: increased significantly in Rucava site. Recent fire event (Rucava) | Available to collaborators on request. Iraida Luylko, Latvian Environment, Geology and Meteorology Agency, 165, Maskavas str., Riga, LV1019, Latvia; +371 7032639, epoc@lvgma.gov.lv | Laiviņš 2007 (a) and (b) |

| Location | Forest Type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| | vitis-idaea-Pinetum var. typicum and var. Calluna vulgaris community. Vaccinium vitis-idaea, Calluna vulgaris, Empetrum nigrum, Deschampsia flexuosa, and Melampyrum pratense dominate in ground layer and Pleurozium schreberii, Dicranum polysetum, D. scoparium, Cladina rangiferina etc. dominate in moss layer. | | | | | |
| **9. Latvia, all territory** | Plots are situated within pine tree ecosystems dominated by Pleurozium schreberi and Hylocomium splendens in moss layer | ICP Vegetation database, **101 plots** | 1995-2005 measurements every 5 years. Mosses chemistry: N, Cd, Fe, Cr, Ni, Pb, Cu, Zn, Cd, Cr, Ni, Pb, V, As, Hg. N wet deposition data measured on the 5 sites on the Latvian territory. | Nitrogen concentration was first evaluated in Pleurozium schreberi in 2005. All in all, the concentrations of nitrogen in mosses were not high with a highest of 16.5 mg/kg on a polygone near Jelgava. It may be due to the introduction of nitrogen-containing mineral fertilizers in agricultural lands. Relatively high nitrogen concentrations were found in the vicinity of Riga (16.0 mg/kg) and Grobiņa (14.3 mg/kg). It is likely to be mostly due to ambient air pollution. | Available to collaborators upon request. Marina Frolova, Latvian Environment, Geology and Meteorology Agency, 165, Maskavas str., Riga, LV1019, Latvia; +371 7032635, marina.frolova@lvgma.gov.lv | Monitoring Report under the International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops, Latvian University, 2006 ( in Latvian) |

| Location | Forest Type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **10. Poland**, Roztocze - upland (South-East part of Poland): Between 51o 31' - 51o 40' N and 22o 56' - 23o 07' E. All study plots are protected as national park, 4 study plot are under strict protection furthermore. | 4 forest communities: Abietetum polonicum, Dentario glandulosae-Fagetum, Querco roboris-Pinetum and Leucobryo-Pinetum as well as semi natural associations representing the Querco-Fagetea class. (Upland deciduous forest, Upland mixed deciduous forest and Fresh mixed coniferous forest sites). | Comparison of populations dynamics of woody species and forest floor vegetation in forest communities of different fertility in the Roztoczański National Park. | About 10 years, last year of study 2007. All higher plants. Species composition, height, height of crown bases, DBH, increment, injure from browsers etc.[1] Some soil and climatic data. | Changes in species composition of vascular plants (woody and forest floor vegetation). | Available to all collaborators. Zbigniew Maciejewski, Roztoczański National Park, ul. Plażowa 2, 22 - 470 Zwierzyniec, Poland zbigniewmaciejewski@wp.pl | Maciejewski Z. 1998 |
| **11. Poland** West part of East Carpathians: From 300 - 1400 m / 22°04'-22°47'N; 49°03'-49°38'E | Beech forests of the phytosociological alliance Fagion sylvaticae (G1) | Resampling of phytosociological relevés carried out by Zarzycki (1963) and Dzwonko (1977). All higher plants. | 1950s, 1970s. The surveys have been carried out continually since 2004 (presently about 90 relevés). In the plots, vascular plants were recorded and their cover was estimated using the Braun-Blanquet scale. | Changes in species composition, changes in Ellenberg indicator values. | Available for collaborative work on a mutually agreeable basis. dr Tomasz Durak, Chair of Botany, Faculty of Biology and Agriculture, Rzeszów University, Cegielniana 12, 35-959 Rzeszów, tel.+48178721444, tdurak@univ.rzeszow.pl | None given. |
| **12. Sweden**, Halland Gradient from c. 55 20N, 13 00E to 68 25N, 21 50E,: | Coniferous (G3) | Gradient survey of the occurrence of a restricted number of plant species along the Swedish N deposition gradient. Occurrence of Vaccinium myrtillus, V. vitis-idaea, Deschampsia flexuosa, and a parasitic fungi attacking V. myrtillus | 778 forest stands were inventoried in 2000. In each forest stand presence or absence of the three species were recorded in 20 subplotsplots (1 dm3) within a larger circular plot sized 314 m2. If V. myrtillus was present, absence and presence of the parasite was recorded. N deposition data derived from the 1996 MATCH model. | Occurrence of the two dwarf shrubs was negatively associated with areas of high N deposition and the parasitic fungus was regardless of the occurrence of its host plant positively associated with N deposition. Regions receiving up to 6 kg N ha-1 yr-1 showed no difference in occurrence of the dwarf shrubs but in regions where the N deposition exceeded 6 kg N ha-1 yr-1 the occurrence of these species was substantially lower. | From the attached paper and raw data may also be available. Please contact me for details if these are of interest/ Joachim Strengbom, Plant Ecology, Uppsala University, Villavägen 14 SE-752 36 Uppsala, Sweden. Phone +46-70 634 67 30, email: joachim.strengbom@ebc.uu.se | Strengbom et al. 2003 |

| Location | Forest Type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **13. Sweden**, Västerbotten,: 64 N/19 E | Boreal spruce forest with Vaccinium myrtillus dominated understorey. Fullgrown forest (c. 100 years old) | Experimental study simulating N deposition by yearly additions of 6, 12.5 and 50 kg N ha-1 yr-1. | Ongoing, annual measurements of ground flora 1996 onwards: abundance of species, foliar chemistry. Background N deposition c. 2 kg N ha-1 yr-1. | Increased abundance of graminoids, decreased abundance of dwarf-shrubs and bryophytes. | Contact Annika Nordin, Umeå Plant Science Centre, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences, 901 83 Umeå. Annika.Nordin@genfys.slu.se, +49-90-786 8537 | Nordin et al. 2005; Nordin, A., Strengbom, J. & Ericson L. 2006 |
| **14. Switzerland**, northern part: '7-8 /47 | Deciduous (mainly beech) or Norway spruce forest (G1.6113, G1.6312, G1.6311, G1.6331/32, G1.6611, G1.A411). heavily logged stands excluded; no grazing. | Forest observation plots. Repeated (48 plots in 18 stands). | Frequency, 2: 1984 and 2003.). All higher and lower plants. Tree height, growth (stem and shoot), crown transparency, stand density, foliar chemistry. Modelled according to an emission model, some throughfall measurements. Soil chemistry, in part soil solution, 2 stations with meteorology and air chemistry. | Increase of Ellenberg N value, increase in the cover of Rubus fruticosus. | Freely available. Sabine Braun, Institute for Applied Plant Biology, Sandgrubenstrasse 25, CH.4124 Schönenbuch, Switzerland +41 61 481 32 24, sabine.braun@iap.ch | Only reports (available in German) |
| **15. Switzerland**, whole country: '7-8 /46-47 | Deciduous (mainly beech) or Norway spruce forest (G1.1111, G1.21 (group), G1.2111, G1.4112, G1.6113, G1.6122, G1.6311, G1.6312, G1.6331/32, G1.6611, G1.6612, G1.671, G1.676, G1.A1 (group), G1.A411, G1.A413, G3.1112/1B22, G3.121/1B4, G3.135, G3.1B1, G3.1B21, G3.1B22, G3.1C1, G3.1C2, G3.1C3, G3.1C5). Heavily logged stands excluded; no grazing. | Forest observation plots. One-off survey (151 plots in 110 stands). | 2003-2005. All higher and lower plants. Tree height, growth (stem and shoot), crown transparency, stand density, foliar chemistry. Modelled according to an emission model, some throughfall measurements. Soil chemistry, in part soil solution, 2 stations with meteorology and air chemistry. | Relation between the cover of Rubus fruticosus and N deposition, indicator species for low base saturation. | Freely available. Sabine Braun, Institute for Applied Plant Biology, Sandgrubenstrasse 25, CH.4124 Schönenbuch, Switzerland +41 61 481 32 24, sabine.braun@iap.ch | Only reports (available in German) |

| Location | Forest Type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **16. Switzerland,** Central plateau (BE, FR): '7-8 /47 | Deciduous or coniferous forest (G1.6113, G1.6122, G1.6312, G1.6331/32, G3.135) | Plots for classification of vegetation. One-off survey (184 plots in 184 stands) | 1996-2006. All higher and lower plants. Soil Chemistry. | Indicator species for low base saturation. | Freely available. Sabine Braun, Institute for Applied Plant Biology, Sandgrubenstrasse 25, CH.4124 Schönenbuch, Switzerland +41 61 481 32 24, sabine.braun@iap.ch | Only reports (available in German) |

## Table 8: Health/scrub/tundra

| Location | Health/scrub/ tundra Type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **1. Scotland, UK.** Covers several BAP priority habitats. | Montane vegetation including, dwarf-shrub heaths, snowbeds, springs, Racomitrium heaths and grasslands. Management varies across sites, but mostly grazing only - too high for other direct managements. | Macaulay Montane Vegetation Resurvey, UK. Repeated survey. | Initial survey data 1963-1987. Resurvey 2004-6. Each plot recorded twice. All higher and lower plants. Height of vegetation. CEH 5km N deposition data used. No field measurements. Soils data collected for subsample of plots. | Analysis of N impacts not yet completed (in progress) | Available to collaborators subject to negotiation. Dr Andrea Britton, Macaulay Institute, Craigiebuckler, Aberdeen, AB15 8QH. Tel: 01224 498200 Email: a.britton@macaulay.ac.uk | None yet for this study. |
| **2. The Netherlands**, east and north. | Mostly dry and wet heaths, some Nardus grasslands and Molinia grasslands (H2310, H2320, H4010, H6230, H7150). Managed. | OBN heathland survey. The study was carried out to evaluate the effects of several management practices that aim to reduce effects of N-enrichment and acidification in heathlands and grasslands. Twelve sites each consisting of several plots and controls, were repeatedly visited | Start 1990 (sometimes 1989 or 1991). Until 2001, varying between 6 times per year to once per 6 year, depending on the site and period since management measures have been taken. Abundance of higher plants sampled (mosses are rarely included). N deposition was not measured and used in the study. Soil data (top 10 cm), sometimes water quality. We measured pH, Al, Ca, Mg, Fe, K, NO3, NH4, Na, Si, Zn, Cl, SO4, PO4, S and P in water extracts and in 0,2 M NaCl-extracts (no Na, and Cl). Occasionally, total N and C and C/N-ratio have been measured. Furthermore, the dry weight of the soil is determined. | Changes in species composition. | Available on request. dr. Roland Bobbink, Landscape Ecology, Institute of Environmental Biology Utrecht University, P.O. Box 800.84 3508 TB Utrecht, The Netherlands. R.Bobbink@uu.nl | Lange termijn effecten van herstelbeheer in heide en heischrale graslanden (Long term effects of restoration practices in heathlands and acidic grasslands), Ministry of Agriculture, nature and food quality. Attached as PDF<br><br>de Graaf, MCC, Verbeek, PJM, Bobbink, R & JGM Roelofs 1998. |

## Table 9: Grasslands/tall forbs

| Location | Grasslands/tall forbs type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **1. UK,** Isle of Man and Ireland | Violion caninae grassland (U4 ). Grazed to varying degrees. | Ecosystem Properties of acid grasslands along a gradient of N deposition, UK IoM. | One-off survey 2002-2007. 88 sites. All higher plants and bryophytes. Height of vegetation, foliar N, foliar P. Modelled N deposition data (CEH Edinburgh). Modelled N deposition, MET data from MORECS, topsoil and subsoil extractable nitrate, ammonium and metals, topsoil and subsoil pH, bulk density. | Reduction in species richness especially forbs with increasing N deposition. Evidence of soil acidification and increased ammonium with increasing deposition. | Available to collaborators. Dr. Carly Stevens, The Open University, Department of Life Sceinces, Walton Hall, Milton Keynes, MK7 6AA. c.j.stevens@open.ac.uk | Stevens et al. (2004); Gidman et al. (2006); Stevens et al. (2006) |
| **2. Hungary,** Pannonian Region, 20 kms east from Budapest: 47036'N, 19026'E, 220 m a.m.s.l. | Loess grassland, Salvio-Festucetum rupicolae association; Vegetation covered loess monoliths were transplanted from Gödöllő Hills to the Botanical Garden of Szent István University in spring 2002 ; It is a xeric, species rich, tall loess grassland. Transplanted monoliths initially dominated by Festuca ovina ssp. valesiaca, Bromus inermis and Brachypodium rupestre in spring 2002. Other characteristic taxa of the community, like Salvia nemorosa, Euphorbia pannonica, Seseli osseum and Galium verum were commonly encountered in the plots. This plant community is appeared to be similar to the tallgrass prairie and sage-bush grassland of North America. **Rare but diverse natural plant community.** (E) | Repeated survey | June 2002 – Nov 2007 twice per year (late spring & autumn) except for 2005 (no data). All higher plants. Percentage cover, abundance-dominance and presence-absence patterns, vegetation dynamics, foliar chemistry. No N deposition data. Met data (air temperature, precipitation, soil water content), soil data, N deposition (estimation based on a nearby station, only for 2003). | Changes in species composition; indicators of species change, potential biological indicators - C:N, N:P, %N | Available to collaborators only. Dr. Szilárd Czóbel PhD & Prof. Zoltán Tuba DSc; address: Institute of Botany & Ecophysiology, Szent István University, H-2103 Páter u. 1. , Gödöllő, HUNGARY; phone: +36-28-522-075; email: Czobel.Szilard@mkk.szie.hu, Tuba.Zoltan@mkk.szie.hu | Czóbel et al. (2005, 2008a and b) |

## Table 10: Mire/Bog/Fen

| Location | Mire/Bog/Fen type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **1. Hungary** (easternmost tip of Hungary near the Ukrainian border): Lake Bence 48° 08' 43" N, 22° 27' 12" E; Lake Báb-tava 48° 11' 16" N, 22° 29' 0" E; Lake Nyíres 48° 11' 3" N, 22° 30' 6" E. Pannonian, (Samicum district). Strictly protected area, glacial relict. | Mire, fencarr; Lake Bence mire since 1994, Lake Báb and Lake Nyíres since 1996; description: Five peat moss dominated mires have been described on the Bereg plain of NE Hungary (e.g.Nagy et al. 1998), Lake Nyíres, Lake Báb, Navad stream, Lake Zsid and Lake Bence. These mires lie in the North-Eastern corner of the Great Hungarian Plain in East-Central Europe, near the Hungarian-Ukranian border. They have formed in abandoned river-beds (silted oxbow lakes), in an area delimited by Beregdaróc, Gelénes, Tákos, and Csaroda villages. (D - mire, bog and fen habitat). Flooded in 2001 for conservation purpose, forest belt plantation of oak forest (Quercus robur), schrub clearing in Lake Báb on yearly basis | Repeated survey. All higher plants in addition with Sphagnum and Riccia taxa. Abundance-dominance pattern, presence-absence, vegetation dynamics, decay of peat moss cushions, percentage cover, spatial patterns, vegetation mapping. No modelled data used or measurements made in the field. Met. data (precipitation, ground water level), pH of water and conductivity | August 1994 to October 2007, minimum yearly basis | Changes in species composition; indicators of species change. | Available to collaborators only. Dr. János Nagy PhD & Prof. Zoltán Tuba DSc; address: Institute of Botany & Ecophysiology, Szent István University, H-2103 Páter u. 1. , Gödöllő, HUNGARY; phone: +36-28-522-075; email: Nagy.Janos@mkk.szie.hu, Tuba.Zoltan@mkk.szie.hu | Nagy et al. 1998; 2003; 2007. |

| Location | Mire/Bog/Fen type (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **2. Sweden**, Västerbotten: 64 N/19 E | Boreal Sphagnum dominated mire. Not managed. | Experimental study simulating N deposition by yearly additions c. 13 and 28 kg N ha-1 yr-1. | Started in 1995 and ongoing with yearly measurements. Ground flora - abundance of species, foliar chemistry. Background N deposition c. 2 kg N ha-1 yr-1. No met. data; air quality/deposition data; soils data; water quality data[1]**.** | Decline of Sphagnum, increased abundance of sedges and dwarf-shrubs. | Available to collaborators. Annika Nordin, Umeå Plant Science Centre, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences, 901 83 Umeå. Annika.Nordin@genfys.slu.se, +49-90-786 8537 | Wiedermann et al. 2007. |
| **3. Sweden**, SW, Halland. High conservation status of all investigated sites. | Ombrotrophic bogs, soligenous fens and topogenous fens. No management on the bogs. In the fens there were moving and grazing in the past, but it stopped at least 50 years ago. | Monitoring of mires in Halland, SW Sweden | Monitoring of 30 ombrotrophic bogs and 39 fens. First years: 1999, 2000, 2001; last years: 2004, 2005, 2006. Sampled every 5 years. Vascular plants and bryophytes (no height of vegetation, foliar chemistry etc.). Field measurements made but no met. data; air quality/deposition data; soils data; water quality data. | Changed species composition. | Available to collaborators. Urban Gunnarsson, Dept of Plant Ecology, Villavägen 14, 752 36 Uppsala. | Gunnarsson & Flodin (2007); Flodin & Gunnarsson, 2008. |

**Table 11: Surveys across all habitat types**

| Location | All habitat types (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **1. Germany.** In order to better integrate ecological conditions into environmental cause-effect relationships and critical load values, the BERN model (Bio indication of Ecosystem Regeneration potentials towards Natural conditions) was developed on the basis of empirical surveys in Germany. | Data provided but not shown here as it is in separate comprehensive spreadsheet. | Database for BERN-Model (Bioindication of Ecosystems Regeneration ability towards Naturale conditions). Literature study for sampling vegetation relevees in combination with site information before 1960 (for the reference communities in time before the intensive industrialization period began); one-off surveys | Plant communities with their constant higher and lower plants in all respective relevees. Height of main trees in case of a forest community. C-, N-amount in the humus layer + 10 cm mineral top layer; base saturation; soil moisture [m³/m³], Modelled historical N deposition data; Climate data: vegetation period lengh VZ (sum of days >10℃/a), continentality-index KI (Pveg/Tveg+10) from long-term weather data 1950-1980 . | Lost of constant species, changes from community to another community, changes into fragment community, changes into derivate community (all connected to changes in C/N-ratio in humus and top mineral soil, related to changes of base saturation) | Available to collaborators. PD Dr.-Ing. habil. Angela Schlutow<br>ÖKO-DATA Strausberg<br>Hegermühlenstr. 58<br>D-15344 Strausberg<br><br>Tel: 03341 3901924<br>Fax: 03341 3901926<br>e-mail: Angela.Schlutow@oekodata.com<br>www.oekodata.com | Schlutow & Kraft (2006) |
| **2. The Netherlands + EU** (world) | All types of habitat | Single mon. all habitats, Netherlands | >1900-2007. In principle single monitoring, however for some repeated surveys are done, but not included in the database, except releves made in nature development areas. Vegetation releves and soil data. Releves up till now are only made in natural areas. The database is continuously growing, subjected to quality control. | None given. | We would like to exchange data, available to collaborators. Wieger Wamelink, p.o. box 47, 6700AA Wageningen, The Netherlands, e-mail: wieger.wamelink@wur.nl | Wamelink et al. 2002 (JVS), Wamelink et al. (2005 JVS), results based on the database www.abiotic.wur.nl |
| **3. UK.** GB rural land | All broad and some priority habitats according to the UK BAP classification. Limited information available at the vegetation plot level. | Countryside Survey of Great Britain. Long term, national -scale ecological surveillance; involves roughly 8-yearly sampling of 1km squares across GB | Roughly 8-yearly (1978, 1984, 1990, 1998, 2007). Selected lower plants but this data is not reliable or comprehensive. Common higher plants | Correlative evidence of a small-magnitude yet significant impact of cumulative N deposition on sensitive semi-natural vegetation types - see attached WAS | Free but under licence. Simon Smart, ssma@ceh.ac.uk<br>Tel: 01524-595823. | Attached. CS2007 reports in November 2008 |

| Location | All habitat types (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| | Usual practice has been to use independent datasets eg. AgCENSUS, N dep, UKCIP etc. for the larger grid-square but this inevitably restricts correlative analyses to explaining between square rather than between-plot/within-square variation in ecological responses - see attachments. | stratified by an environmental land-classification. Started in 1978 and has involved collection of soils in 1978, 1998 and 2007 (contact Bridget Emmet or Paul Chamberlain for details), freshwaters (contact John Murphy at CEH for details) and plant species composition from fixed vegetation plots (see attached papers). Numbers of 1km squares has increased over time from 256 in 1978 to 591 in 2007. | censussed in each vegtation plot and given cover estimates. Also co-laocted with soil samples in 5 plots in each 1km square. Categories of vegetation height recorded for the first time in 2007 alongwith aspect and slope. FRAME data for the wider 5km sqr used and provided by CEH Edinburgh. 1996 model estimates generally used as benchmark of the deposition maximum. Joint analyses have been carried out with 5km sqr LTAA met data from UKCIP as well as FRAME SOx estimates, but nothing has yet been published and we also are on the brink of analyses that can now include 2007 data. Further joint analyses are planned involving waters-soils-vegetation and other explanatory variables as part of an ongoing Integrated Assessment project over the next 2-3 years. | paper, GANE report and the TU report to DEFRA from 2007. The vegetation data has shown a widespread eutrophication signal but the challenge has been to attribute this to competing drivers, of which N deposition is a key one - see attached GCB paper. | | |
| **4. Austria**, all over. | Mosses | Monitoring within ICP vegetation framework, Central Europe. Repeated survey - 200 sites. | Start 2005, every 5 years. Bryophytes. N-concentration and delta N 14. N-concentration and N-deposition. N-deposition data on approx. 40 sites. | Monitoring of N changes. | Available to collaborators, e.g. joint publications. Dr. Harald G. Zechmeister, University of Vienna, Althanstr. 14, 1090 Vienna, ++43 1 8792994; harald.zechmeister@univie.ac,at | Zechmeister et al. 2008 (in press) |

| Location | All habitat types (EUNIS) and management | Survey type | Frequency and nature of measurements | Main findings | Availability of data/contact | References |
|---|---|---|---|---|---|---|
| **5. Europe** (Austria, Belgium, Bulgaria (selected regions), Czech Republic, Estonia, Finland, France (selected regions), Germany, Italy (North), Latvia, Slovakia, Slovenia, Spain (Navarra and Galicia), Switzerland, Turkey (West), United Kingdom) | Mosses. For majority of countries Corine landcover data available at level 3. Majority: forests (311-313), but also natural grasslands (321), moors and heathland (322) and others. | European moss survey 2005/6. European moss survey has been repeated at five-yearly intervals since 1990, originally to determine heavy metal concentrations in mosses. In 2005/6, the total N concentration in mosses was included for the first time. However, selected countries (at least Finland) have included the determination of N in previous year(s), but those earlier data are not included in the European database. | 2005 (in 16 European countries). Finland since 1990. Every five year. Mosses (last 3 year's growth, primarily green parts). Total N concentration (either by elemental analysis or Kjeldahl) in moss. In addition: concentration of 10 (sometimes more or less, depending on country) heavy metals (As, Cd, Cr, Cu, Fe, Hg, Ni, Pb, V, Zn). Selected countries (e.g. Switzerland) have measured N deposition data at selected sampling sites. UK: N deposition data based on CBED (Concentration-Based Estimated Deposition) database from CEH Edinburgh. At European scale: mean values per EMEP 50 km x 50 km grid calculated, which can be compared with EMEP modelled N deposition data. | Relationship N accumulation in mosses and modelled N deposition at the EMEP scale under investigation. In a pilot study mosses were collected at selected sites in selected European countries between 1977 and 2000: good linear relationship between N concentration moss and EMEP modelled N deposition (total, NOx and ammonium) in Norway and Sweden, weaker relationship for Finland. Selected 2005/6 results so far: good linear relationship between N concentration moss and measured total N deposition in Switzerland; no clear relationship between N concentration in moss and N deposition in the UK. Therefore, the relationship between N concentration in moss and measured/modelled N deposition appears to be country-specific and might depent on the scale of comparison (e.g. local or EMEP). | Dr Harry Harmens (Chairman ICP Vegetation), Centre for Ecology and Hydrology, Environment Centre Wales, Deiniol Road, Bangor, Gwynedd LL57 2UW, UK. 01248 374500 (direct line: 374512). hh@ceh.ac.uk http://icpvegetation.ceh.ac.uk | Harmens et al. (in preparation); Harmens et al. (2005); Solga et al. (2005); ICP Vegetation annual report 2004/2005. ISBN: 1 870393 80 5 |

# 4. Spatial analysis of the N concentration in mosses in relation to N deposition maps and comparison with critical load exceedances, both at the UK and EMEP scale

## (a) UK scale

The concentrations of tissue N were determined for 170 moss samples collected in 2005 from 170 sites distributed across the UK (Ashmore et al., 2007). These N concentrations have been compared with current national estimates of N deposition and N critical load exceedances. The sections below describe the methods and the results of the analysis.

### (i) Methods

The moss sample site information and N concentrations were imported into an Access database and a Geographic Information System (ArcGIS) to allow the manipulation and spatial analysis of the data. The Concentration Based Estimated Deposition (CBED: Smith et al., 2000; Smith & Fowler, 2001) values for N for 2003-2005 were extracted from the national 5x5 km maps for each moss sample site. The CBED data consists of three sets of values:

- Average – for all vegetation types;
- Moorland – assuming all land cover is low growing vegetation;
- Woodland – assuming all land cover is woodland.

The CBED data provides separate values for oxidised, reduced and total (oxidised + reduced) N, and for the average data set values of wet and dry deposition were also available. The relationships between the moss N concentrations and different N deposition values were analysed spatially and by exporting the data into Excel.

Empirical critical loads of nutrient N have been assigned to habitat classes of the European Nature Information System (EUNIS) as a result of an international (UNECE) workshop (Achermann & Bobbink, 2003). For the majority of the moss sites the CORINE land cover level 3 class has been recorded by the moss surveyor, and in some cases there is additional qualifying information on the habitat type. Using information from Slootweg et al. (2005) and Brown (pers comm.) the CORINE land cover classes were related to EUNIS habitat codes and UK Broad Habitat types. From this information it was possible to assign appropriate empirical nutrient N critical loads (CLnutN) to those sites with habitat information, and with habitats for which critical loads are available (Table 12). However, it should be noted that for some habitats the correspondence between different classifications is not always direct; some habitat types may overlap with or be contained within others, or may relate to more than one class in a different classification. In Table 12 below the following points in particular should be noted:

- All the woodland habitats were assigned the empirical critical load to protect woodland ground flora from the adverse impacts of N deposition;
- The CORINE class of Natural Grasslands encompasses many different kinds of grassland and hence can only be related directly to EUNIS class E: Grasslands and areas dominated by forbs, mosses or lichens. In the creation of the CORINE map for the UK, which is based on the CEH Land Cover Map 2000 (LCM2000), only acid grasslands in the UK are assigned to the CORINE Natural Grassland class, with other grass types being coded as Pastures. Hence, in this work, we have assumed that the CORINE Natural Grasslands are acid grasslands for the purposes of assigning empirical N critical loads;
- The CORINE classes corresponding to EUNIS class F (Heathland, scrub & tundra) have been assumed to correspond to the UK Broad Habitat of dwarf shrub heath. In the UK we

have assigned different empirical N critical load values for wet heaths and dry heaths; for this project we have assumed all the heathland sites are wet heaths (EUNIS class F4.11) and assigned the critical load value accordingly;

- Critical loads have not been assigned to the moss sites with CORINE habitat codes of 243 (land principally occupied by agriculture, with significant areas of natural vegetation) or 333 (sparsely vegetated areas) because critical loads are not available for the corresponding EUNIS classes.

An alternative approach to setting the empirical critical loads was also explored; the dominant LCM2000 class was extracted for each 1x1 km square in which the moss sample sites are located. Comparing these land cover classes with the CORINE ones showed only 24% agreement between the two datasets (Table 13); this is not particularly surprising as the CORINE classes are much broader and encompass more land cover types within a class than the LCM2000 classes. Table 14 shows the differences in CLnutN assignment of the two approaches.

However, as the CORINE class assigned is based on the surveyors' site visit, one would expect that to be more appropriate. The LCM2000 class assigned is the one occupying the largest area within each 1x1 km square, and as there are 26 different classes, each square may contain a mosaic of a number of different classes with the dominant not necessarily occupying a much greater area than another class. Therefore the results presented in this report are based on the CORINE classes translated into UK Broad Habitats, with the corresponding EUNIS CLnutN values assigned (Table 12).

### (ii) Results

The distribution of the moss species collected for the survey (Figure 1) show sites with moss *Hypnum cupressiforme* (HC) are mainly scattered across England with one site in north Wales and two in the far north of Scotland. *Hylocomium splendens* (HS) was collected mainly at sites in Scotland and Northern Ireland. *Pleurozium schreberi* (PS) and *Rhytidiadelphus squarrosus* (RS) appear to more widespread across the country and hence will span a wider range of N deposition values. *Pseudoscleropodium purum* (PP) was only collected at two sites, both in south Wales.

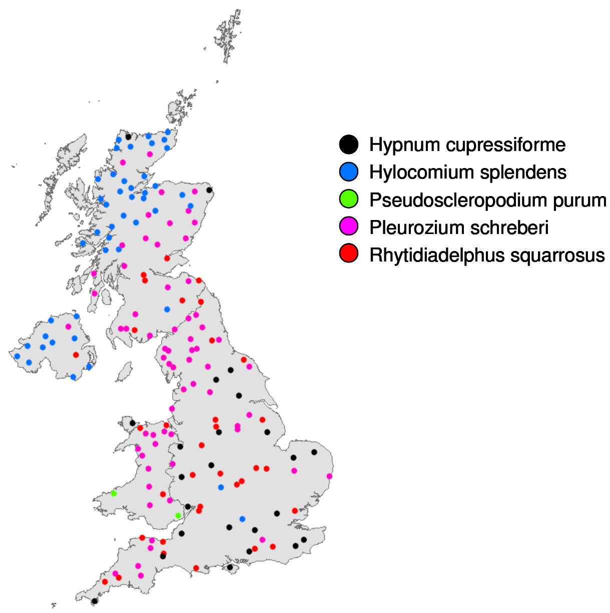


**Figure 1: Distribution of moss species collected across the UK.**

**Table 12: Relationships between CORINE, EUNIS and UK Broad Habitats and the corresponding empirical critical loads of N nitrogen**

| CORINE class | Corresponding EUNIS class | UK Broad Habitat | EUNIS class used for CLnutN | CLnutN (kg N/ha/yr) | Deposition Type[#] |
|---|---|---|---|---|---|
| 243 Agriculture & natural vegetation | I Agricultural, horticultural habitats | Not assigned | N/A | N/A | |
| 311 Broadleaved forest | G1 Broadleaved deciduous woodland | Broadleaved woodland | G Woodland (effects on ground flora) | 12 | woodland |
| 312 Coniferous forest | G3 Coniferous woodland | Coniferous woodland | G Woodland (effects on ground flora) | 12 | woodland |
| 313 Mixed forest | G4 Mixed woodland | Broadleaved/mixed woodland | G Woodland (effects on ground flora) | 12 | woodland |
| 321 Natural grasslands | E Grasslands | Acid grassland | E1.7 Dry acid & neutral grassland | 15 | moorland |
| 322 Moors & heathland | F Heathland, scrub & tundra | Dwarf shrub heath | F4.11 Wet heaths | 15 | moorland |
| 324 Transitional wood & scrub | F Heathland, scrub & tundra | Dwarf shrub heath | F4.11 Wet heaths | 15 | moorland |
| 331 Beaches, dunes, sand | B Coastal habitats | Supralittoral sediment | B1.4/B1.5 Dune grasslands | 15 | moorland |
| 333 Sparsely vegetated | H Inland sparsely vegetated habitats | Not assigned | N/A | N/A | |
| 412 Peat bogs | D Mires, bogs & fens | Bogs | D1 Ombrotrophic/raised bogs | 10 | moorland |

[#] Denotes which deposition field used in the calculation of critical load exceedance.

**Table 13: Correspondence between CORINE classes (represented here as broad habitats) and LCM2000 classes for the 170 moss sample sites (numbers in table are the number of sites)**

| LCM2000 class | CORINE class (expressed as broad habitat) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acid grassland | Bog | Dwarf shrub heath | Dwarf shrub heath/acid grass | Broadleaved woodland | Broadleaved/ mixed woodland | Coniferous woodland | Woodland | Supralittoral sediment | Blank | Totals |
| Acid grassland | 2 | 1 | 9 | 1 | 1 | | | 1 | | 1 | 16 (9.4%) |
| Calcareous grassland | | | 3 | | 1 | | | | | 1 | 5 (2.9%) |
| Improved grassland | 9 | 3 | 11 | | 6 | 1 | 3 | 1 | 1 | 1 | 36 (21.2%) |
| Neutral grassland | 1 | | 1 | 1 | | | 1 | | | | 4 (2.4%) |
| Bog | | | 4 | | | | | | | | 4 (2.4%) |
| Bracken | | | 1 | | | | | | | | 1 (0.01%) |
| Dense dwarf shrub heath | 1 | | 5 | 1 | | | | | | | 7 (4.1%) |
| Open dwarf shrub heath | | 1 | 8 | 1 | 1 | | | | | | 11 (6.5%) |
| Montane | | | 1 | | | | | | | | 1 (0.01%) |
| Broadleaved/mixed woodland | 2 | | 8 | | 4 | 6 | 1 | | | 3 | 24 (14.1%) |
| Coniferous woodland | 5 | | 17 | 1 | 1 | 5 | 14 | 1 | | 2 | 46 (27.1%) |
| Fen/marsh/swamp | | | 1 | | | | | | | | 1 (0.01%) |
| Arable cereals | | | | | | 1 | | | | | 1 (0.01%) |
| Arable horticulture | 1 | | 1 | | 1 | 1 | 3 | 1 | | | 8 (4.7%) |
| Suburban | | | | | | 1 | | | | | 1 (0.01%) |
| Inland water | 1 | | | | | 1 | | | | 1 | 3 (1.8%) |
| Sea/Estuary | | | 1 | | | | | | | | 1 (0.01%) |
| Totals | 22 (12.9%) | 5 (2.9%) | 71 (41.8%) | 5 (2.9%) | 15 (8.8%) | 16 (9.4%) | 22 (12.9%) | 4 (2.4%) | 1 (0.01%) | 9 (5.3%) | 170 |

**Table 14: CLnutN values for comparison**

| LCM2000 broad habitat | CLnutN for dominant LCM2000 class (kg N/ha/yr) | CORINE class expressed as broad habitat# | CLnutN for CORINE class (kg N/ha/yr) |
|---|---|---|---|
| Acid grassland | 15 | Acid grassland | 15 |
| Calcareous grass | 20 | - | - |
| Improved grass | 25 | - | - |
| Neutral grass | 15 | - | - |
| Bog | 10 | Bog | 10 |
| Dense & Open dwarf shrub heath | 15 | Dwarf shrub heath & acid grass | 15 |
| Montane | 7 | - | - |
| Fen, marsh, swamp | 15 | - | - |
| All woodland | 12 | All woodland | 12 |

# The number of CORINE classes assigned to the moss sites by the site surveyors is fewer than the number of broad habitats the LCM2000 would suggest is covered by these sites.

The spatial distribution of the percent N values at the moss sites is shown in Figure 2A. There is no clear spatial pattern in the percent N values across the country, though there appears to be more sites with lower values in Scotland and the west, and higher values in the south and east. Figure 2B shows the total N deposition values for the sites, extracted from the national maps of CBED habitat specific (average, moorland, woodland) deposition, depending on the CORINE land cover class recorded for each site. Ten of the 170 sites were on either agricultural land or lacked land cover information; for these sites the average CBED deposition values were applied. The map shows the lowest deposition values across northern Scotland and the western fringe of Northern Ireland.

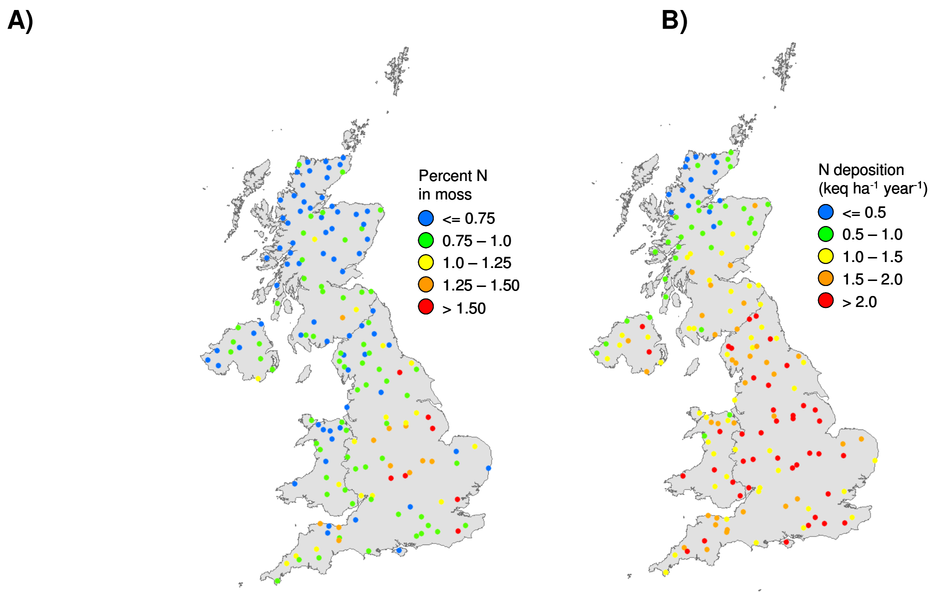


**Figure 2: (A) N concentration in mosses and (B) total N deposition (moorland or woodland according to CORINE class)**

Plotting the percent N in moss against N deposition (oxidised, reduced, total (oxidised + reduced)) or critical load exceedance shows a lot of scatter in the data. For example, Figure 3 shows the data from Figure 2 (A: percent N) and 2 (B: N deposition) plotted against each other, giving an $R^2$ value of 0.21.

The tables below summarise the relationships examined and the $R^2$ values obtained; these show:

- Poor relationships when examining the percent N against the average deposition values (wet, dry, wet+dry, $NO_x$, $NH_x$, $NO_x+NH_x$) for all sites (Table 15);
- Slightly improved relationships between moss percent N and habitat specific N deposition (moorland or woodland deposition values are applied according to the CORINE habitat class for each site). These results exclude sites on agricultural land or sites without land cover information. (Tables 16 and 17);
- Better results are obtained when the data are examined by individual moss species (Table 18). The data for HS include one site on agricultural land with a high percent N value (2.38%) which shows as a clear outlier when plotted against N deposition, therefore this point was excluded when calculating the $R^2$ value (0.27) for this species alone. The best results are seen for percent N in HC versus total N deposition ($R^2$ = 0.36). The $R^2$ values for PP and RS are very small (<0.1). The $R^2$ value was not determined for the moss PS as this was only collected at two sites;
- Correlations with critical load exceedance (Table 17) are highest for species HC ($R^2$ = 0.36) and HS ($R^2$ = 0.39). Not surprisingly critical load exceedance is lowest in the far north of Scotland (Figure 4) where total N deposition is also lowest, and is higher across England and Wales where N deposition is higher. Critical loads are exceeded for 117 out of the 160 sites to which critical loads could be assigned.

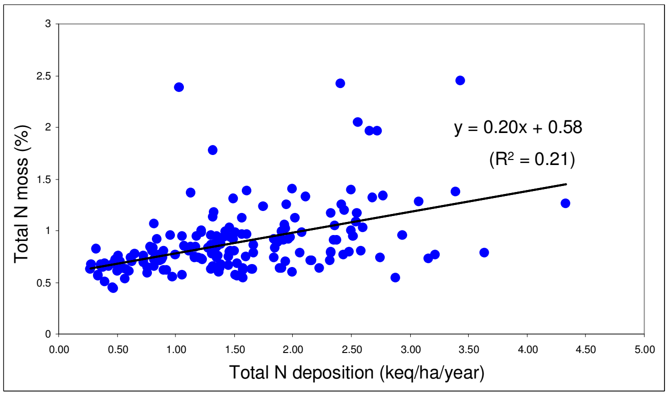


**Figure 3: Percent N in mosses (all species) vs habitat-specific total N deposition**

**Table 15: $R^2$ values for relationships between percent N in all moss sites (170) and average N deposition values (i.e., average values for all vegetation types)**

| %N in moss vs: | $R^2$ |
|---|---|
| Average wet N (NOx + NHx) | 0.01 |
| Average dry N (NOx + NHx) | 0.11 |
| Average NOx + NHx (wet + dry) | 0.07 |
| Average NOx (wet + dry) | 0.12 |
| Average NHx (wet + dry) | 0.02 |

**Table 16: $R^2$ values for relationships between percent N in the moorland moss sites (106 sites) vs N deposition values for moorland and vs critical load exceedance**

| %N in moss vs: | $R^2$ |
|---|---|
| Moorland NOx (wet + dry) | 0.20 |
| Moorland NHx (wet + dry) | 0.18 |
| Moorland NOx + NHx (wet + dry) | 0.25 |
| Nutrient nitrogen critical load exceedance | 0.24 |

**Table 17: $R^2$ values for relationships between percent N in the woodland moss sites (54) vs N deposition values for woodland and vs critical load exceedance**

| %N in moss vs: | $R^2$ |
|---|---|
| Woodland NOx (wet + dry) | 0.21 |
| Woodland NHx (wet + dry) | 0.05 |
| Woodland NOx + NHx (wet + dry) | 0.17 |
| Nutrient nitrogen critical load exceedance | 0.17 |

**Table 18: $R^2$ values for relationships between percent N in mosses vs N deposition (average, moorland or woodland as appropriate) and vs critical load exceedance, shown by moss species**

| %N in moss vs: | $R^2$ values for moss species (number of sites): *[number of sites exceeded out of total with CLnutN values]* | | | |
|---|---|---|---|---|
| | HC (24) | HS (45)# | PS (65) | RS (34) |
| NOx (wet + dry) | 0.30 | 0.06 | 0.08 | 0.24 |
| NHx (wet + dry) | 0.19 | 0.23 | 0.03 | 0.024 |
| NOx + NHx (wet + dry) | 0.36 | 0.27 | 0.07 | 0.12 |
| CLnutN exceedance | 0.36 *[20/23]* | 0.39 *[10/40]* | 0.06 *[55/65]* | 0.09 *[30/30]* |

#Regressions for HS exclude one outlier

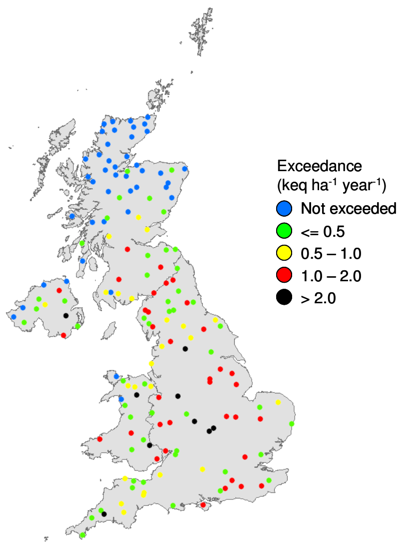


**Figure 4: Exceedance of nutrient N critical loads by habitat-specific N deposition**

### (iii) Discussion and conclusions

In general the moss sites with lower percent N, the lowest N deposition and small or no critical load exceedance are found in northern Scotland, and sites with high percent N, high N deposition and high exceedance are found in central and eastern England. However, not all sites conform to this spatial pattern, with variability from one site to another resulting in a lot of scatter in the data, reflected in the relatively low $R^2$ values obtained. The results appear to show a small positive trend between percent N in the moss and total N deposition (and critical load exceedance) for species HC and HS, with $R^2$ values between 0.27 and 0.39. However, for species PS and RS the $R^2$ values were very small reflecting the large amount of scatter in the data.

One reason for the low correspondence between the data sets may be the resolution of the deposition data; these values are taken from the national CBED maps that assume deposition is constant across each 5x5 km grid square. Deposition values may vary considerably within such an area due to topography, local climate and vegetation. Using habitat-specific deposition values appropriate for the CORINE land cover class at each site (i.e., where moorland or woodland deposition velocities are used to estimate the dry deposition component) improved the relationships compared to using the grid average deposition for all vegetation types.

In addition to the resolution of the deposition data there are other uncertainties to be considered:

- Uncertainties in the measurement and calculation of emissions and deposition;
- Uncertainties in the measurement of the N concentrations in the mosses;
- Uncertainties in the assignment of critical loads; the moss site habitat is recorded in terms of the CORINE land cover map, the classes of which may be very broad in definition; secondly translating these to EUNIS and/or broad habitats may lead to further uncertainties;
- Uncertainties in the critical load values themselves; ranges of critical loads were assigned to EUNIS habitats (Achermann & Bobbink, 2003) and for the UK single mapping values within each range have been identified (Hall et al., 2003), but uncertainties remain about what the exact value should be within these ranges, particularly for site-specific applications.

Not all of these uncertainties can be quantified but it is important to acknowledge what the uncertainties are. It should be remembered that the national scale data (such as deposition) used in this analysis are only really intended for use at the national scale; at a site-specific scale local measurements that can take account of the local climate, vegetation and topography would be more appropriate.

## (b) EMEP scale

### (i) Methods and results

For the first time in the European moss survey, 16 countries submitted data on the total N concentration in mosses from almost 3,000 sites for 2005/6 (Harmens et al., in preparation). The N concentration in mosses was measured using either the Kjeldahl method or elemental analysis. The analytical technique varied between but not within countries. Around a dozen different moss species were collected, with *Pleurozium schreberi* and *Hylocomium splendens* being the preferred species (ICP Vegetation, 2005). Each species may have been collected in several countries, with several species collected in any one country. The distribution of locations and concentrations is shown in Figure 5A, the mean N concentration in mosses per EMEP grid square (50 x 50 $km^2$) is shown in Figure 5B. The lowest concentrations were observed in mosses in northern Finland and northern parts of the UK, the highest concentrations were found in mosses in central and eastern Europe.

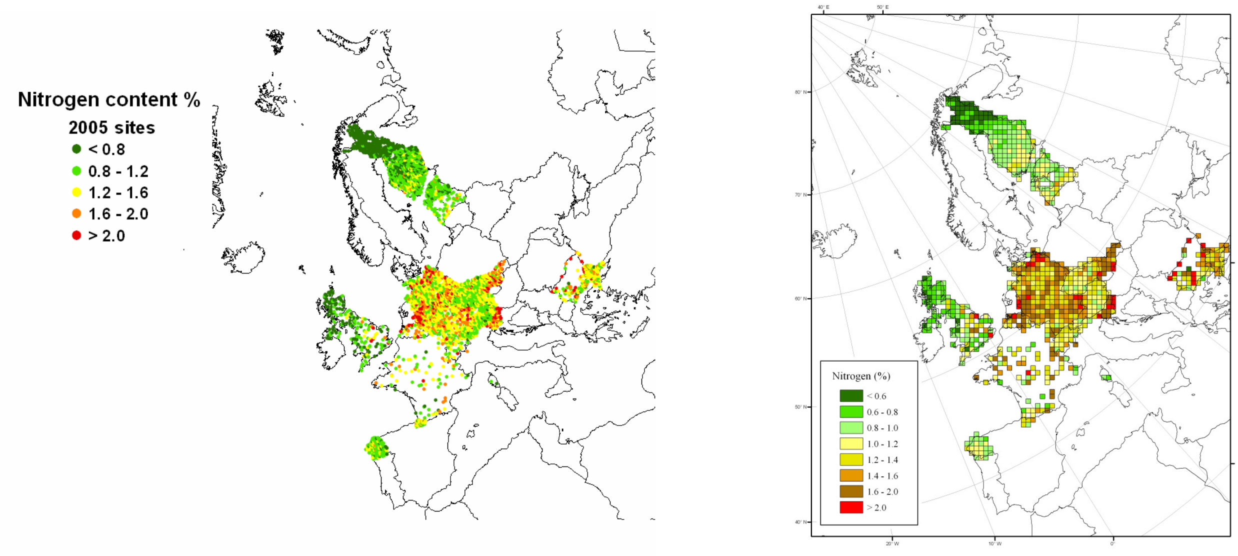


**Figure 5: N concentration in mosses at individual sampling sites across Europe and the mean N concentration in mosses per EMEP grid square in 2005/6**

It is clear that the number and spatial distribution of sites varies markedly between countries, so that for some countries a mean value may be considered as "representative" (for example Finland), or very regionally biased (for example Spain). For further reference, boxplots of concentrations for all samples regardless of moss species or analytical method are shown by country in Figure 6. The coloured boxes show the median and interquartile range, with "staples" to 1.5 x the interquartile range, and individual outliers beyond.

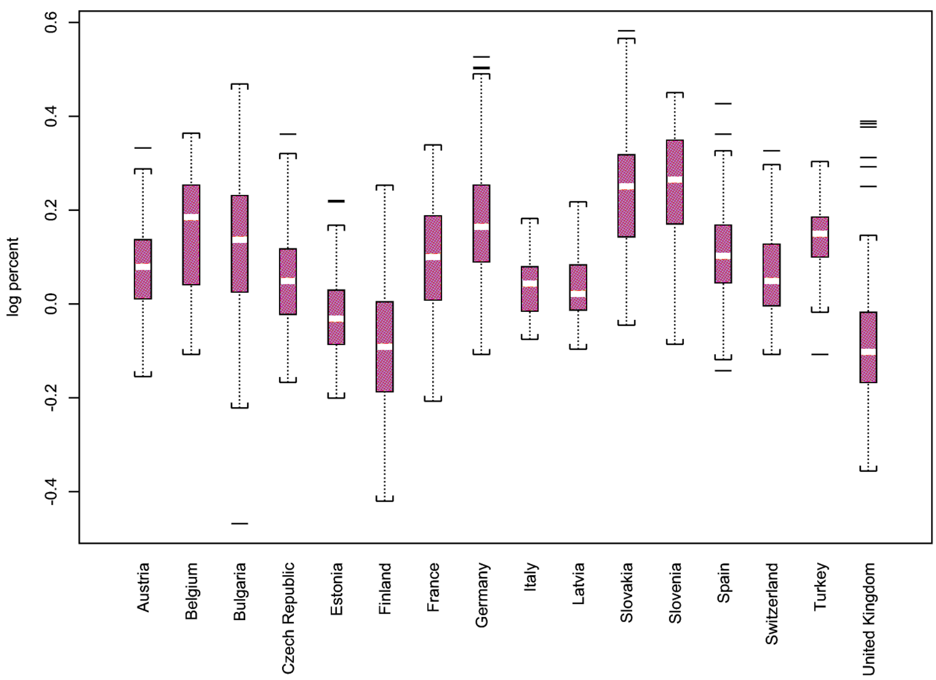


**Figure 6: Boxplot of log N concentration (%) in moss per country. The coloured boxes show the median and interquartile range, with "staples" to 1.5 x the interquartile range, and individual outliers beyond.**

The regional variability in the N concentration in mosses might be modelled as a concentration surface viewed as a function of location. Possibly in combination with geostatistical modelling, this could be a way of interpolating N concentrations from location alone. Any effect attributable to differences in moss species or analytical technique could be accounted for using a simple additive model prior to geostatistical analysis. Such an analysis would take no account of processes influencing regional variation. One plausible hypothesis is that the N concentration in mosses is a function of atmospheric N deposition, and we investigated this hypothesis. The moss sampling sites are (semi-)natural and do not receive application of agricultural fertiliser. N deposition estimates provided by EMEP for Europe for 2004 are shown in Figure 7.

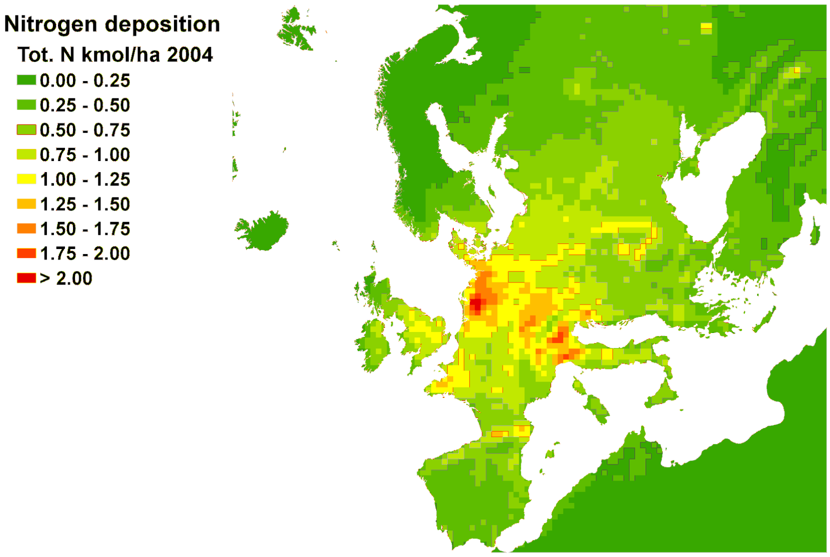


**Figure 7: EMEP estimated total N deposition for Europe in 2004**

The EMEP deposition map (Figure 7) shows good resemblance with the N concentration in mosses map (Figure 5B) in that the lowest total N deposition rates were observed in northern Scandinavia (including northern Finland) and northern parts of the UK, and the highest total N deposition rates were found in central Europe. However, in eastern Europe the total N deposition rates were relatively lower than the N concentration in mosses. In 2005, areas at risk from high exceedance of the empirical N critical loads for ecosystems were primarily identified in central and western continental Europe, with eastern Europe being at low risk from exceedance (CCE, personal communication). Despite the relatively good resemblance between deposition and moss maps, the relationship between N concentration in mosses and N deposition based on averaging all sampling site values within any one grid square, shows considerable scatter. Figure 8 shows an apparent asymptotic relationship between total annual N deposition rate and N concentration in mosses with saturation occurring above ca. 10 kg $ha^{-1}$ $y^{-1}$. In the UK, the low N concentration in mosses is associated with moderate deposition estimates, so that many of the UK data points fall below the fitted curve. As EMEP estimates of UK deposition are believed to be an underestimate of the true N deposition rates (Figure 9), higher deposition estimates would place adjusted UK data points even further below the asymptotic line. Although the relationship between the total N concentration in mosses and EMEP modelled total N deposition rates shows a lot of scatter for individual countries, the relationship was significantly linear ($R^2$ = 0.91) using measured site-specific total N deposition rates in Switzerland (Thöni et al., unpublished). Previous studies have also shown that strong linear relationships can sometimes be observed when using EMEP modelled total N deposition rates, e.g. for Norway and Sweden (Harmens et al., 2005). A more detailed investigation in Austria suggests that the relationship is affected by local climate, N species in deposition and possibly pH of rain water (Zechmeister et al., unpublished).

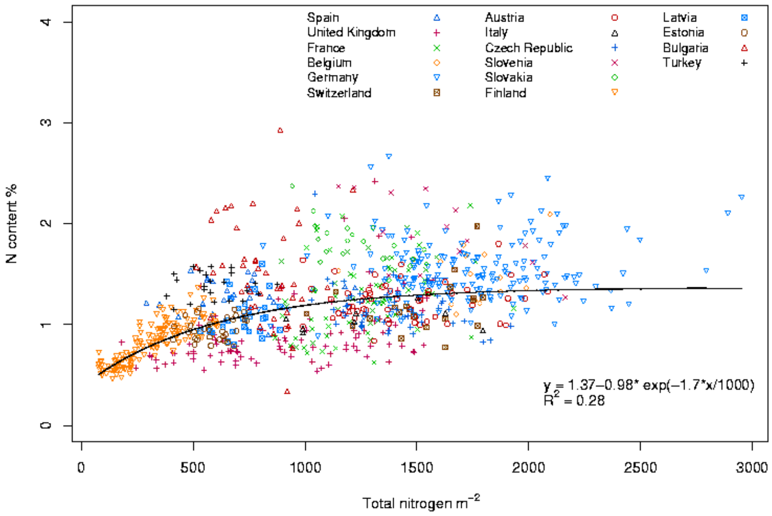


**Figure 8: Relationship between EMEP modelled total N deposition (mg m$^{-2}$ in 2004) and N concentration in mosses (2005/6) per EMEP grid per country**

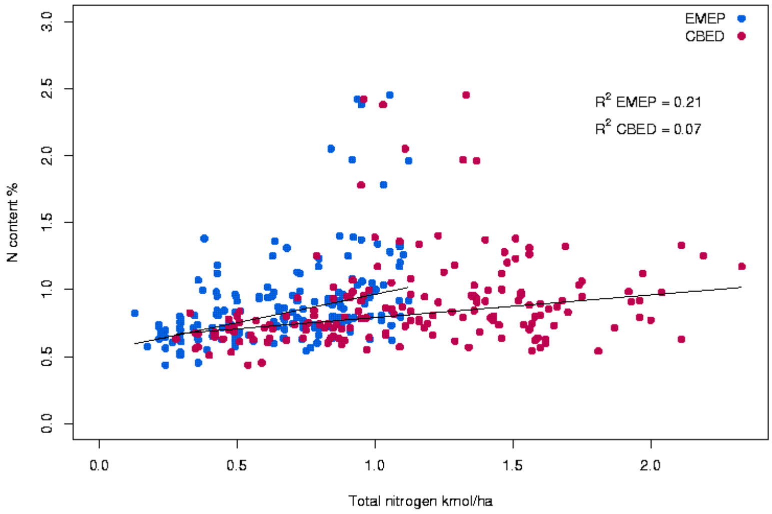


**Figure 9: Relationship between the N concentration in mosses (2005) and average CBED (2003 – 2005 annual average; see also table 15) or EMEP (2004) total N deposition estimates at UK sampling sites. CBED deposition is based on a 5 km grid square using GB National Grid coordinates, EMEP is based on a 50 km grid square using EMEP coordinates.**

We have carried out an analysis of variance using moss species, country and analytical technique as factors and EMEP total N deposition as a covariate. We have taken the logarithm of the data in order to stabilise the variance and reduce its asymptotic behaviour. The underlying best-fit curve, back transformed, reaches an asymptote more slowly the one shown in Figure 8. A summary of the results of an analysis of variance for a range of linear models using the logged data is shown in Table 19.

The results suggest that, after fitting a straight line model for the effect of deposition, there is a strong country effect and small but statistically significant difference between mosses. The country effects identified are to be interpreted as in addition to any effect of differences in deposition and cannot be explained in terms of different moss species or analytical method between countries. It is possible that they are due to regional inaccuracies in deposition estimates.

**Table 19: Summary of a model fit for analysis of variance. The model used logged data with deposition as a covariate and country, moss species and analytical method as factors**

| Additive model components | Model df | $R^2$ |
|---|---|---|
| deposition | 1 | 0.362 |
| deposition+country | 16 | 0.509 |
| deposition+moss species | 15 | 0.448 |
| deposition+country+moss species | 30 | 0.537 |
| deposition+country+method | 17 | 0.512 |
| deposition+country+moss species+method | 31 | **0.538** |
| country+moss species+method | 30 | 0.498 |

## (ii) Conclusions

- The lowest N concentrations were observed in mosses in northern Finland and northern parts of the UK, the highest concentrations were found in mosses in central and eastern Europe. The EMEP map of total N deposition in 2004 shows a similar spatial pattern except that low N depositions were reported for eastern Europe;
- A plot of the N concentration in mosses against EMEP estimated N deposition rates suggests an asymptotic relationship, with a lot of scatter in the data and possible N saturation in mosses occurring at deposition rates above ca. 10 kg $ha^{-1}$ $y^{-1}$. Although this might imply that mosses might not be a useful tool as biomonitors of atmospheric N deposition at the European scale, research in for example Switzerland has shown that mosses can be used as biomonitors of atmospheric N deposition when their N concentration was related to site-specific measured total N deposition rates. There is a need to collate more site-specific measured total N deposition data to investigate whether this is true for other European countries too. At a local scale the variation in total N deposition and total N concentration in mosses can be high, which might explain the scatter in the data when comparing site-specific N concentrations in mosses with N deposition rates averaged at a grid scale (whether 5 or 50 km grid squares);
- Analysis of variance of logged data with estimated deposition as a covariate suggests that deposition and country effects are highly statistically significant. The effect of moss species (i.e. differences between moss species) is smaller but remains significant. The presence of strong country effects cannot be explained in terms of different moss species or analytical method between countries. It might be that country effects are due to regional inaccuracies in deposition estimates. Local deposition values vary considerably within EMEP grid squares due to topography, local climate and vegetation. This could explain the significant country effect on top of the deposition effect on the total N concentration in mosses.

## (iii) Future research needs

There is a need to further investigate the general applicability of mosses as biomonitors of atmospheric N deposition. In particular, site-specific relationships between the N concentration in mosses and measured atmospheric N deposition rates, and the impacts of local variables such as climate, vegetation and topography on such a relationship, should be investigated further. As a start, the N concentration in mosses could be determined at N deposition monitoring stations. Such an investigation might be confounded by the presence of different moss species at various monitoring sites. Therefore, the need arises to conduct interspecies calibration exercises regarding the N concentration in mosses. Linking the European moss database with other databases on e.g. climate, land cover and topography will provide further insight into factors (other than deposition) affecting the N concentration in mosses. In addition, the impacts of N deposition on moss growth and physiology should be investigated and reviewed. To extend the European N in mosses database, we encourage more countries to determine the N concentration in mosses in future moss surveys. Finally, to be able to use the moss database in the critical load approach, there is the challenge to relate the N concentration in mosses with N impacts on vegetation.

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## *Annex 1. Covering letter and questionnaire for meta-database development.*

Dear Collaborator,

We are writing to invite you to participate in a project to develop a meta-database describing national and sub-national **vegetation surveys** which will summarise evidence of nitrogen deposition impacts on species composition in Europe and encourage wide use of the data (e.g. by dynamic modellers). The project is funded by the UK Department of Environment, Food and Rural Affairs (DEFRA) as part of the work programme of the ICP Vegetation (http://icpvegetation.ceh.ac.uk). The project is being co-ordinated by the Centre for Ecology & Hydrology (CEH), Bangor, and the Stockholm Environment Institute (SEI), at the University of York.

As you are aware, Critical Loads of nitrogen deposition for adverse effects on sensitive communities are exceeded over many parts of Europe. In a policy context, evidence that critical loads exceedance is associated with significant changes in species composition and loss of species of conservation value is of great importance. Although such evidence was considered, alongside experimental studies, in developing the currently recommended empirical critical loads of nitrogen, there has been no systematic collation and assessment of the evidence of impacts of nitrogen deposition in the field. Such evidence would benefit the further development and validation of the nitrogen critical load approach within the Long-Range Transboundary Air Pollution Convention.

The data we are looking for fall under two main categories:

(i) National or sub-national surveys on changes in plant species composition over time either focused on all vegetation types or on particular habitats of interest. Data may or may not have been analysed to assess whether observed changes over time can be explained by nitrogen deposition;

(ii) Specific national or sub-national surveys of sensitive communities that have been under taken to test the hypothesis that loss of species is associated with nitrogen deposition (these may be only spatial in nature).

**What is requested from you?**

It is hoped that the final database will be used by a variety of users including dynamic modellers. Therefore, we would like to request that you supply background information on the parameters that have been measured in surveys by filling in the attached spreadsheet. We would also be very grateful to receive soft or hard copies of any relevant publications, especially if they are in the grey literature and any supporting information that accompanies the studies that you recommend. These may be published papers or other publications and reports that you are aware of where vegetation surveys have been linked to, or have the potential to be linked to, nitrogen deposition.

Could you also please give an indication if the data contained in the surveys are available for general use in the nitrogen effects community and/or whether in principle you would be prepared to share the data in future collaborative work on a mutually agreeable basis.

We will be pleased to send you a copy of a report summarizing the information. We expect to be able to do this in May 2008.

Please return the filled in spreadsheet and send your relevant documents **as soon as possible, but by Monday 28th January 2008 at the latest,** to Kevin Hicks: khicks@york.ac.uk

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We look forward to working with you on this project.

Yours Sincerely

Kevin Hicks and Mike Ashmore (SEI York)
Harry Harmens (Chairman ICP Vegetation) and Bridget Emmett CEH Bangor)

| Question | | Answer |
|---|---|---|
| **1. Name of study or database** | | |
| **2. Type of Study** | *Repeated survey, one-off survey, single monitoring site or other (please explain)* | |
| **3. Period covered** | *First year of study* | |
| | *Last year of study* | |
| | *Frequency of measurements* | |
| **4. Location / geographical range** | *Latitude/longitude* | |
| | *Country* | |
| | *Region* | |
| **5. Habitat specific or all vegetation types** | *Habitat, name, description* | |
| | *EUNIS class* | |
| **6. Nature of Botanical Survey** | *All higher plants, all higher and lower plants, ground flora only, trees only etc.* | |
| **7. Vegetation parameters recorded** | *Height of vegetation, foliar chemistry etc* | |
| **8. N deposition data measured or used in the survey** | *Type of modelled data used or measurements made in the field* | |
| **9. Other data collected** | *Met data; air quality/deposition data; soils data; water quality data?* | |
| **10. Summary of evidence of N impacts** | *Changes in species composition; indicators of species change; potential biological indicators - C:N, N:P, %N etc.* | |
| **11. Management past and current if available** | *E.g. grazed by sheep; logged in 1960, burned recently etc.* | |
| **12. Contact information** | *Name, affiliation, address, telephone, email* | |
| **13. Key publications** | | |
| **14. Data availability** | *Freely available, at a cost, available to collaborators etc.* | |
| **15. Other information** | E.g. conservation status of vegetation | |

**Note: please complete all data fields if you can, add extra columns for different studies or databases**

## *Annex 2. List of respondents to questionnaire.*

| Name | Affiliation | Country | Email | Ecosystem Type |
|---|---|---|---|---|
| 1. Harald G. Zechmeister | University of Vienna | Austria | harald.zechmeister@univie.ac.at | Forest and Mire/Bog/Fen |
| 2. Ivan Suchara | Silva Tarouca Research Institute for Landscape and Ornamental Gardening | Czech Republic | suchara@vukoz.cz | Mire/Bog/Fen |
| 3. Eero Kubin | Director. METLA | Finland | eero.kubin@metla.fi | Mire/Bog/Fen |
| 4. Tiina Tonteri | Finnish Forest Research Institute | Finland | Tiina.Tonteri@metla.fi | Forest |
| 5. Maija Salemaa | Finnish Forest Reserach Institute | Finland | Maija.Salemaa@metla.fi | Forest |
| 6. Angela Schlutow | ÖKO-DATA Strausberg | Germany | Angela.Schlutow@oekodata.com | All Habitats |
| 7. Martin Lorenz and Richard Fischer | vTI Institute for World Forestry, PCC of ICP Forests | Germany | martin.lorenz@vti.bund.de richard.fischer@vti.bund.de | Forests |
| 8. Edit Kovács-Láng | Institute of Ecology and Botany | Hungary | lange@botanika.hu | Forest |
| 9. János Nagy | Institute of Botany & Ecophysiology, Szent István University | Hungary | Nagy.Janos@mkk.szie.hu | Mire/Bog/Fen |
| 10. Szilárd Czóbel | Institute of Botany & Ecophysiology, Szent István University | Hungary | Czobel.Szilard@mkk.szie.hu | Grasslands/Tall forbs |
| 11. Marina Frolova | Latvian Environment, Geology and Meteorology Agency | Latvia | marina.frolova@lvgma.gov.lv | Mire/Bog/Fen |
| 12. Iraida Luylko | Latvian Environment, Geology and Meteorology Agency | Latvia | epoc@lvgma.gov.lv | Forests |
| 13. Zbigniew Maciejewski | Roztoczański National Park, | Poland | zbigniewmaciejewski@wp.pl | Forest |
| 14. Tomasz Durak | Chair of Botany, Faculty of Biology and Agriculture | Poland | tdurak@univ.rzeszow.pl | |
| 15. Urban Gunnarsson | Dept of Plant Ecology, Uppsala | Sweden | Urban.Gunnarsson@ebc.uu.se | Mire/Bog/Fen |
| 16. Joachim Strengbom | Plant Ecology, Uppsala University | Sweden | joachim.strengbom@ebc.uu.se | Forest |
| 17. Annika Nordin | Umeå Plant Science Centre | Sweden | Annika.Nordin@genfys.slu.se | Forest and Mire/Bog/Fen |
| 18. Sabine Braun | Institute for Applied Plant Biology | Switzerland | sabine.braun@iap.ch | Forest |
| 19. Wieger Wamelink | Wageningen | Netherlands | wieger.wamelink@wur.nl | All Habitats |
| 20. Roland Bobbink | Landscape Ecology, Institute of Environmental Biology, Utrecht | | R.Bobbink@uu.nl; m.degraaf@science.ru.nl | Health/scrub/tundra |
| 21. Carly Stevens | The Open University, Department of Life Sciences | UK | c.j.stevens@open.ac.uk | Grasslands/Tall forbs |
| 22. Andrea Britton | Macaulay Institute | UK | a.britton@macaulay.ac.uk | Health/scrub/tundra |
| 23. Harry Harmens | (Chairman ICP Vegetation), Centre for Ecology and Hydrology, Bangor | UK | hh@ceh.ac.uk | All Habitats |
| 24. Simon Smart | Centre for Ecology and Hydrology, Lancaster | UK | ssma@ceh.ac.uk | All Habitats |

# Annex 3. N empirical critical load exceedance tables per country

## Albania

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 79 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 2,951 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 227 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 28% | 0% | 0% | 24% | 0% | 0% |
| | | | N | 72% | 100% | 100% | 76% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 2,220 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 5% | 0% | 0% | 3% | 0% | 0% |
| | | | N | 95% | 100% | 100% | 97% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 1,558 | D | 50% | 0% | 0% | 22% | 0% | 0% |
| | | | L | 32% | 0% | 0% | 60% | 0% | 0% |
| | | | P | 18% | 10% | 0% | 17% | 4% | 0% |
| | | | N | 0% | 90% | 100% | 1% | 96% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 1,490 | D | 52% | 0% | 0% | 20% | 0% | 0% |
| | | | L | 35% | 0% | 0% | 68% | 0% | 0% |
| | | | P | 13% | 13% | 0% | 11% | 6% | 0% |
| | | | N | 0% | 87% | 100% | 2% | 94% | 100% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

# Armenia

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 253 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 3,431 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 4,962 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 10% | 0% | 0% | 26% | 0% | 0% |
| | | | N | 90% | 100% | 100% | 74% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 240 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 33% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 67% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 980 | D | 7% | 0% | 0% | 19% | 0% | 0% |
| | | | L | 44% | 0% | 0% | 47% | 0% | 0% |
| | | | P | 13% | 7% | 0% | 6% | 19% | 0% |
| | | | N | 35% | 93% | 100% | 28% | 81% | 100% |
| F1 | Tundra | 666 | D | 0% | 0% | 0% | 11% | 0% | 0% |
| | | | L | 18% | 0% | 0% | 22% | 11% | 0% |
| | | | P | 32% | 1% | 0% | 0% | 22% | 11% |
| | | | N | 50% | 98% | 100% | 66% | 67% | 89% |
| F2 | Arctic, alpine and subalpine scrub habitats | 686 | D | 0% | 0% | 0% | 1% | 0% | 0% |
| | | | L | 42% | 0% | 0% | 42% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 1% | 0% |
| | | | N | 57% | 100% | 100% | 57% | 99% | 100% |
| F4 | Wet and dry heathlands | 866 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 11% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 89% | 100% | 100% |

# Austria

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 5,842 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 5,459 | D | 3% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 33% | 0% | 0% | 10% | 0% | 0% |
| | | | P | 33% | 23% | 0% | 52% | 0% | 0% |
| | | | N | 31% | 77% | 100% | 38% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 79 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 5% | 0% | 0% | 2% | 0% | 0% |
| | | | P | 62% | 2% | 0% | 53% | 0% | 0% |
| | | | N | 34% | 98% | 100% | 45% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 6,219 | D | 79% | 1% | 0% | 67% | 0% | 0% |
| | | | L | 20% | 17% | 0% | 33% | 2% | 0% |
| | | | P | 1% | 48% | 13% | 0% | 59% | 0% |
| | | | N | 0% | 35% | 87% | 0% | 38% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 3,202 | D | 94% | 1% | 0% | 81% | 0% | 0% |
| | | | L | 6% | 43% | 0% | 19% | 5% | 0% |
| | | | P | 0% | 38% | 16% | 0% | 67% | 0% |
| | | | N | 0% | 17% | 84% | 0% | 28% | 100% |
| F4 | Wet and dry heathlands | 18 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 8% | 0% | 0% | 1% | 0% | 0% |
| | | | P | 57% | 1% | 0% | 65% | 0% | 0% |
| | | | N | 34% | 99% | 100% | 34% | 100% | 100% |

## Azerbaijan

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 3,316 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 374 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 374 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 26,662 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 8,480 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 6% | 0% | 0% | 6% | 0% | 0% |
| | | | N | 94% | 100% | 100% | 94% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 1,269 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 2,526 | D | 8% | 0% | 0% | 8% | 0% | 0% |
| | | | L | 34% | 0% | 0% | 36% | 0% | 0% |
| | | | P | 12% | 8% | 0% | 23% | 8% | 0% |
| | | | N | 46% | 92% | 100% | 33% | 92% | 100% |
| F1 | Tundra | 1,106 | D | 4% | 0% | 0% | 4% | 0% | 0% |
| | | | L | 59% | 4% | 0% | 71% | 4% | 0% |
| | | | P | 25% | 46% | 4% | 12% | 58% | 4% |
| | | | N | 13% | 50% | 96% | 14% | 39% | 96% |
| F2 | Arctic, alpine and subalpine scrub habitats | 2,195 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 12% | 0% | 0% | 12% | 0% | 0% |
| | | | P | 77% | 0% | 0% | 77% | 0% | 0% |
| | | | N | 11% | 100% | 100% | 11% | 100% | 100% |
| F4 | Wet and dry heathlands | 366 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

# Belarus

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 1,446 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 2,741 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | 18 | D | 0% | 0% | 0% | 7% | 0% | 0% |
| | | | L | 100% | 0% | 0% | 93% | 0% | 0% |
| | | | P | 0% | 7% | 0% | 0% | 100% | 0% |
| | | | N | 0% | 93% | 100% | 0% | 0% | 100% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 118 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

# Belgium

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 7,144 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 11 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 66% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 34% | 24% | 0% | 66% | 0% | 0% |
| | | | N | 0% | 76% | 100% | 34% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 185 | D | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 66% | 0% | 0% | 1% | 0% | 0% |
| | | | P | 29% | 20% | 0% | 75% | 1% | 0% |
| | | | N | 3% | 80% | 100% | 24% | 99% | 100% |

## Bosnia and Herzegovina

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 3,768 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 4,628 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 32% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 68% | 100% | 100% | 100% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 603 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 44% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 56% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 1,636 | D | 75% | 0% | 0% | 6% | 0% | 0% |
| | | | L | 25% | 0% | 0% | 93% | 0% | 0% |
| | | | P | 0% | 52% | 0% | 1% | 0% | 0% |
| | | | N | 0% | 48% | 100% | 0% | 100% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 2,418 | D | 56% | 0% | 0% | 4% | 0% | 0% |
| | | | L | 43% | 0% | 0% | 79% | 0% | 0% |
| | | | P | 1% | 35% | 0% | 17% | 0% | 0% |
| | | | N | 0% | 65% | 100% | 0% | 100% | 100% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

# Bulgaria

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 573 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 4% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 6% | 4% | 0% | 0% | 0% | 0% |
| | | | N | 90% | 96% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 573 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 4% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 6% | 4% | 0% | 0% | 0% | 0% |
| | | | N | 90% | 96% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 6,638 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 391 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 6% | 0% | 0% |
| | | | P | 44% | 0% | 0% | 38% | 0% | 0% |
| | | | N | 56% | 100% | 100% | 56% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 2,694 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 5% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 20% | 3% | 0% | 4% | 0% | 0% |
| | | | N | 75% | 97% | 100% | 96% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 1,628 | D | 61% | 0% | 0% | 52% | 0% | 0% |
| | | | L | 32% | 0% | 0% | 48% | 8% | 0% |
| | | | P | 7% | 41% | 0% | 0% | 30% | 0% |
| | | | N | 0% | 59% | 100% | 0% | 62% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 2,317 | D | 64% | 0% | 0% | 54% | 0% | 0% |
| | | | L | 34% | 0% | 0% | 45% | 10% | 0% |
| | | | P | 2% | 38% | 0% | 0% | 39% | 0% |
| | | | N | 0% | 62% | 100% | 0% | 51% | 100% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

## Croatia (Hrvatska)

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 9,746 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 1,199 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 4% | 0% | 0% | 1% | 0% | 0% |
| | | | P | 88% | 1% | 0% | 16% | 0% | 0% |
| | | | N | 9% | 99% | 100% | 83% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 455 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 3% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 23% | 0% | 0% | 12% | 0% | 0% |
| | | | N | 74% | 100% | 100% | 88% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 469 | D | 95% | 0% | 0% | 11% | 0% | 0% |
| | | | L | 0% | 4% | 0% | 84% | 0% | 0% |
| | | | P | 5% | 64% | 0% | 1% | 11% | 0% |
| | | | N | 0% | 32% | 100% | 4% | 89% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 1,178 | D | 94% | 0% | 0% | 21% | 0% | 0% |
| | | | L | 1% | 5% | 0% | 72% | 1% | 0% |
| | | | P | 6% | 80% | 1% | 5% | 20% | 0% |
| | | | N | 0% | 15% | 99% | 1% | 79% | 100% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

## Cyprus

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | 0 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 0 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 441 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

# Czech Republic

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | 15 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 100% | 0% | 0% | 100% | 0% | 0% |
| | | | N | 0% | 100% | 100% | 0% | 100% | 100% |
| E 1.9 | Inland Dunes | 15 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 100% | 0% | 0% | 100% | 0% | 0% |
| | | | N | 0% | 100% | 100% | 0% | 100% | 100% |
| E2 | Mesic grasslands | 7,227 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 6 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 32% | 0% | 0% | 37% | 0% | 0% |
| | | | N | 68% | 100% | 100% | 63% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 422 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 26% | 0% | 0% | 19% | 0% | 0% |
| | | | P | 63% | 0% | 0% | 66% | 0% | 0% |
| | | | N | 11% | 100% | 100% | 16% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 0 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 100% | 0% | 0% | 100% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 100% | 100% | 0% | 100% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 2 | D | 22% | 0% | 0% | 43% | 0% | 0% |
| | | | L | 78% | 0% | 0% | 57% | 0% | 0% |
| | | | P | 0% | 22% | 0% | 0% | 43% | 0% |
| | | | N | 0% | 78% | 100% | 0% | 57% | 100% |
| F4 | Wet and dry heathlands | 31 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 12% | 0% | 0% | 14% | 0% | 0% |
| | | | P | 88% | 0% | 0% | 86% | 0% | 0% |
| | | | N | 0% | 100% | 100% | 0% | 100% | 100% |

## Denmark

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 1,017 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 277 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 513 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

## Estonia

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 3,289 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 384 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 154 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

## Finland

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 3,222 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E4 | Alpine and subalpine grasslands + Moss and | 33 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 8,331 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| F4 | Wet and dry heathlands | 576 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

# France

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 37 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 135 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 5% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 95% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 135 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 5% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 95% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 167,901 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 2,556 | D | 4% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 14% | 0% | 0% | 8% | 0% | 0% |
| | | | P | 20% | 9% | 0% | 16% | 4% | 0% |
| | | | N | 62% | 91% | 100% | 76% | 96% | 100% |
| E3 | Seasonally wet and wet grasslands | 8,917 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 7% | 0% | 0% | 1% | 0% | 0% |
| | | | P | 16% | 1% | 0% | 1% | 0% | 0% |
| | | | N | 77% | 99% | 100% | 98% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 7,102 | D | 81% | 7% | 0% | 58% | 0% | 0% |
| | | | L | 19% | 31% | 0% | 31% | 15% | 0% |
| | | | P | 0% | 32% | 18% | 11% | 33% | 10% |
| | | | N | 0% | 31% | 82% | 0% | 52% | 90% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 1,808 | D | 71% | 6% | 0% | 47% | 0% | 0% |
| | | | L | 27% | 20% | 0% | 38% | 10% | 0% |
| | | | P | 2% | 35% | 14% | 15% | 29% | 6% |
| | | | N | 0% | 40% | 86% | 0% | 61% | 94% |
| F4 | Wet and dry heathlands | 2,106 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 1% | 0% | 0% | 1% | 0% | 0% |
| | | | P | 41% | 1% | 0% | 3% | 0% | 0% |
| | | | N | 59% | 99% | 100% | 96% | 100% | 100% |

## Germany

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | 93 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 100% | 0% | 0% | 29% | 0% | 0% |
| | | | P | 0% | 98% | 0% | 71% | 0% | 0% |
| | | | N | 0% | 2% | 100% | 0% | 100% | 100% |
| E 1.9 | Inland Dunes | 93 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 100% | 0% | 0% | 29% | 0% | 0% |
| | | | P | 0% | 98% | 0% | 71% | 0% | 0% |
| | | | N | 0% | 2% | 100% | 0% | 100% | 100% |
| E2 | Mesic grasslands | 57,295 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 554 | D | 22% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 64% | 0% | 0% | 66% | 0% | 0% |
| | | | P | 14% | 82% | 0% | 33% | 0% | 0% |
| | | | N | 0% | 18% | 100% | 1% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 1,509 | D | 2% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 24% | 1% | 0% | 8% | 0% | 0% |
| | | | P | 59% | 11% | 0% | 33% | 2% | 0% |
| | | | N | 15% | 88% | 100% | 59% | 98% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 331 | D | 100% | 3% | 0% | 96% | 0% | 0% |
| | | | L | 0% | 53% | 0% | 4% | 46% | 0% |
| | | | P | 0% | 45% | 50% | 0% | 50% | 0% |
| | | | N | 0% | 0% | 50% | 0% | 4% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 315 | D | 100% | 20% | 0% | 93% | 0% | 0% |
| | | | L | 0% | 57% | 0% | 7% | 34% | 0% |
| | | | P | 0% | 23% | 52% | 0% | 59% | 0% |
| | | | N | 0% | 0% | 48% | 0% | 7% | 100% |
| F4 | Wet and dry heathlands | 424 | D | 3% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 51% | 0% | 0% | 9% | 0% | 0% |
| | | | P | 35% | 12% | 0% | 57% | 3% | 0% |
| | | | N | 11% | 87% | 100% | 34% | 97% | 100% |

## Georgia

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 2,534 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 1,710 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 2% | 0% | 0% | 3% | 0% | 0% |
| | | | N | 98% | 100% | 100% | 97% | 100% | 100% |
| E 1.9 | Inland Dunes | 1,710 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 2% | 0% | 0% | 3% | 0% | 0% |
| | | | N | 98% | 100% | 100% | 97% | 100% | 100% |
| E2 | Mesic grasslands | 4,314 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 6,409 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 5% | 0% | 0% | 28% | 0% | 0% |
| | | | N | 95% | 100% | 100% | 72% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 448 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 6,033 | D | 13% | 0% | 0% | 25% | 0% | 0% |
| | | | L | 12% | 0% | 0% | 24% | 0% | 0% |
| | | | P | 19% | 6% | 0% | 3% | 18% | 0% |
| | | | N | 56% | 94% | 100% | 48% | 82% | 100% |
| F1 | Tundra | 20,894 | D | 8% | 0% | 0% | 22% | 0% | 0% |
| | | | L | 15% | 3% | 0% | 21% | 7% | 0% |
| | | | P | 22% | 9% | 4% | 9% | 19% | 18% |
| | | | N | 55% | 88% | 95% | 48% | 73% | 81% |
| F2 | Arctic, alpine and subalpine scrub habitats | 975 | D | 17% | 0% | 0% | 47% | 0% | 0% |
| | | | L | 44% | 2% | 0% | 45% | 2% | 0% |
| | | | P | 25% | 12% | 0% | 0% | 45% | 2% |
| | | | N | 14% | 85% | 100% | 8% | 53% | 98% |
| F4 | Wet and dry heathlands | 438 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 3% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 97% | 100% | 100% |

## Great Britain

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 3 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 602 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 602 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 82,077 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 20,090 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 30,217 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |

## Greece

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 1,510 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 195 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 195 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 15,192 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 100% | 0% | 0% | 100% | 0% | 0% |
| | | | N | 0% | 100% | 100% | 0% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 1,209 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 23% | 0% | 0% | 36% | 0% | 0% |
| | | | N | 77% | 100% | 100% | 64% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 3 | D | 34% | 0% | 0% | 34% | 0% | 0% |
| | | | L | 66% | 0% | 0% | 66% | 0% | 0% |
| | | | P | 0% | 34% | 0% | 0% | 34% | 0% |
| | | | N | 0% | 66% | 100% | 0% | 66% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 11 | D | 56% | 0% | 0% | 56% | 0% | 0% |
| | | | L | 44% | 0% | 0% | 44% | 0% | 0% |
| | | | P | 0% | 56% | 0% | 0% | 56% | 0% |
| | | | N | 0% | 44% | 100% | 0% | 44% | 100% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

# Hungary

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 729 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 442 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 442 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 8,476 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 1,414 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 3% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 97% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 0 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 100% | 0% | 0% | 100% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 100% | 100% | 0% | 100% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

# Iceland

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 3 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 169 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | 54,867 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| F2 | Arctic, alpine and subalpine scrub habitats | 4,428 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

## Ireland

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | 16 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 16 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 43,376 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 970 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 623 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

# Italy

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 375 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 242 | D | 3% | 0% | 0% | 1% | 0% | 0% |
| | | | L | 64% | 3% | 0% | 40% | 0% | 0% |
| | | | P | 29% | 27% | 1% | 34% | 26% | 0% |
| | | | N | 3% | 69% | 99% | 25% | 74% | 100% |
| E 1.9 | Inland Dunes | 242 | D | 3% | 0% | 0% | 1% | 0% | 0% |
| | | | L | 64% | 3% | 0% | 40% | 0% | 0% |
| | | | P | 29% | 27% | 1% | 34% | 26% | 0% |
| | | | N | 3% | 69% | 99% | 25% | 74% | 100% |
| E2 | Mesic grasslands | 14,425 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 3% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 97% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 3,333 | D | 29% | 0% | 0% | 23% | 0% | 0% |
| | | | L | 25% | 23% | 0% | 35% | 20% | 0% |
| | | | P | 21% | 25% | 23% | 23% | 36% | 15% |
| | | | N | 25% | 52% | 77% | 19% | 44% | 85% |
| E3 | Seasonally wet and wet grasslands | 3,789 | D | 2% | 0% | 0% | 1% | 0% | 0% |
| | | | L | 22% | 2% | 0% | 4% | 0% | 0% |
| | | | P | 20% | 9% | 2% | 17% | 4% | 0% |
| | | | N | 55% | 89% | 98% | 77% | 96% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 7,010 | D | 87% | 12% | 0% | 82% | 21% | 0% |
| | | | L | 13% | 43% | 9% | 15% | 30% | 16% |
| | | | P | 0% | 28% | 26% | 3% | 27% | 32% |
| | | | N | 0% | 16% | 65% | 0% | 22% | 52% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 4,978 | D | 89% | 14% | 0% | 86% | 26% | 0% |
| | | | L | 11% | 48% | 9% | 12% | 36% | 18% |
| | | | P | 0% | 24% | 37% | 2% | 19% | 42% |
| | | | N | 0% | 14% | 54% | 0% | 19% | 40% |
| F4 | Wet and dry heathlands | 1,843 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 3% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 3% | 0% | 0% | 4% | 0% | 0% |
| | | | N | 94% | 100% | 100% | 96% | 100% | 100% |

## Kazakhstan

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 402,848 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 52,048 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 52,048 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 196,136 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 200,532 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | 36,455 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 12,392 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

## Latvia

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 10,608 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 65 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

## Liechtenstein

| EUNIS CODE | | Area $km^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 2 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 16 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 100% | 0% | 0% | 100% | 0% | 0% |
| | | | N | 0% | 100% | 100% | 0% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E4 | Alpine and subalpine grasslands + Moss and | 26 | D | 100% | 0% | 0% | 100% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 100% | 0% | 0% | 100% | 0% |
| | | | N | 0% | 0% | 100% | 0% | 0% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 10 | D | 100% | 0% | 0% | 100% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 100% | 0% | 0% | 100% | 0% |
| | | | N | 0% | 0% | 100% | 0% | 0% | 100% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

# Lithuania

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 5,154 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 9 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 47% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 53% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 37 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 17% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 83% | 100% | 100% |

## Macedonia

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | 17 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 17 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 2,106 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 923 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 6% | 0% | 0% | 6% | 0% | 0% |
| | | | N | 94% | 100% | 100% | 94% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 637 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 1,319 | D | 29% | 0% | 0% | 28% | 0% | 0% |
| | | | L | 66% | 0% | 0% | 66% | 0% | 0% |
| | | | P | 4% | 6% | 0% | 6% | 6% | 0% |
| | | | N | 1% | 94% | 100% | 0% | 94% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 2,528 | D | 16% | 0% | 0% | 16% | 0% | 0% |
| | | | L | 70% | 0% | 0% | 70% | 0% | 0% |
| | | | P | 6% | 7% | 0% | 13% | 7% | 0% |
| | | | N | 7% | 93% | 100% | 0% | 93% | 100% |
| F4 | Wet and dry heathlands | 2 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

## Malta

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

# Moldova

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 1,270 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 867 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | 13 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 100% | 0% | 0% | 100% | 0% | 0% |
| | | | P | 0% | 86% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 14% | 100% | 0% | 100% | 100% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 115 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

## Netherlands

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 14,769 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 14% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 86% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 338 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 6% | 0% | 0% | 4% | 0% | 0% |
| | | | P | 13% | 4% | 0% | 3% | 0% | 0% |
| | | | N | 80% | 96% | 100% | 93% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 407 | D | 14% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 77% | 5% | 0% | 84% | 0% | 0% |
| | | | P | 9% | 79% | 5% | 11% | 14% | 0% |
| | | | N | 0% | 16% | 95% | 6% | 86% | 100% |

# Norway

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | 7 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 7 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 1,425 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 200 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 4,207 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 3,545 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 77% | 0% | 0% | 48% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 29% | 0% | 0% |
| | | | N | 22% | 100% | 100% | 23% | 100% | 100% |
| F1 | Tundra | 161,821 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 10% | 0% | 0% | 2% | 0% | 0% |
| | | | P | 5% | 1% | 0% | 7% | 1% | 0% |
| | | | N | 85% | 99% | 100% | 90% | 99% | 100% |
| F2 | Arctic, alpine and subalpine scrub habitats | 3,870 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 18% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 5% | 0% | 0% | 17% | 0% | 0% |
| | | | N | 78% | 100% | 100% | 83% | 100% | 100% |
| F4 | Wet and dry heathlands | 1,453 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

# Poland

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 32,031 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 1,818 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 35% | 0% | 0% |
| | | | P | 55% | 0% | 0% | 48% | 0% | 0% |
| | | | N | 45% | 100% | 100% | 16% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 403 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 16% | 0% | 0% | 7% | 0% | 0% |
| | | | N | 84% | 100% | 100% | 93% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 117 | D | 83% | 0% | 0% | 88% | 0% | 0% |
| | | | L | 17% | 0% | 0% | 12% | 34% | 0% |
| | | | P | 0% | 83% | 0% | 0% | 54% | 0% |
| | | | N | 0% | 17% | 100% | 0% | 13% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 165 | D | 97% | 0% | 0% | 99% | 0% | 0% |
| | | | L | 3% | 0% | 0% | 1% | 37% | 0% |
| | | | P | 0% | 97% | 0% | 0% | 62% | 0% |
| | | | N | 0% | 3% | 100% | 0% | 1% | 100% |
| F4 | Wet and dry heathlands | 4 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 16% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 84% | 100% | 100% |

# Portugal

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 64 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 6,279 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 720 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 3,999 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

## Romania

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 0 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 12 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 10% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 90% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 12 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 10% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 90% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 25,297 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 7,381 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 23% | 0% | 0% | 12% | 0% | 0% |
| | | | P | 49% | 3% | 0% | 47% | 0% | 0% |
| | | | N | 28% | 97% | 100% | 41% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 1,343 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 15% | 0% | 0% | 1% | 0% | 0% |
| | | | P | 33% | 1% | 0% | 4% | 0% | 0% |
| | | | N | 52% | 99% | 100% | 95% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 2,740 | D | 93% | 0% | 0% | 82% | 0% | 0% |
| | | | L | 7% | 53% | 0% | 18% | 7% | 0% |
| | | | P | 0% | 31% | 13% | 0% | 64% | 0% |
| | | | N | 0% | 16% | 87% | 0% | 29% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 4,246 | D | 91% | 0% | 0% | 76% | 0% | 0% |
| | | | L | 9% | 35% | 0% | 23% | 11% | 0% |
| | | | P | 0% | 40% | 9% | 0% | 52% | 0% |
| | | | N | 0% | 25% | 91% | 0% | 37% | 100% |
| F4 | Wet and dry heathlands | 25 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 45% | 0% | 0% | 12% | 0% | 0% |
| | | | P | 55% | 5% | 0% | 10% | 0% | 0% |
| | | | N | 0% | 95% | 100% | 77% | 100% | 100% |

**Serbia and Montenegro** (not separated into two countries for this exercise)

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 0 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 133 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 133 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 14,758 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 1,104 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 43% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 57% | 100% | 100% | 100% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 2,589 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 20% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 80% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 112 | D | 48% | 0% | 0% | 8% | 0% | 0% |
| | | | L | 44% | 0% | 0% | 55% | 0% | 0% |
| | | | P | 8% | 48% | 0% | 37% | 0% | 0% |
| | | | N | 0% | 52% | 100% | 0% | 100% | 100% |
| F1 | Tundra | 1,469 | D | 24% | 0% | 0% | 19% | 0% | 0% |
| | | | L | 72% | 23% | 0% | 63% | 0% | 0% |
| | | | P | 4% | 59% | 24% | 14% | 23% | 0% |
| | | | N | 0% | 18% | 76% | 4% | 77% | 100% |
| F2 | Arctic, alpine and subalpine scrub habitats | 330 | D | 59% | 0% | 0% | 6% | 0% | 0% |
| | | | L | 33% | 0% | 0% | 65% | 0% | 0% |
| | | | P | 9% | 59% | 0% | 29% | 0% | 0% |
| | | | N | 0% | 41% | 100% | 0% | 100% | 100% |
| F4 | Wet and dry heathlands | 147 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

# Slovakia

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 1,015 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 3,548 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 29% | 0% | 0% |
| | | | P | 31% | 0% | 0% | 24% | 0% | 0% |
| | | | N | 69% | 100% | 100% | 47% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 58 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 284 | D | 84% | 0% | 0% | 92% | 0% | 0% |
| | | | L | 16% | 0% | 0% | 8% | 62% | 0% |
| | | | P | 0% | 62% | 0% | 0% | 23% | 0% |
| | | | N | 0% | 38% | 100% | 0% | 15% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 1,723 | D | 44% | 0% | 0% | 69% | 0% | 0% |
| | | | L | 54% | 0% | 0% | 31% | 36% | 0% |
| | | | P | 2% | 38% | 0% | 0% | 24% | 0% |
| | | | N | 0% | 62% | 100% | 0% | 41% | 100% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

# Slovenia

| EUNIS CODE | | Area km$^2$ | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 1,845 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 934 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 8% | 0% | 0% | 7% | 0% | 0% |
| | | | P | 41% | 7% | 0% | 22% | 0% | 0% |
| | | | N | 51% | 93% | 100% | 71% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 128 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 3% | 0% | 0% | 3% | 0% | 0% |
| | | | P | 70% | 3% | 0% | 67% | 0% | 0% |
| | | | N | 27% | 97% | 100% | 30% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 126 | D | 85% | 0% | 0% | 80% | 0% | 0% |
| | | | L | 15% | 4% | 0% | 20% | 4% | 0% |
| | | | P | 0% | 70% | 4% | 0% | 14% | 0% |
| | | | N | 0% | 25% | 96% | 0% | 81% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 436 | D | 85% | 0% | 0% | 82% | 0% | 0% |
| | | | L | 15% | 5% | 0% | 18% | 3% | 0% |
| | | | P | 0% | 77% | 3% | 0% | 10% | 0% |
| | | | N | 0% | 18% | 97% | 0% | 86% | 100% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

## Spain

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 1,191 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 110 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 110 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 41,869 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 532 | D | 2% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 37% | 0% | 0% | 2% | 0% | 0% |
| | | | P | 38% | 11% | 0% | 37% | 2% | 0% |
| | | | N | 23% | 89% | 100% | 61% | 98% | 100% |
| E3 | Seasonally wet and wet grasslands | 15,681 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 2,172 | D | 78% | 7% | 0% | 38% | 0% | 0% |
| | | | L | 22% | 31% | 0% | 62% | 8% | 0% |
| | | | P | 0% | 40% | 14% | 0% | 30% | 7% |
| | | | N | 0% | 22% | 86% | 0% | 62% | 93% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 1,823 | D | 78% | 3% | 0% | 37% | 0% | 0% |
| | | | L | 22% | 35% | 0% | 60% | 3% | 0% |
| | | | P | 0% | 41% | 10% | 3% | 35% | 3% |
| | | | N | 0% | 22% | 90% | 0% | 63% | 97% |
| F4 | Wet and dry heathlands | 8,725 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

## Sweden

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 2,662 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 62 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 50 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 1,763 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| F1 | Tundra | 29,672 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| F2 | Arctic, alpine and subalpine scrub habitats | 271 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| F4 | Wet and dry heathlands | 184 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

## Switzerland

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | 3,799 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 6,784 | D | 6% | 0% | 0% | 3% | 0% | 0% |
| | | | L | 29% | 0% | 0% | 41% | 3% | 0% |
| | | | P | 65% | 22% | 0% | 52% | 20% | 3% |
| | | | N | 0% | 78% | 100% | 4% | 78% | 97% |
| E3 | Seasonally wet and wet grasslands | 25 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 63% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 28% | 8% | 0% | 74% | 0% | 0% |
| | | | N | 8% | 92% | 100% | 26% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 363 | D | 100% | 28% | 0% | 98% | 2% | 0% |
| | | | L | 0% | 43% | 0% | 2% | 77% | 2% |
| | | | P | 0% | 27% | 68% | 0% | 9% | 65% |
| | | | N | 0% | 2% | 32% | 0% | 12% | 33% |
| F1 | Tundra | 4,365 | D | 100% | 44% | 14% | 99% | 57% | 6% |
| | | | L | 0% | 55% | 44% | 1% | 35% | 62% |
| | | | P | 0% | 1% | 42% | 0% | 7% | 25% |
| | | | N | 0% | 0% | 1% | 0% | 0% | 7% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |

## Turkey

| EUNIS CODE | | Area km2 | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 39,187 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 371,309 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 371,309 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 73,123 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | 1 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E3 | Seasonally wet and wet grasslands | 137,180 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 1% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 99% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | 4 | D | 80% | 0% | 0% | 36% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 64% | 0% | 0% |
| | | | P | 20% | 44% | 0% | 0% | 36% | 0% |
| | | | N | 0% | 56% | 100% | 0% | 64% | 100% |
| F1 | Tundra | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F2 | Arctic, alpine and subalpine scrub habitats | 5 | D | 41% | 0% | 0% | 41% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 59% | 0% | 0% |
| | | | P | 59% | 0% | 0% | 0% | 41% | 0% |
| | | | N | 0% | 100% | 100% | 0% | 59% | 100% |
| F4 | Wet and dry heathlands | 3,141 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 21% | 0% | 0% | 2% | 0% | 0% |
| | | | N | 79% | 100% | 100% | 98% | 100% | 100% |

## Ukraine

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E1.7 | Non-med dry acid and neutral closed grassland | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E 1.9 | Inland Dunes | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2 | Mesic grasslands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | 163 | D | 2% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 58% | 0% | 0% | 73% | 0% | 0% |
| | | | P | 21% | 2% | 0% | 7% | 47% | 0% |
| | | | N | 19% | 98% | 100% | 21% | 53% | 100% |
| F2 | Arctic, alpine and subalpine scrub habitats | 24 | D | 63% | 0% | 0% | 80% | 0% | 0% |
| | | | L | 37% | 2% | 0% | 20% | 3% | 0% |
| | | | P | 0% | 61% | 0% | 0% | 60% | 0% |
| | | | N | 0% | 37% | 100% | 0% | 36% | 100% |
| F4 | Wet and dry heathlands | 1,250 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |

## Uzbekistan

| EUNIS CODE | | Area km² | | 2005 Min CL | 2005 Mean CL | 2005 Max CL | 2010 Min CL | 2010 Mean CL | 2010 Max CL |
|---|---|---|---|---|---|---|---|---|---|
| E1.2 | Sub-atlantic semi-dry calcareous grassland | 55,622 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E1.7 | Non-med dry acid and neutral closed grassland | 1,650 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E 1.9 | Inland Dunes | 1,650 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2 | Mesic grasslands | 2,034 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E2.3 | Moutain hay meadows | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| E3 | Seasonally wet and wet grasslands | 106,463 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| E4 | Alpine and subalpine grasslands + Moss and | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F1 | Tundra | 0 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |
| F2 | Arctic, alpine and subalpine scrub habitats | - | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 0% | 0% | 0% | 0% | 0% | 0% |
| F4 | Wet and dry heathlands | 10,726 | D | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | L | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | P | 0% | 0% | 0% | 0% | 0% | 0% |
| | | | N | 100% | 100% | 100% | 100% | 100% | 100% |