Development of distribution maps of grassland habitats of EUNIS habitat classification

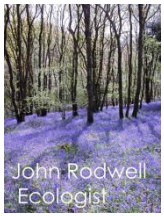
Joop H.J. Schaminée
Milan Chytrý
Jürgen Dengler
Stephan M. Hennekens
John A.M. Janssen
Borja Jiménez-Alfaro
Ilona Knollová
Flavia Landucci
Corrado Marcenò
John S. Rodwell
Lubomír Tichý
and data-providers

Report EEA/NSS/16/005

Alterra, Institute within the legal entity Stichting Dienst Landbouwkundig Onderzoek

Professor Joop Schaminée
Stephan Hennekens

Partners
Professor John Rodwell, Ecologist, Lancaster, UK
Professor Milan Chytrý, Masaryk University, Brno, Czech Republic
Doctor Ilona Knollová, Masaryk University, Brno, Czech Republic
Doctor Lubomír Tichý, Masaryk University, Brno, Czech Republic



Date: 07 December 2016

Alterra
Postbus 47
6700 AA Wageningen (NL)
Telephone: 0317 – 48 07 00
Fax: 0317 – 41 90 00

In 2003 Alterra has implemented a certified quality management system, according to the standard ISO 9001:2008.

Since 2006 Alterra works with a certified environmental care system according to the standard ISO 14001:2004.

TABLE OF CONTENTS

7 Recommendations and future prospects

8 References

Appendix A: Crosswalk of EUNIS and Red List habitat codes and names with possible further revisions

Appendix B: List of the grassland habitat types that are treated in the project, based on the revised EUNIS classication

Appendix C: Formal definitions of EUNIS grassland habitat types used in the expert system

Appendix D: Lists of indicator species of the revised EUNIS grassland habitat types

Appendix E: Descriptions of the revised EUNIS grassland habitat types

Appendix F: List of data providers

Appendix G: Maps of distribution of phytosociological relevés of the revised EUNIS grassland habitat types

1 Introduction

The EU and global biodiversity targets for 2020 call for an enhanced capability of monitoring, reporting and assessing progress in the thematic area of biodiversity. A review of the available tools used to describe components of biodiversity at a European scale is a necessary preparatory action to meet the needs of the new biodiversity targets.

The EEA hosts and maintains the biodiversity data centre, where European data sets and information on sites, species and habitats of Europe are published. Together with data sets provided by other environmental data centres, these data sets support the assessment of progress in achieving biodiversity targets as shown in the Biodiversity Information System for Europe (BISE). BISE, along with the Water Information System for Europe (WISE), anticipates an integration of ecosystem assessment across Europe.

The EEA has developed the European Nature Information System (EUNIS) habitat classification and maintains it as part of the biodiversity data centre. The aim of the EUNIS habitat classification (Davies & Moss 1999) is to provide a pan-European reference set of habitat units with a common unit description within a hierarchical classification aiming to fulfil specific objectives and support specific applications related to biodiversity monitoring and reporting at the European scale. Such applications include reporting for the implementation of the EU Habitats Directive and the Bern Convention, as well as providing information in the context of the Common Agricultural Policy (CAP) and the Regional Development Funds. A European standard list of habitat types is also necessary for the implementation of the INSPIRE Directive, to which other national or regional classifications will have to make reference to be comparable.

Further to the above, the EEA is participating in the Mapping and Assessment of Ecosystems and their Services (MAES), an activity within the framework of the EU Biodiversity Strategy. Relevant to this activity, and in support of the ecosystem assessment of Europe, is the development of a baseline for documenting, monitoring and assessing the quality of habitats across Europe, by analysing existing in situ vegetation monitoring data in accordance with the EUNIS habitat classification.

The aim of this contract is to provide distribution maps and descriptions of EUNIS grassland habitat types. The requested services are building on the outcomes of work package 1 under Service contract 3417/B2015/EEA.56197, of which the results were published earlier this year (Schaminée et al. 2016). The grassland habitat types in focus are included under habitat group E (Grasslands), specifically subgroups E1, E2, E3 and E4 and, if appropriate, subgroups E5 and E6, as well as grasslands included under habitat group B, subgroups B1.4 (Coastal stable dune grassland) and B1.9 (Machair), on the basis of in situ vegetation measurements across Europe. The mapping of

distribution of phytosociological relevés for the grasslands will be based on lists of indicator species, derived from the analysis of vegetation databases across Europe. The maps and the data supporting them are intended to be used in the EUNIS website and also for modelling the predicted habitat suitability of these habitats across Europe for each of the grassland habitat types.

The assessment of the EUNIS grassland habitat types fits in a series of projects, that started in 2012 with a project to revise the crosswalk of EUNIS to phytosociological syntaxa (Rodwell et al. 1998, 2002) and to inform on the capacity of in situ vegetation recording for demonstrating trends in habitat diversity and quality (Schaminée et al. 2012). The actual underpinning of the EUNIS classification with in situ vegetation plot data was the next step. As a first group of habitat types the forests were considered, resulting in the EEA technical report *Review of EUNIS forest habitat classification* (Schaminée et al. 2013). A second group of habitat types (heathland, scrub and tundra vegetation) was the subject of an EEA project that was carried out in 2014 (Schaminée et al. 2014).

As mentioned in the 2016 report, Grasslands are of great importance in European nature policy, of widespread distribution, housing a large proportion of the biodiversity in this part of the world, and everywhere under threat. The existing descriptions are insufficient and inadequately supported by in situ vegetation data which limit the usability of the EUNIS habitat classification.

The objectives of the project were specified as tasks in the Annex I of the tender specifications (EEA/NSS/16/003) and elucidated in the Inception Report (February 2016, Service Contract No. 3417/B2016/EEA.56510):[1]

Task 2 To prepare lists of 'indicator species' of all grassland habitat types (level 3) based on vegetation database analyses, taking into account the outcome of work package 1 of Service contract 3417/B2015/EEA.56197.

Task 3 To prepare maps of distribution of phytosociological relevés for each of the grassland habitat types for which fact sheets are provided in work package 1 of Service contract 3417/B2015/EEA.56197.

Task 4 To provide descriptions, in the standard format, for each of the grassland habitat types, and to provide input for relevant updates in relation to grasslands for each alliance of the EuroVegChecklist to the EUNIS-

[1] Task 1 of the Work Package concerned the Inception Report. The approach to the work was discussed at a meeting on the results of the previous grassland project (Service contract 3417/B2015/EEA.56197) at the European Environment Agency in Copenhagen on the 22nd of February 2016, attended by Mette Palitzsch Lund (EEA project manager), Annemarie Bastrup-Birk (EEA Copenhagen), Joop Schaminée, Stephan Hennekens (both Alterra Wageningen, The Netherlands), John Rodwell (Lancaster, UK), Milan Chytrý (Masaryk University, Brno, Czech Republic), and – by teleconferencing – Doug Evans (ETC-BD Paris).

EuroVegChecklist crosswalks of 2012 (in case changes have been introduced to the latter).

With the agreement of the EEA, also included in this report is a chapter on relationships between the EUNIS revision process and the European Red List of Habitats (hereafter Red List) and an indication of how this convergence might be taken forward.

2 Scope of the project

2.1 Background

In 2015, the European Environment Agency (EEA) launched an open call for tender No EEA/NSV/15/005 aiming at the 'Review of grassland habitats and development of distribution maps of heathland/scrub habitats of EUNIS habitats classification'. The tender specifications foresaw the possibility of awarding a separate service contract to the successful tenderer for documenting each of the revised EUNIS grassland habitats with lists of indicator species, distribution maps of plot observations (phytosociological relevés) and descriptions in a standardized format.

The work would include all EUNIS grassland habitat types as listed under habitat group E (Grasslands), specifically subgroups E1, E2, E3 and E4 and, if appropriate, subgroups E5 and E6, as well as grasslands included under habitat group B, subgroups B1.4 (Coastal stable dune grassland) and B1.9 (Machair), on the basis of in situ vegetation records across Europe. The selection of relevant habitat types was discussed in detail during the work on the previous contract, in close collaboration with the DG Environment project European Red List of Habitats (hereafter Red List). It was decided to consider here those EUNIS E habitat types that are natural or semi-natural vegetation dominated by grasses, or grasses and herbs, and to treat the rest of the habitat types elsewhere (see further under Chapter 6).

The result of this decision was that the habitat types E5.2 (Thermophilous woodland fringe[2]), E5.4 (Moist or wet tall-herb and fern fringe of the lowlands), E5.5 (Subalpine moist or wet tall-herb and fern stand), as well as both habitat types of subgroup E6 (E6.1 Mediterranean inland salt steppe and E6.2 Continental inland salt steppe) have been taken into account now. The EUNIS categories E7 (Wooded pasture and meadow) were not dealt with, as these types are complexes of different vegetation types. The same applies to B1.9 (Machair), as was discussed in the previous report (Par. 3.3). The habitat type was concerned to be a vegetation complex as well as – more restricted – a grassland habitat type. Floristically the grassland part has the same content as the Irish and Scottisch representatives of the revised habitat type B1.4a (Atlantic and Baltic coastal dune grasslands). Several habitat types of the E group have been omitted as these types must be merged with other habitat types (see Par. 3.2 of the previous report). This applies to E1.4 (Mediterranean tall grass and Artemisia steppes), E2.5 (Meadows of the steppe zone) and E4.2 (Moss and lichen dominated mountain summits, ridges and exposed slopes). Habitat type E1.4 was partly merged with E1.3b (Mediterranean tall perennial dry grassland) and partly with F6.8a (Mediterranean halo-nitrophilous scrub) and F6.8b (Caspian Sea halo-

[2] Habitat names follow the revisions summarised in Appendix A.

nitrophilous scrub). E2.5 is now included in E1.2a (Sem-dry perennial calcareous grassland). E4.2 is moved in the EUNIS revision to group H (Inland unvegetated or sparsely vegetated habitats). A special case is habitat type E1.1c (Boreal open, sub-thermophilous grassland on shallow soils on siliceous rock outcrops), that was proposed in the previous report as a new EUNIS habitat type, but was merged in the Red List project with habitat type E1.1b (Temperate and boreal pioneer grassland on shallow soils on silicious rock outcrops), a decision we are following now. Some habitat types were omitted as they are not grasslands, such as E1.C (Dry mediterranean lands with unpalatable non vernal herbaceous vegetation) and E5.3 (Pteridium aquilinum stand), having not a clear definition, such as E1.D (Unmanaged dry grassland), E2.7 (Unmanaged mesic grassland) and E2.8 (Trampled mesophilous grasslands with annuals), or are anthropogenic/agricultural habitats, such as E1.6 (Subnitrophilous annual grassland), E2.6 (Agriculturally-improved, re-seeded and heavily fertilised grassland, including sports fields and grass lawns), E1.E (Trampled dry grassland with annuals) and E5.1 (Anthropogenic herb stands). It still is an open question how to treat these in the final EUNIS classification; they probably will have to be reallocated. In total, 32 of the original EUNIS grassland habitat types will be considered as target habitat types (54 redefined types, see Appendix A).

2.2 Review of the EUNIS grassland habitat types

In the 2012 (crosswalks), 2013 (forests), 2014 (heathlands, scrubs and tundras) and 2016 (grasslands I) research reports provided by our consortium for the EEA, it has been shown how the classification of vegetation types and its underlying *in situ* data, as provided by phytosociologists throughout Europe, could support the use of reference systems of habitat types for policy making, such as the EUNIS habitat classification (Davies & Moss 1999; Davies et al. 2004; Moss 2008). For a short overview of backgrounds and developments in vegetation research and the current availability of software packages for processing phytosociological data, such as JUICE (Tichý 2002) and TURBOVEG (Hennekens & Schaminée 2001), we refer to these reports; here, we will only mention two important initiatives that were launched during the last decade: the *EuroVegChecklist* and *European Vegetation Archive*.

The *EuroVegChecklist* is an attempt to achieve a respectable level of stability in European vegetation classification, by providing a comprehensive overview of vegetation units at the levels of alliances, orders and classes, based on expert revision by a team under the leadership of Professor Ladislav Mucina. It reviews and integrates the massive number of formally described plant communities at all levels in national and regional studies, covering all Europe as well as territories such as the Azores, Canary Islands, Cyprus, Caucasus and Greenland. A first version was submitted to the journal *Applied Vegetation Science* in 2013 for publication and after review and further

revisons will be published before the end of this year (Mucina et al. 2016). Under the name *Vegetation of Europe*, it comprises hierarchical floristical classification systems of not just vascular plant communities, but also of bryophyte, lichen and algal communities. The vascular plant communties include 109 classes, 300 orders and 1108 alliances.

The *European Vegetation Archive* (EVA) is a centralized database of European vegetation plots. It stores copies of national and regional vegetation-plot databases on a single software platform. The management of multiple databases is facilitated by the SynBioSys Taxon Database, a system of taxonomic names and concepts used in the individual databases and their matches to a unified list of European flora. Data storage in EVA does not affect the ongoing independent development of the contributing databases, which remain the property of the data contributors (www.euroveg.org/eva-database). By November 2016, more then 60 databases from all European regions, have joined EVA. The centralised database contained in total 1,288,171 vegetation plots from most European regions, especially from western, central and southern Europe (see Figure 2.1). However, there still is a lack of data from Scandinavia and eastern European countries, i.e. Europe-

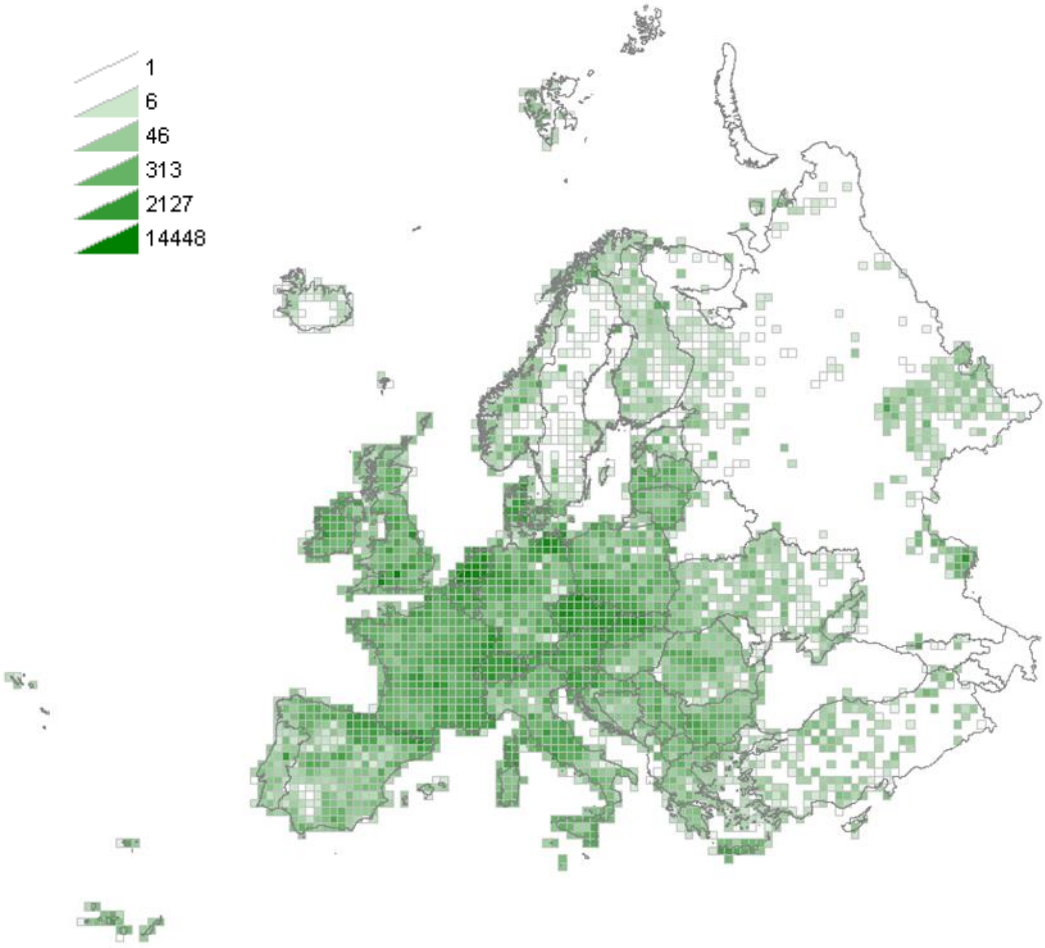


Figure 2.1. Density of all georeferenced plots in EVA in 50 x 50 km grid cells at 6-11-2016 (based on 1,288,171 plots).

an regions with less strong or interrupted phytosociological traditions. The majority of these plots (87%) have geographic coordinates.

The EUNIS grassland habitat types were reviewed in line with the recommendations for improving the EUNIS forest habitat classification (Schaminée et al. 2013) and the heathland, tundra and scrub classification (Schaminée et al. 2014), of which the results were published in the 'Grassland I report' earlier this year (Schaminée et al. 2016). Again, two types of recommendations were proposed, one concerning the classification itself, with recommendations for new units by splitting and merging existing units, and one dealing with their naming (see the EEA 2013 report fur further details).

Our main conclusion was that the EUNIS grassland habitat types are generally too broad and therefore should be divided. The proposed revision is mainly based on floristic composition, whereas EUNIS sometimes follows a division based on vegetation stucture (for example open and closed grassland). The level of the Order in syntaxonomy proves to be especially appropriate for making distinctions. The proposed classification based on species composition brings together grasslands with a similar soil, hydrology and management. Quite often these grasslands are zonal, being related to particular climatic conditions, and so confined to a specific geographic region, which can be reflected in the name (boreal, continental, submediterranean, and so on).

Discussions between the EEA, the ETC-BD and the team working on the DG Environment Red List (Rodwell et al. 2013, Janssen et al. 2016) resulted in a clear desire for close collaboration, ensuring a harmonisation of the two habitat typologies. As both programmes have a different time line, the Red List adopted for its typology of forest habitats and heathland, scrub and tundra habitats the revised classification of the 'EUNIS Project' almost without exception[3], whereas the grasslands habitat types were reviewed in a joint effort. In coming projects, the Red List typology will be a strong guidance for the aimed revision of the EUNIS classification (see further under Chapter 7).

[3] The very few exceptions are described in Paragraph 6.2 and highlighted in Appendix A.

3 Indicator species of the revised EUNIS grassland habitat types

3.1 Background

In our April 2016 report (Schaminée et al. 2016), vegetation plots (phytosociological relevés) representing EUNIS habitat types of grasslands were identified in the databases of the Braun-Blanquet project and in the European Vegetation Archive (EVA; Chytrý et al. 2016) using a crosswalk between syntaxa (phytosociological alliances) and EUNIS habitat types (Schaminée et al. 2012, with later updates). This work identified gaps in the data and enabled subsequent targeted gap filling. At the same time, a computer expert system for identification of EUNIS habitat types of heathlands, scrub and tundra was created and indicator species of these habitats were identified. The expert system of EUNIS habitat types of forests was updated and a corresponding update of the indicator species lists for forest habitats was provided (Schaminée et al. 2016).

The main methodological principles of the previous work were the following:

1) Identification of EUNIS habitat types in a large European database of vegetation plots was done using a newly developed computer expert system. This expert system comprised formal definitions of individual habitats, which were used to identify vegetation plots belonging to these habitats in the database. The expert system approach has the following advantages: (i) it applies habitat classification consistently across the whole of Europe, unlike classifications based on expert assignments to phytosociological alliances, which depend on subjective judgement of various experts and varying regional traditions; (ii) it enables identification of vegetation plots that have not been labelled by the alliance names; (iii) it can be used to classify any vegetation plot obtained in the future using the same criteria.

2) Indicator species of habitat types were obtained through statistical analysis of the groups of vegetation plots classified by the expert system. Three types of indicator species were provided: diagnostic species, constant species and dominant species. Each of these types of indicator species has a different meaning and together they provide a comprehensive characterization of the habitat's species diversity. Diagnostic species are species with occurrences concentrated in the habitat, being absent or rare in other habitats. As such they are good positive indicators of the habitat, but they do not need to be present at every site where the habitat occurs. Constant species are species frequently occurring in the habitat, but they may include generalist species that are also frequent in other habitats. Dominant species are those that often reach high cover in the habitat, thus determining the habitat physiognomy.

In this report we extend the previously developed expert system for EUNIS habitat groups G (Forests) and F (Heathlands, scrub and tundra) to cover also group E (Grasslands). However, European grassland habitats are generally defined based on different principles than forests, heathlands and scrub. While woody habitats of groups F and G can be defined based mainly on the dominance of a few species of trees and shrubs (e.g. beech forest habitats are defined by the dominance of *Fagus*), grasslands are species-rich ecosystems with a less prominent dominance structure, or with dominant species changing in space and time. Therefore most grassland habitats have to be defined based on the total species composition, which required a different methodological approach to be used in the expert system. We developed such an approach together with a software solution in the framework of the current project. Here we present both this new approach and the resulting classification of European vegetation plots to the revised EUNIS grassland habitat types.

3.2 Expert system method to classify grassland habitats

The expert system for automatic classification of vegetation plots to habitat types was developed within this project as a software tool implemented in the JUICE 7 software and, in a simpler form, also in the Turboveg 3 software. This software uses the formal definitions of individual habitat types which are defined as logical formulas in an editable script stored as a TXT file. All plots from a vegetation database submitted to the software are checked as to whether they meet the conditions of some of the formal definitions of habitats included in this script. If they do, they are assigned to this habitat.

The information used by the expert system includes the species composition of vegetation plots and percentage cover of species. Species composition is identified using groups of species that are similar in their ecology or distribution ranges. Each group is indicated by a three-character string which indicates how the group is used in the expert system. The basic types of species groups are the following:

Sociological species groups. The concept of sociological species groups follows Bruelheide (1995, 2000) and Kočí et al. (2003). A species group of this type is considered to be present in a vegetation plot if more than a specified number of species of the group is present in the plot. In the expert system file these groups are defined with the string ### followed by the group name. When the ### string is used in the formula defining the habitat type, the minimum number of species is by default set to half of the total number of species of this group. This default setting is useful especially for classification to finely-divided habitat types that is based on small sociological groups that contain few species. However, broad habitat types such as those used in the revised EUNIS classification are usually characterized by many species, but only few of them co-occur at particular sites representing the habitat type. Therefore, smaller thresholds can be specified by replacing two

hashes by the minimum number of species required. For example, #03 followed by the group name used in the formula means that occurrence of at least three species of the group is required for the group to be considered as present in the plot.

Total-cover groups. The concept of total-cover groups follows Landucci et al. (2015). A species group of this type is considered to be present in a vegetation plot if the total cover of all species of the group exceeds a specified threshold. In the expert system file these groups are defined with the string ### followed by the group name, i.e. in the same way as the sociological species groups. The same species group can be therefore used both as a sociological species group and a total-cover group. The use of the group as a total-cover group is defined in the formulas by coding them with the string #TC and specifying the threshold cover. For example, <#TC Group-name GR 25> means that a group is considered to be present in the plot if its species have a total cover higher than 25% in this plot. This group can be represented by a single species with a cover higher than 25%, or several species, each with an individual cover lower than 25%, but with a cover exceeding 25% if their individual covers are combined. Covers are combined based on an algorithm implemented in the Juice program, assuming random overlap of covers of individual species. This algorithm was proposed by Chytrý et al. (2005) and recently formally described by Fischer (2015). Alternatively, a cover of single species can be used instead of the total cover of a species group. The total-cover groups or covers of single species are especially useful to identify habitat types that are defined based on the dominant species, e.g. heathland is a habitat determined by the dominance of a few species of ericoid dwarf shrubs. Therefore the total-cover groups and covers of single species were extensively used in the expert system to define forests and scrub habitats (Schaminée et al. 2016), but they are not useful for defining habitat types with weak and irregular dominance, particularly for grasslands.

Diagnostic species groups. The concept of diagnostic species groups follows Dengler et al. (2006) and Mucina et al. (2016). If this type of species group is used, each habitat type in the classification is represented by a single species group of this type, which includes its diagnostic species. One species can be assigned to more than one of these groups. The lists of the diagnostic for the expert system are initially prepared by compilation of the species lists published in the literature, which can be further modified based on statistical analysis of plots assigned to the habitat type. In the expert system file these groups are defined with the string ##D followed by the group name. A plot is assigned to that habitat type whose diagnostic species group is most represented in this plot. The measure of representation can be the number of species of the group (in that case the ##D string is used in the formulas), the total percentage cover of the group, based on the assumption of random overlap of individual species covers (##C) or the sum of square-rooted percentage covers of individual species (##Q). The last mentioned method provides an intermediate solution between the emphasis on species numbers and the emphasis on total species cover, which can, in some cases, lead to counter-intuitive classification (especially when a plot contain several species

of one habitat type with small cover and one species of another habitat type with high cover).

These three types of species groups can be combined in single formulas defining the habitat types. In the formulas the conditions defined by species groups are combined using the logical operators AND, OR and NOT, following the proposals of Bruelheide (1997), and also relational operators GR (= greater than) or GE (= greater than or equal to). To define habitat types characterised by dominance of single species or species groups (e.g. forests, scrub, marshes, aquatic vegetation), total-cover groups are often sufficient. For grasslands, however, the use of diagnostic species groups is necessary.

The expert system can be used in a hierarchical mode. In that case, the definitions with the highest priority are applied to the dataset first, resulting in habitat assignment of some plots, while other plots remain unclassified. Then, the definitions with lower priority are applied only to the plots that have not been classified by the plots of higher priority. Consequently, one habitat type can have two definitions. The definition applied at a higher priority level can be based on the occurrence of sociological species groups or total-cover groups that include species narrowly specialized to this habitat. This definition usually classifies those plots that are very typical examples of the habitat, but it leaves many less typical plots of this habitat unclassified. Subsequently a definition at a lower priority level, based on diagnostic species groups, is applied to unclassified plots. This definition classifies plots that are less typical examples of the habitat but still exhibit a higher degree of membership to this habitat than to any other habitat. For example, on the first priority level of classification the habitat type E11a Pannonian and Pontic sandy steppe is defined by the formula:

<#TC E11a-Pannonian-and-Pontic-sandy-steppe-specialists GR15> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

which means that total cover of the species group E11a-Pannonian-and-Pontic-sandy-steppe-specialists, including a selection of narrow specialists of this habitat, must have a cover greater than 15% and neither the groups of trees nor the group of shrubs can have a cover higher than 5%. Then, the following formula defining the same habitat is applied to the plots that were not classified by the formulas on the first priority level:

(<##Q E11a-Pannonian-and-Pontic-sandy-steppe> AND <#03 E11a-Pannonian-and-Pontic-sandy-steppe>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

which means that the sum of square-rooted percentage covers of a group of typical species of this habitat (including both the narrow specialists and frequently occurring less specialized species) is higher than the sum of square-rooted percentage covers of any other diagnostic species group *and* the plot contains at least three species of this group *and* the total cover of both trees and shrubs does not exceed 5%.

3.3 Data and information sources used to create the expert system and habitat classification

The vegetation-plot dataset used for the analysis was compiled from the EVA database and the Braun-Blanquet project database. This data set contained a total of 1,288,169 vegetation plots from Europe, including a small number of plots from adjacent regions such as Greenland, Siberia, Anatolia and the Mediterranean coast of North Africa (see Figure 2.1). All vegetation types were included. The dataset was prepared using the Turboveg 3 program (S.M. Hennekens, unpublished) and analyzed using the Juice 7 program (Tichý 2002).

Taxon names in this dataset originated from several source databases, which use different taxon lists with partly inconsistent taxonomic concepts and nomenclature. Taxon names were unified in the Turboveg 3 program in two steps. First, names from the original databases were interpreted within a regional context, considering the taxonomic concepts and nomenclature used in the focal regions of each database. In this step, taxon lists of most of the databases (including all the largest ones) were matched to the SynBioSys Taxon Database, a working database of the EVA project that is not linked to a single taxonomic standard. Secondly, names from the SynBioSys taxon database and names from the original databases that did not match any name in the SynBioSys taxon database were translated to the nomenclature of Euro+Med PlantBase (Euro+Med 2006–2016; ww2.bgbm.org/EuroPlusMed), using an up-to-date list of accepted names and synonyms provided by Dr. Eckhard von Raab-Straube from the Botanischer Garten und Botanisches Museum Berlin-Dahlem in October 2016. Synonyms that can relate to more than one accepted name were assigned to one of these names following the prevailing use of this synonym in most of the modern European floras. The names from the SynBioSys Taxon Database or the names from the taxon lists of the source vegetation-plot databases were used for ca. 5% of European vascular plants that are not yet included in the Euro+Med PlantBase and for other names that did not match any valid name or synonym of the Euro+Med PlantBase.

As a baseline for the compilation of diagnostic species groups of individual habitats for the expert system, we took the species lists included in the Habitat descriptions used in the Red List (Janssen et al. 2016). These lists were critically revised based on phytosociological literature, data from our previous report (Schaminée et al. 2016), our personal field experience, and trial analyses of the vegetation plot database used in this project. In connection with this revision, we also selected smaller groups of narrow habitat specialists or typical dominant species, which were used as sociological species groups or total-cover groups.

A database of European trees, shrubs and dwarf shrubs developed for previous projects in 2014–2015 was further extended and revised and other

plant growth forms and life-history types such as hemicryptophytes (perennial herbs), chamaephytes (dwarf shrubs and herbs with above-ground buds) and therophytes (annual plants) were added as a separate species groups and used as sociological species groups or total-cover groups in some definitions.

A total of 76 definitions of 54 habitat types (some habitat types with two definitions) were developed and included in the expert system (Appendix E). The species composition of all 1,288,169 vegetation plots was compared with all the formal definitions. The plots assigned to individual habitats were checked for species composition and mapped, and based on the results, formal definitions were adjusted and errors in the input database corrected. This procedure was repeated several times until an optimal solution was achieved. At the end 289,992 plots were classified as one of the 54 grassland habitat types.

The groups of plots assigned to EUNIS habitat types were used to prepare distribution maps. As some of the coastal dune habitat types could not be separated from the inland sand grasslands based on their species composition, these types were separated using a geographic information system by taking a distance of 500 m from the coast as a division criterion.

3.4 Indicator species of the revised EUNIS grassland habitat types

Three groups of indicator species were defined and extracted for each of the revised EUNIS grassland habitat types based on the groups of vegetation plots assigned to habitat types by the expert system. These groups included diagnostic, constant and dominant species.

It is important to note that diagnostic species were both used as an input to the expert system and created as an output of statistical analysis of groups of vegetation plots classified by this expert system. The input groups of diagnostic species were based on the expert-based compilation of various sources, including the European Red List of Habitats and various phytosociological literature. Consequently, these groups may contain various inconsistencies. The input groups are described in Section 3.2. The output groups were based on the statistical analysis of the classified vegetation plots, which is described in this section. The output groups are more consistent and more reliable. Further development of methods should focus on iterative procedures that would feed back the output groups to the expert system, where they would replace the initial input groups, the updated expert system would be used to reclasify the vegetation-plot data, new output groups would be recalculated based on the new classification, fed back to the expert system and so forth until reaching the convergence between the input and output groups.

An important issue that had to be solved before computing indicator species was the geographical stratification of the vegetation-plot dataset (Knollová et al. 2005). This was needed in order to remove the effect of geographically unbalanced sampling effort across Europe, which meant that some relatively small areas had a high concentration of vegetation plots, while other (often large) areas were represented by few or no plots, even though the habitat type most probably occurs there.

For the purpose of the stratified resampling, the data set was divided into two parts – plots classified as grassland habitat types and plots representing other types. Aquatic vegetation plots and vegetation plots from Greenland, North Africa and Asia east of 60° E were deleted prior to the stratification. Geographical stratification of the classified part of the data set was performed in a grid of 3 x 5 minutes. If a cell of this grid contained more than 1 plot belonging to the same habitat type, one plot was selected randomly and the others were deleted. Geographical stratification of the unclassified part of the data set (plots with geographical coordinates) started with its random division to 10 subsets with equal numbers of plots. Within each subset, one randomly selected plot from each grid cell of 3 x 5 minutes (approximately 5.5 x 6 km at 50° N) was included in the resampled file, while others were deleted. In this way, up to 10 times more unclassified plots were selected from each grid cell, which is justified by the fact that unclassified plots belonged to many habitat types, while for the classified plots selection was always made from a single habitat type. The number of plots in the resampled dataset was much smaller than the total number of plots of these habitats available, but the advantage of this dataset was that it was more representative. Plots of the other types had to be retained in the dataset to provide background for calculating the degree of concentration of species occurrences within the target vegetation type in the computation of diagnostic species.

Diagnostic species were determined based on the degree of concentration of their occurrences in groups of plots representing each EUNIS habitat type. This degree of concentration was calculated using the phi coefficient of association (Sokal & Rohlf 1995) standardized for the identical number of relevés across all groups, which was arbitrarily set to 1% of the total data set (Tichý & Chytrý 2006). The species with a value of phi for the particular habitat higher than 0.15 were considered as diagnostic for this habitat type. However, for some habitat types represented by a low number of plots in the stratified dataset, the concentration of species occurrence within the type may not have been statistically significant. Therefore statistical significance of the species-habitat type association was tested using the Fisher's exact test (Sokal & Rohlf 1995) and if this association was not significant at $P < 0.05$, the species was excluded from the list of diagnostic species (Tichý & Chytrý 2006).

Constant species were defined as those with constancy (= percentage occurrence frequency) in the target habitat type at least 10%.

Dominant species were defined as those that occurred with a cover higher than 25% in at least 5% of vegetation plots classified to the target habitat

type. This means that a species is considered as dominant even if it does not belong to the tallest vegetation layer, and a single plot can have more than one dominant species, or no dominant species if vegetation is very sparse or if cover values of all species are lower than 25%.

Records of species identified only to the genus level were removed from the lists of indicator species. Bryophytes and lichens were included in the calculation of diagnostic, constant and dominant species. However, these taxa were recorded only in some plots, which means that their diagnostic values and values for constancy and dominance are underestimated. It was not possible to calculate these values only for the plots in which they were recorded, because often it was unclear whether their absence in a plot means that they were really absent or they were present but not recorded. Still we list these species with their calculated values at the outputs because they have some information value, though not directly comparable with the values reported for vascular plants.

The resulting lists of indicator species for EUNIS grassland habitat types, including diagnostic, constant and dominant species, are presented in Appendix D.

4 Maps of distribution of the revised EUNIS grassland habitat types

4.1 Background

For policy planning, the distribution of habitat types is an important source of spatial information for assessing the possible effects of human impacts on biodiversity. This includes a wide range of pressures going along with changes in land use (agriculture, urbanisation, etc.) and climate. A phytosociological relevé may reflect the occurrence of a specific habitat type and as such can be seen as a 'pars pro toto' for it. As such, maps of distribution of phytosociological relevés of individual habitat types have their own value, but they also can be used for habitat modelling. Assuming that each habitat type has a specific species composition, responding to specific ecological requirements, correlative estimations of geographic distribution may be generated by analysing patterns in environmental factors such as topsoil pH, solar radiation, annual precipitation and temperature seasonality. In the EEA reports on forest habitats (2013) and heathland, scrub and tundra habitats (2014), such habitat suitability modelling was applied, in the present report on grassland habitats only maps of distribution of phytosociological relevés will be provided. The habitat modelling will be taken care for under another (ETC-Alterra) contract.

4.2 Maps of distribution of phytosociological relevés for each of the revised EUNIS grassland habitat types

The initial dataset used for the analysis was compiled from the EVA database (Chytrý et al. 2016). This data set contained a total of 289,922 grassland vegetation plots of which 243,196 were properly georeferenced (Figure 4.1). The distribution maps are presented in Appendix G, showing the location of the relevés that have been assigned to the EUNIS type concerned and therefore, as indicated above, are used as presence data. The output of the mapping procedure is (to a certain extent) flexible, as different thresholds may be set in applying the expert system. As such, different maps can be produced, e.g. those of the most typical sites and those of all sites, and compared with other habitat maps (see Par. 4.3).

The EUNIS grassland types are in most cases floristically well-defined and therefore relatively few corrections in the distribution had to be made. In total 240 plots have been excluded (located in the sea or otherwise obviously misplaced), which is about 0.1% of the total pool. Some plots located within

500 m from the coast were relocated from other types to coastal B types. For example a number of plots from E1.9a (Oceanic to subcontinental inland sand grassland on dry acid and neutral soils), E1.9b (Inland sanddrift and dune with siliceous grassland), and E1.1a (Pannonian and Pontic sandy steppe) were moved to B1.4a (Atlantic and Baltic coastal dune grassland (grey dune)). It is important to mention that the maps show available plots and not the complete distribution of a habitat type.

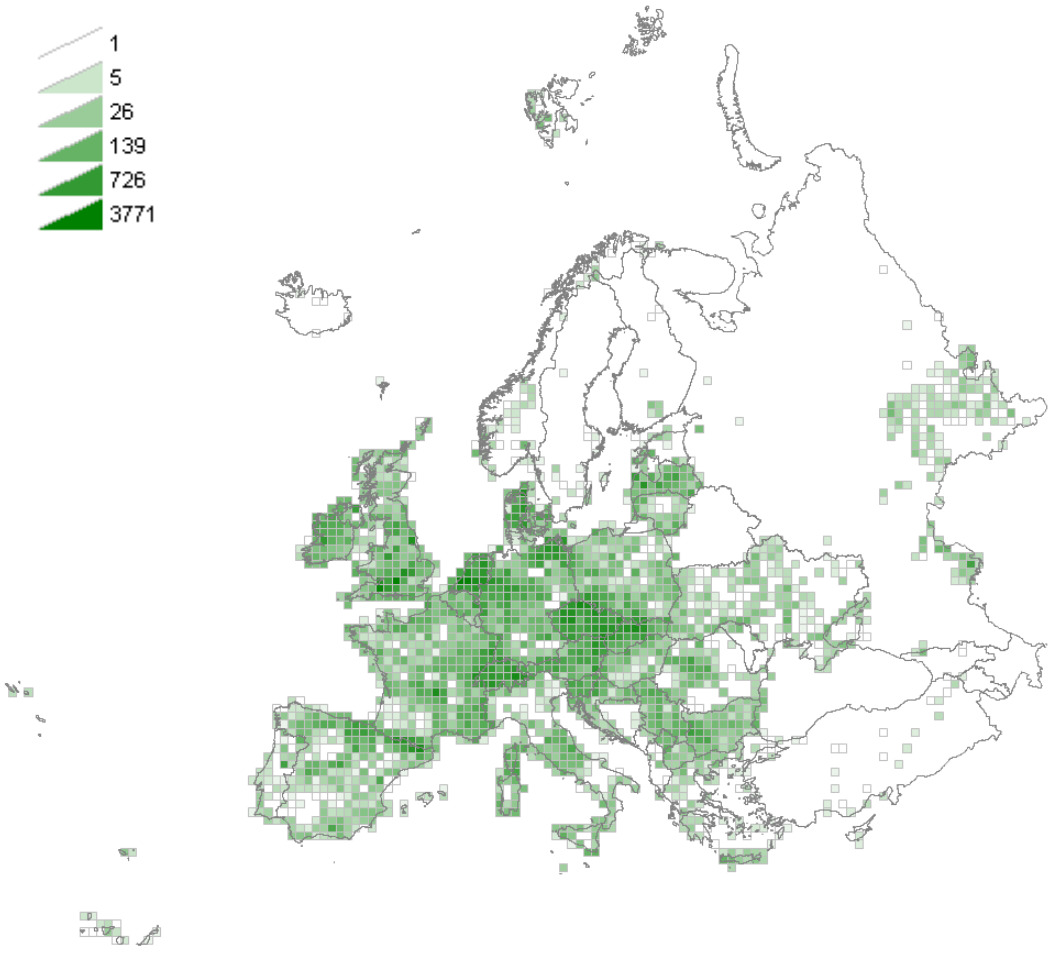


Figure 4.1. Density of all georeferenced grassland plots in EVA in 50 x 50 km grid cells on 6-11-2016 (based on 243,196 plots).

4.3 Comparison of maps

Maps showing the distribution of (*in situ*) vegetation plots are a way of presenting spatial information about habitat types in a well-structured and formalized way. Other maps use a variety of sources of information and therefore may show a different distribution for the same habitat type. For example, Figure 4.2 compares the distribution of the plots assigned to the EUNIS habitat type E2.3 (Mountain hay meadows) with the distribution map produced by the European Red List project for the same habitat. It can be seen that there are no plots shown for United Kingdom and Sweden, although the Red List map shows that the habitat occurs there. Partly this is due to a lack of plot data (particularly for Sweden), but partly also to the role that indicator species play for the habitat identification. The pool of species typical of this habitat in the UK is relatively poor compared to central Europe; many members of the group of indicator species for this habitat type are not present. By lowering the threshold for the required number of species in the expert system, British sites would be shown but at the same time many extra sites would appear in central Europe which may not house this habitat and it furthermore would also suggest that the habitat type is present in the Baltic States. Yet, at the same time, as far as the Red List map is concerned, this habitat does occur in the UK and Sweden via one of the data sources used for the Red List map (Habitats Directive Annex 1 habitat type 6520 Mountain hay meadow, equivalent to the EUNIS E2.3).

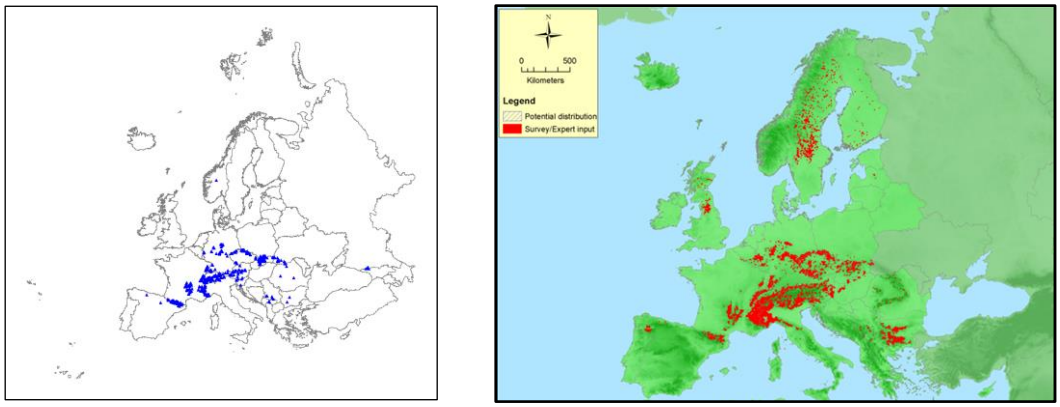


Figure 4.2. Examples of the map of Mountain hay meadows from the EUNIS revision (left, this report) and the European Red List habitat project (right; Janssen et al. 2016).

5 Description in a standard format of the revised EUNIS grassland habitat types

5.1 The existing EUNIS habitat definitions

From the start, the aim of a European habitat classification has been to provide a comprehensive and definitive reference list that is scientific, unambiguous and easily understood (Moss & Roy 1998; Moss 2008). To this end, an integral feature of the EUNIS Habitat Classification is the habitat text descriptions which were incorporated into the underlying database, intended to be accessible as an interface via the EUNIS website portal and available in the hard-copy download of the Classification published as Davies et al. (2004).

Such text descriptions were not at first included for the CORINE Biotopes that were the forerunner of EUNIS, simply English language titles of the habitats (Internal Technical Handbook 1988, partially updated 1989, see Moss & Roy 1998). The later development of the CORINE Biotopes Manual (Devillers et al. 1991) included a descriptive text for each habitat, together with phytosociological and scientific references. When the classification was expanded to the whole Palaearctic, the published version of the classification (Devillers & Devillers Terschuren 1996) did not include text descriptions, simply habitat codes and titles, but in 1995 these were added to the underlying PHYSIS database which had first been released the previous year.

The development of the existing text descriptions in the EUNIS Habitat Classification from earlier versions is detailed in Hill et al. (2004a, 2004b). The text descriptions are variable in length, detail and content: they often include some kind of general statement about the structure of the habitat, many mention particular characteristic species, sometimes highlighting endemic floras, and references to climatic, terrain and soil characteristics vary in detail, often being summarised using broad categories or terms.

There is a glossary appended to the EUNIS Habitats Classification (Davies et al. 2004, since been updated in 2006, version supplied by Doug Evans of the ETC-BD) and this has been derived from various sources. In fact, many of the terms in the Glossary, particularly those with a more specific geographical and topographic reference, are redundant, never figuring in the text descriptions.

5.2 The habitat descriptions of the revised EUNIS grassland types

Since the revision of the EUNIS G Forests (Schaminée et al. 2013) and F Heath, Scrub & Tundra habitats (Schaminée et al. 2014), in which new standardised habitat definitions were provided, the Red List has completed its work. That project has used a habitat typology which has now been adopted for EUNIS and provides a fact sheet for each habitat which includes a full Habitat description and also a Summary.

Although the Summary includes references to the condition of and threats to the habitat, it is primarily concerned to provide a brief description of the vegetation, its relation to climate, soils and biotic factors – particularly human interventions – and its European distribution. In other words, it offers (and for all the EUNIS habitats in the typology) essentially the kind of summary description that has already been prepared in these contracts for G Forests and F Heath, Scrub & Tundra habitats and which were commissioned in this current contract for E Grasslands. Accordingly, with due acknowledgement to the Red List, we have prepared Grassland descriptions which are very similar to the Summaries found there and recommend that, in future EUNIS habitat revisions, there is an explicit adoption of a single standardised format.

These should provide, as accurately, briefly and precisely as possible, the key distinguishing features of the habitat. With details of species composition now available through analysis of constituent relevés or data tables for the alliances of each habitat, there is no need to repeat this information in the description, as was sometimes the case with the original EUNIS descriptions, unless particular species are absolutely definitive. Any detail provided should concisely reflect the variability in the habitat, not its richness or structural complexity because the descriptions are not the place for small essays in ecology or status, particularly where the habitat is more recognisable.

Like the existing EUNIS habitat and Annex I habitat descriptions and the EuroVegChecklist descriptors, the Red List Habitat Summaries sit rather lightly to the questions of explicit standardised terminology and parameter frames; and there are unresolved questions about the compatibility of terms in the various glossaries that are currently applied to the description of habitats. Therefore, for the moment, we use non-technical terms as far as possible to describe terrain, soil types, altitudinal belts; and we use the ETC-BD terminology to refer to the biogeographic zone otherwise avoiding any specialised terminology to describe climatic relationships or broad geographical distribution.

The new descriptions along with the originals are attached as Appendix E EUNIS revision and the European Red List of Habitats.

6 EUNIS revision and the European Red List of Habitats

6.1 Background

Concurrently with the EUNIS Revision process, the Red List has been providing an assessment of endangerment of all European terrestrial, freshwater and marine habitats. Below, we consider how the two strands of enquiry have used the existing EUNIS typology, what is their geographical and ecological scope and what are the elements of the descriptive frames offered by each.

6.2 Habitat typology

The Red List used a modified EUNIS typology as the most appropriate framework for assessment, at level 3 for all terrestrial and freshwater habitats (Janssen et al. 2016). This differed only very slightly from the typology that formed the basis of the earlier EUNIS revisions of G Forests and F Heath, Scrub and Tundra: in the Red List, F9.1a (Arctic, boreal and alpine riparian scrub) and F9.1b (Temperate riparian scrub) were merged into a single F9.1 (Temperate and boreal riparian scrub); and B1.7b (Mediterranean wooded dunes with Quercus spp.) was merged with G2.1 (Mediterranean evergreen Quercus woodland). There were also subsequent changes to habitat names among these and other groups: for example, changing from plural to singular terms in the names of all habitats ('grasslands' to 'grassland') and some other clarifications (such as changing 'waters' to 'water body'). The present relationship between the original EUNIS habitat codes and names and those used in the Red List and EUNIS revision process so far are shown in the crosswalk included as Appendix B.

During the Red List assessment, it became clear that some parts of the modified EUNIS typology were less robust than others and would warrant subsequent revision, sometimes merging of habitats, sometimes splitting, sometimes addition of wholly new types. The assessment process itself allowed assessors to indicate whether they felt sub-habitats could be recognised but the results, though included on the Red List Habitat fact-sheets, are rather uneven, are meant to indicate whether sub-division would result in a different endangerment category and are sometimes influenced by regional enthusiasms.

Since completion of the Red List, further enquiries have been made among the Habitat Working Group leaders and their suggestions are included in column E of the Appendix B spreadsheet. More thorough and detailed

possibilities for revising the typology of C Freshwater habitats have also been produced by Arts & Schaminée (2016) and these too are included there. Further more formal revision is most pressing for C Freshwaters and D Mires, less so for A/B Coastal and H/I Sparsely-vegetated habitats.

6.3 Geographical scope

The EUNIS revision process encompasses habitats across the wider Europe while the Red List was specifically concerned with assessments at the levels of the EU28 and EU28+ (Switzerland, Norway, Iceland and the Balkan countries, see Figure 6.1) and excludes habitats found only beyond these limits such as E1.1f Continental dry rocky steppic grasslands and dwarf scrub on chalk outcrops included here. The Red List also includes benthic marine habitats, although EUNIS A saltmarshes were considered with the B Coastal habitats among the terrestrial types.

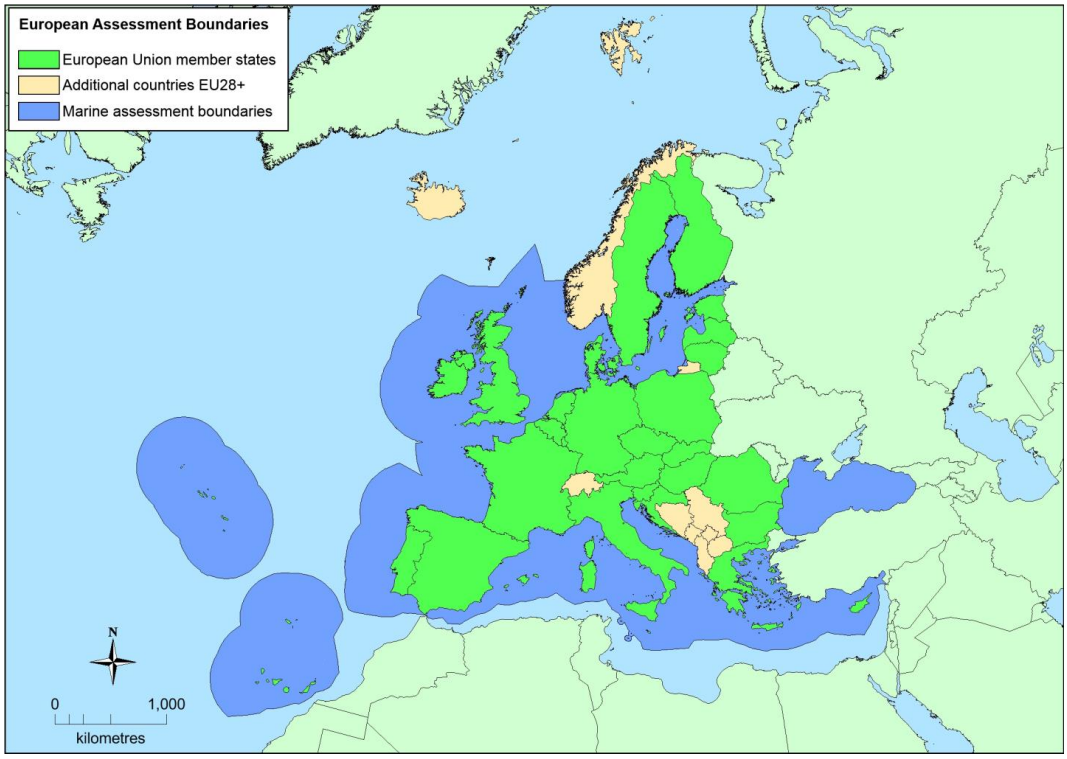


Figure 6.1. Geographical scope of the European Red List of Habitats.

6.4 Ecological scope

Both the EUNIS revision and the Red List exclude habitats considered highly anthropogenic, such as E1.6 Subnitrophilous annual grassland, E1.C Dry mediterranean lands with unpalatable non-vernal herbaceous vegetation, E1.D Unmanaged xeric grassland and E1.E Trampled xeric grasslands with annuals. The Red List also includes a very few mosaics and abiotic habitats of rocks, ice and waters.

6.5 The descriptive frame

Table 6.1 summarises the descriptive information available under different heads and the following text provides detail and highlights compatibilities and differences between the EUNIS Revision process and the Red List.

Descriptor
The EUNIS habitat revision process has included the delivery of brief, more or less standardised descriptions to replace the rather varied style of text appended to the habitat codes and names in Davies et al. (2004) and in the underlying database. After the delivery of such descriptions for the G Woodlands (Schaminée et al. 2014) and F Heath, scrub & Tundra habitats (Schaminée et al. 2015), the Red List began producing a Summary for all habitats in essentially the same format, although also including a brief reference to major threats and current condition. Without these latter details, the Summaries have been used to develop the Descriptions for this revision of the E Grassland habitats and it will now be possible to adapt them as the basis of what are perhaps best termed Descriptors for the remaining EUNIS habitats.

Habitat Description
The Red List used a team of experts to produce detailed Habitat Descriptions to aid recognition of the habitats for the assessment process. These were of a broadly standardised format, providing text information on species composition, vegetation structure, relationships to climate, geology, terrain, soil and biotic influences. Information on associated fauna and cultural resonances was also sometimes included. The Habitat Description provided the basis of the Summary for each habitat. A thorough final scientific and linguistic edit would be necessary before these could be included in any revised EUNIS framework.

Species list
For the EUNIS revision process, an expert system has been devised and refined, using formal definitions to extract vegetation plots, then consistent numerical criteria to identify constant, diagnostic and dominant species, including bryophytes and lichens where the data were available in the relevés. The Red List includes a list of 'characteristic species' selected by experts for each habitat, always vascular plants, sometimes also bryophytes and lichens, rarely fauna, and then usually charismatic animals.

	EUNIS Revision process	European Red List (only terrestrial types)
Geographical scope	All Europe	EU 28 and EU28+ (Switzerland, Norway, Iceland & Balkan countries)
Ecological scope	Excludes extreme anthropogenic habitats and landscape-scale mosaics	Excludes extreme anthropogenic habitats and most landscape-scale mosaics, but includes some abiotic habitats
Descriptor	Habitat description	Summary
Habitat Description		Habitat text description
Species list	List & % of Constant, dominant & diagnostic vascular plants, sometimes bryophytes and lichens (EVA data with expert system & numerical criteria)	List of characteristic vascular plants, often including bryophytes and lichens, rarely fauna (expert opinion)
Indicators of quality		List of particular indicators of quality for the habitat
Images		Two images with brief title
Synonymy	EUNIS (2004) & EuroVegChecklist (2013)	EUNIS (2004), Emerald (2015), EuroVegChecklist (2013), Annex I (2003), MAES (2016), IUCN (2015) & EFT (2007)
Map	Map of point-source data (EVA relevés) & Habitat suitability map (MAXENT modelling) on 1x1 km grid	Map of actual and potential distribution from various sources on 10x10km grid (EVA relevés, GBIF species, Article 17 habitats, VME polygons, national databases, expert opinion)
Extent of Occurrence		Calculated from the map in km^2
Area of Occupancy		Calculated from map as number of 10x10km cells
Pressures & threats		Main threats using Article 17 categories
Conservation & management		Main actions using Article 17 categories
Red List assessment		Using modified IUCN (2013) Criteria & Categories

Table 6.1. Components of the descriptive frames of the EUNIS revision process and the European Red List of Habitats.

Indicators of quality
The Red List includes for each habitat a set of indicators of quality intended to assist in assessing changes in quality over the prescribed historical time periods of approximately 50 and 250 years.

Images
Two high quality images of each habitat are provided in the Red List, illustrating general character and place in the landscape, rather than fine floristic detail, with brief details of location and attribution to owner.

Synonymy
Both EUNIS revision and the Red List provide an audit trail to the original EUNIS typology and, for synonymy with phytosociological alliances, both use the EuroVegChecklist of July 2013, with an assumption that crosswalks can be updated using the upcoming published version of the EuroVegChecklist. Figure 6.2 indicates the variation in numbers of alliances/habitat for all the Red List habitats.

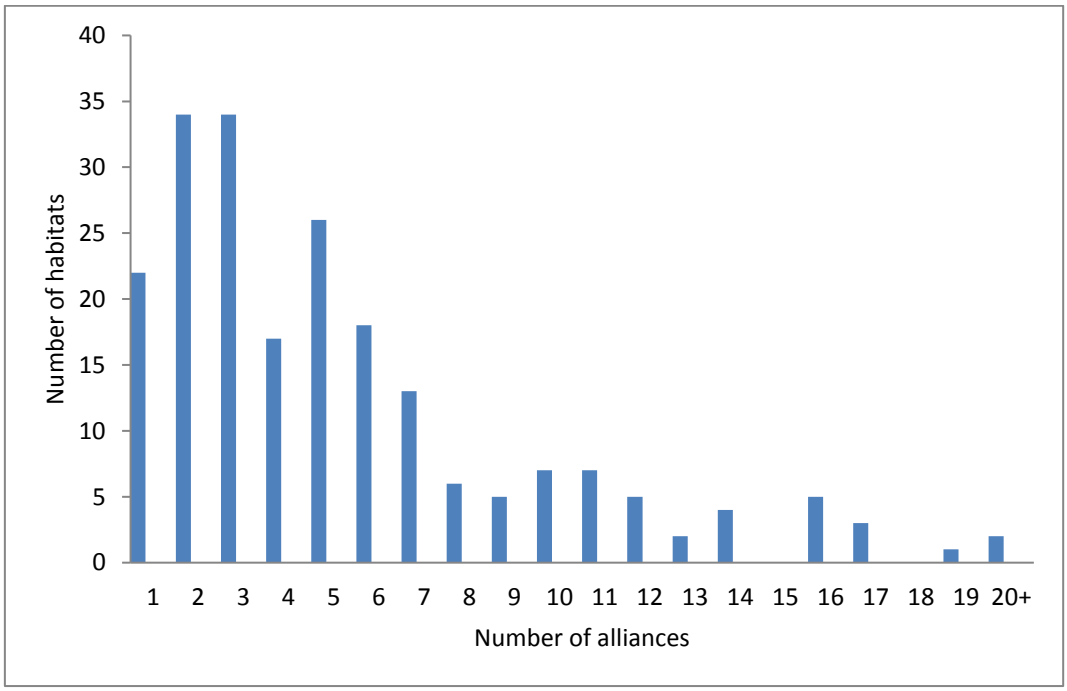


Figure 6.2. Number of EuroVegChecklist 2013 alliances per Red List habitat.

The Red List also includes a synonymy with Emerald, Annex I, MAES, IUCN habitats or ecosystems and any other relevant framework such as, for Forests, the European Forest Types.

Distribution map
Habitat distribution maps for the EUNIS revision process are derived from interrogation of relevés of constituent alliances in EVA, visualised as point sources. In earlier stages of the EUNIS revision, habitat suitability maps were produced using MAXENT modelling but these are now the subject of separate enquiry within ETC/BD-Alterra. EVA data have also been used for the habitat maps in the Red List, along with a number of other sources where appropriate (listed in Table 6.2). Known occurrences of the habitat are shown on a 10x10 km grid in two classes: actual distribution from relatively reliable sources (surveys, expert knowledge), and potential distribution based on models or less reliable indicators. Clicking on a particular grid square within the GIS database reveals the sources for that square. Known but imprecise occurrence within a particular territory is shown by shading the whole.

Number	Description	Code	Reference
1	Distribution maps of Annex I habitat types provided in the 2013 Article 17 report for the Habitat's Directive (covering EU27)	Art17	EEA, Copenhagen
2	European Vegetation Archive (EVA). Dataset of vegetation relevés in Europe, version January 2016.	EVA	Chytrý et al. 2016
3	Distribution of plant and animal species from the GBIF website, version January 2016	GBIF	www.gbif.org
4	Natural Vegetation Map of Europe. Potential natural vegetation. Only used for forest types and other habitats where the potential distribution is likely to be similar to the actual distribution.	BOHN	Bohn et al. 2000/2003
5	European Tree Map, indicating the domiannt tree in an image file. Used for a few forest habitats.	ETM	Hengeveld et al. 2012
6	National databases of different countries, a.o. Spain (vegetation map), Hungary (habitat distribution maps), Bosnia & Herzegovina (N2000 database)	NAT	-
7	Literature and expert knowledge. Only used for habitats with large distribution gaps in the previous sources	EXP, LIT	-

Table 6.2. Data sources for maps in the European Red List of Habitats.

Extent of Occurrence and Area of Occupancy
In the Red List, the distribution maps were used for calculating the Extent of Occurrence as the minimum polygon enclosing all occurrences (in km^2) and Area of Occupancy (number of 10x10km cells) for each habitat.

Territorial distribution
The Red List aimed to provide data on present extent and past extent (approximately 50 years earlier) and, where possible, earlier historical extent (say 250 years earlier) for each habitat in each territory (in km^2). In practice, such data were often based on expert opinion, particularly for earlier extent. These data, together with calculations of the trends in quantity and quality which formed the basis of the Red List assessment, are lodged in an Excel spreadsheet.

Pressures and threats
The Red List indicates the major pressures and threats on each habitat using the framework provided in Article 17 reporting, which was found adequate for the most part. These data were used to provide overall calculations of threats for the major EUNIS-1 habitat groups such as E Grasslands. Text explains the particular impact and importance of the threats for each habitat.

Conservation and management measures
In the Red List, these measures were listed using the Article 17 framework, but this was found to be very inadequate for the purpose. An estimate of the feasibility and time-scale for recovery from damage was provided for each habitat though not included in the assessment calculation.

Red List assessment
For each habitat, a modified version of the IUCN Categories & Criteria for Red List of Ecosystems (2013) was used to provide an overall assessment of level of threat across Europe as a whole. The Habitat factsheet provides full details of the assessment and a Synthesis summarises the assessment category and diagnostic criteria.

6.6 The Red List and Annex 1

The Red List was also charged with comparing the assessments of EUNIS habitats with the Conservation Status ratings of the equivalent Annex I habitats. In fact, such equivalence is complex: few revised EUNIS habitats correspond 1:1 with an Annex I habitat, for others the relationship is 1:many or many:1 or many:many. The results of the comparison were provided as two spreadsheets, organised by EUNIS habitat and by Annex I habitat, but neither these, nor any covering text, have been included in the final Red List publications.

7 Recommendations and future prospects

So far, three major European groups of habitat types have been reviewed: the EUNIS G Forest habitat types in 2013, the F Heathland, scrub and tundra habitat types in 2014, and the E Grassland habitat types in 2016 (together with a few other closely related habitats), based on the crosswalks between the EUNIS habitat classification and the syntaxa of the EuroVegChecklist. An obvious next step (1) would be to analyse further EUNIS habitat groups, such as A/B Coastal habitats, C Freshwater habitats, D Mires & bogs and H/I Sparsely-vegetated habitats. In line with this, the mapping of the distribution of phytosociological relevés and habitat suitability modelling could be extended to these habitat groups, as well as the development of formal definitions for supervised classification and the compilation of lists of indicator species of the habitat types included. Typological complexities and data availability for these habitat groups could suggest a preferred order for considering their analysis.

Two other possible related tasks would include (2) the construction of a roadmap for the final revision of the EUNIS habitat classification, including a gap analysis of the Red List typology with respect to the EUNIS classification and a procedure for defining and documenting missing habitat types, and (3) an update of crosswalks between the revised EUNIS classiciation and the final version of the EuroVegChecklist (December 2016).

Furthermore, the convergence of the EUNIS revision process and the Red List could be pursued, as the completion of the Red List project in June 2016 presents an unparalleled opportunity to combine and harmonise its outputs with those of the EUNIS revision projects, for the enhancement of the EUNIS habitat classification, its scientific meaning and applications, and as a robust basis for more popular dissemination.

In addition to harmonising a common EUNIS habitat typology, the key decisions to consider are (1) how far to combine the results of the EUNIS Revision and the Red List; (2) what are the complementarities and compatibilities in content, quality and format of the data and information in each source; and (3) on what platform any combination might be made.

In Schaminée (2014), it was forseen that the products of the EUNIS revision process would be best incorporated into a revised EUNIS database parameter frame with comprehensive habitat fact sheets accessible through a web portal and with associated formal query routines. Ultimate incorporation of Red List data and information was seen as a key stage in the roadmap for attaining such a goal. These products have been delivered in a variety of specified formats to the EEA for incorporation into the Biodiversity data centre and any combination of material would necessarily involve a technical appraisal of the favoured platform and its suitability for access via a web portal and query routines.

Final editing of the EUNIS habitat descriptions and the Red List habitat summaries and full descriptions, together with the expansion of a EUNIS habitat parameter frame will also necessitate harmonisation of environmental references within a single acceptable glossary.

8 References

Bruelheide, H. (1995). Die Grünlandgesellschaften des Harzes und ihre Standortsbedingungen. Mit einem Beitrag zum Gliederungsprinzip auf der Basis von statistisch ermittelten Artengruppen. *Dissertationes Botanicae* 244: 1-338.

Bruelheide, H. (1997). Using formal logic to classify vegetation. *Folia Geobotanica et Phytotaxonomica* 32: 41–46.

Bruelheide, H. (2000). A new measure of fidelity and its application to defining species groups. *Journal of Vegetation Science* 11: 167-178.

Chytrý M., Hennekens S.M., Jiménez-Alfaro B., Knollová I., Dengler J., Jansen F., Landucci F., Schaminée J.H.J. et al. (2016). European Vegetation Archive (EVA): an integrated database of European vegetation plots. *Applied Vegetation Science* 19: 173–180.

Chytrý, M., Pyšek, P., Tichý, L., Knollová, I. & Danihelka, J. (2005). Invasions by alien plants in the Czech Republic: a quantitative assessment across habitats. *Preslia* 77: 339–354.

Davies, C & Moss, D. (1999). EUNIS Habitats Classification. Final report to the European Topic Centre on Nature Conservation, European Environment Agency. Institute of Terrestrial Ecology, Huntingdon.

Davies, C.E., Moss, D. & Hill, M.O. (2004). Eunis Habitat Classification. Copenhagen: European Environment Agency.

Dengler J., Rūsiņa, S., Boch, S., Bruun, H.H., Diekmann, M., Dierßen, K., Dolnik, C., Dupré, C., Golub V.B., Grytnes, J.-A., Helm, A., Ingerpuu, N., Löbel, S., Pärtel, M., Rašomavičius, V., Tyler, G., Znamenskiy, S.R. & Zobel, M. (2006). Working group on dry grasslands in the Nordic and Baltic region – outline of the project and first results for the class *Festuco-Brometea*. *Annali di Botanica, nuova serie*, 6: 1–28.

Devillers, P. & Devillers-Terschuren, L. (1996). A classification of Palaearctic habitats. Nature & Environment No 78. Council of Europe, Strasbourg.

Devillers, P., Devillers-Terschuren, J. & Ledant, J.-P. (1991). Habitats of the European Community. CORINE Biotopes Manual. Volume 2. Luxembourg: Commission of the European Communities.

Euro+Med (2006–2016). *Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity*. Published on the Internet http://ww2.bgbm.org/EuroPlusMed/.

Fischer, H.S. (2015). On the combination of species cover values from different vegetation layers. *Applied Vegetation Science* 18: 169–170.

Hennekens S. M. & Schaminée, J.H.J. (2001). TURBOVEG, a comprehensive data base management system for vegetation data. *Journal of Vegetation Science* 12: 589–591.

Hill, M.O., Moss, D. & Davies C.E. (2004a). *Revision of habitat descriptions originating from Deviller et al. (2001)*. European Topic Centre on Nature Protection and Biodiversity, Paris.

Hill, M.O., Moss, D. & Davies C.E. (2004b). *EUNIS Habitat classification descriptions*. European Topic Centre on Nature Protection and Biodiversity, Paris.

IUCN (2013) Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria. Version 1.0. Bland, L.M., D.A. Keith, N. J. Murray, R. Miller and J. P. Rodríguez (eds.). International Union for Conservation of Nature (IUCN), Gland, Switzerland.

Janssen, J.A.M. et al. (2016). *European Red List of Habitats. 1. Terestrial & freshwater habitats*. European Commission, Brussels.

Knollová, I., Chytrý, M., Tichý, L. & Hájek, O. (2005). Stratified resampling of phytosociological databases: some strategies for obtaining more representative data sets for classification studies. *Journal of Vegetation Science* 16: 479-486.

Kočí, M., Chytrý, M. & Tichý, L. (2003). Formalized reproduction of an expert-based phytosociological classification: A case study of subalpine tall-forb vegetation. *Journal of Vegetation Science* 14: 601–610.

Landucci, F., Tichý, L., Šumberová, K. & Chytrý, M. (2015). Formalized classification of species-poor vegetation: a proposal of a consistent protocol for aquatic vegetation. *Journal of Vegetation Science* 26: 791–803.

Moss, D. (2008). EUNIS Habitat Classification – a guide for users. Paris: European Topic Centre on Biological Diversity. European Environment Agency, Copenhagen.

Moss, D. & Roy, D. (1998). *Towards a European Habitat Classification: Background Review 1989-1995,* European Environment Agency, Copenhagen.

Mucina, L., Bültmann, H., Dierßen, K., Theurillat, J.-P., Raus, T., Čarni, A., Šumberová, K., Willner, W., Dengler, J., Gavilán García, R., Chytrý, M., Hájek, M., Di Pietro, R., Iakushenko, D., Pallas, J., Daniëls, F.J.A., Bergmeier, E., Santos Guerra, A., Ermakov, N., Valachovič, M., Schaminée, J.H.J., Lysenko, T. Didukh, J.P., Pignatti, S., Rodwell, J.S., Capelo, J., Weber, H.E., Solomeshch, A., Dimopoulos, P., Aguiar, C., Hennekens, S.M. & Tichý, L. (2016, in press). Vegetation of Europe. Hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities. *Applied Vegetation Science* 19.

Rodwell, J.S., Janssen, J., Gubbay, S. & Schaminée, J.H.J. (2013). *Red List Assessment of European Habitat Types, a Feasibility Study. Report to DG (Environment)*. Alterra, Wageningen.

Schaminée J.H.J., Chytrý, M., Hennekens, S.M., Janssen, J.A.M., Jiménez-Alfaro, B., Knollová, I., Marcenò, C., Mucina, L., Rodwell, J.S., Tichý, L. & data providers (2016). Review of grassland habitats and development of distribution maps of heathland, scrub and tundra habitats of EUNIS habitats classification. Alterra, Wageningen.

Schaminée, J.H.J., M. Chytrý, S.M. Hennekens, L. Mucina, J.S. Rodwell & L. Tichý (2012). Development of vegetation syntaxa crosswalks to EUNIS habitat classification and related data sets. Report for the European Environmental Agency, Copenhagen.

Schaminée, J.H.J., Chytrý, M., Hennekens, S.M., Jiménez-Alfaro, B., Mucina, L., Rodwell, J.S. & Tichý, L. (2013). *Review of EUNIS forest habitat classification*. Report for the European Environmental Agency, Copenhagen.

Schaminée, J.H.J., Chytrý, M., Hennekens, S.M., Janssen, J.A.M., Jiménez-Alfaro, B., Knollová, I., Mucina, L., Rodwell, J.S. & Tichý, L. (2014). Vegetation analysis and distribution maps for EUNIS habitats. Report for the European Environmental Agency (EEA/NSV/14/006), Copenhagen.

Schaminée J.H.J., Hennekens S.M., Chytrý M. & Rodwell, J.S. (2009). Vegetation-plot data and databases in Europe: an overview. *Preslia* 81: 173–185.

Tichý, L. (2002). JUICE, software for vegetation classification. *Journal of Vegetation Science* 13: 451–453.

Tichý, L. & Chytrý, M. (2006). Statistical determination of diagnostic species for site groups of unequal size. *Journal of Vegetation Science* 17: 809–818.

Appendix A: List of the grassland habitat types that are treated in the project, based on the revised EUNIS classication

B1.4a	Atlantic and Baltic coastal dune grasslands (grey dunes)
B1.4b	Mediterranean and Macaronesian coastal dune grasslands (grey dunes)
B1.4c	Black Sea coastal dune grasslands (grey dunes)
E1.1a	Pannonian and Pontic sandy steppe
E1.1b	Temperate and boreal pioneer grassland on shallow soils on siliceous rock outcrops
E1.1d	Submediterranean and temperate pioneer grassland on calcareous and ultramafic rock outcrops
E1.1e	Submediterranean open dry grasslands of skeletal calcareous and ultramafic soils
E1.1f	Continental dry rocky steppic grasslands and dwarf scrub on chalk outcrops
E1.1g	Perennial grassland on rocky outcrops at low altitudes in Central and Southeastern Europe
E1.1h	Submontane to supramontane ultramafic rocky grasslands of the Balkans
E1.1i	Subatlantic and submediterranean perennial grassland on calcareous shallow soils
E1.1j	Dry steppic, submediterranean pastures of Southeastern Europe
E1.2a	Semi-dry perennial calcareous grassland
E1.2b	Continental dry steppe
E1.3a	Mediterranean closely grazed dry grassland
E1.3b	Mediterranean tall perennial dry grassland
E1.3c	Mediterranean annual-rich dry grassland
E1.5a	Iberian oromediterranean siliceous dry grassland
E1.5b	Iberian oromediterranean basiphilous dry grassland
E1.5c	Corsican and Sardinian oromediterranean siliceous dry grassland
E1.5d	Greek and Anatolian oromediterranean siliceous dry grassland
E1.5e	Madeiran oromediterranean siliceous dry grassland
E1.7a	Lowland to submontane, dry to mesic Nardus grassland
E1.8	Open Iberian supramediterranean dry acid and neutral grassland
E1.9a	Oceanic to subcontinental inland sand grassland on dry acid and neutral soils
E1.9b	Inland sanddrifts and dunes with siliceous grasslands
E1.A	Mediterranean to Atlantic open, dry, acid and neutral grassland
E1.B	Heavy-metal grassland
E1.F	Azorean open, dry, acid to neutral grassland
E2.1a	Mesic permanent pastures of lowlands and mountains
E2.2	Low and medium altitude hay meadows
E2.3	Mountain hay meadows
E2.4	Iberian summer pastures (vallicar)
E3.1a	Mediterranean tall humid inland grassland
E3.2a	Mediterranean short moist grassland of lowlands

E3.2b	Mediterranean short moist grassland of mountains
E3.3	Submediterranean moist meadow~~s~~
E3.4a	Moist or wet mesotrophic to eutrophic hay meadow~~s~~
E3.4b	Moist or wet mesotrophic to eutrophic pasture~~s~~
E3.5	Non-Mediterranean moist or wet oligotrophic grassland
E4.1	Vegetated snow-patch
E4.3a	Boreal and arctic acidophilous alpine grassland~~s~~
E4.3b	Temperate acidophilous alpine grassland~~s~~
E4.4a	Arctic-alpine calcareous grassland~~s~~
E4.4b	Alpine and subalpine calcareous grassland~~s~~ of the Balkan and Apennines
E5.2a	Thermophilous woodland fringe~~s~~ of base-rich soils
E5.2b	Thermophilous woodland fringe~~s~~ of acidic soils
E5.2c	Macaronesian thermophilous woodland fringe~~s~~
E5.4	Moist or wet tall-herb and fern fringe~~s~~ of the lowlands
E5.5	Subalpine moist or wet tall-herb and fern stand~~s~~
E6.1	Mediterranean inland salt steppe~~s~~
E6.2	Continental inland salt steppe~~s~~
E6.3	Temperate inland salt marsh

Appendix B: Crosswalk of EUNIS and Red List habitat codes and names with possible further revisions

New EUNIS-3 code	New EUNIS-3 habitat name	Red List code	Red List habitat name	Possible revisions	Original EUNIS-3 code	Original EUNIS-3 habitat name
		A2.5a	Arctic coastal salt marsh		A2.5	Coastal salt marshes and saline reed beds
		A2.5b	Baltic coastal meadow			
		A2.5c	Atlantic coastal salt marsh			
		A2.5d	Mediterranean and Black Sea coastal salt marsh			
		B1.1a	Atlantic, Baltic and Arctic sand beach		B1.1 &	Sand beach driftlines & Sand beaches above the driftline
				Arctic sand beach could be separated from B1.1a		
		B1.1b	Mediterranean and Black Sea sand beach			
		B1.3a	Atlantic and Baltic shifting coastal dune		B1.3	Shifting coastal dunes
		B1.3b	Mediterranean and Black Sea shifting coastal dune			
B1.4a	Atlantic and Baltic coastal dune grassland (grey dunes)	B1.4a	Atlantic and Baltic coastal dune grassland (grey dune)	Could be split into basiphilous and calcifuge types	B1.4	Coastal stable dune grassland
B1.4b	Mediterranean and Macaronesian coastal dune grassland (grey dunes)	B1.4b	Mediterranean and Macaronesian coastal dune grassland (grey dune)			
B1.4c	Black Sea coastal dune grassland (grey dunes)	B1.4c	Black Sea coastal dune grassland (grey dune)			
B1.5a	Atlantic and Baltic coastal Empetrum heath	B1.5a	Atlantic and Baltic coastal Empetrum heath		B1.5	Coastal dune heaths
B1.5b	Atlantic coastal Calluna and Ulex heath	B1.5b	Atlantic coastal Calluna and Ulex heath			
B1.6a	Atlantic and Baltic coastal dune scrub	B1.6a	Atlantic and Baltic coastal dune scrub		B1.6	Coastal dune scrub
B1.6b	Mediterranean and Black Sea coastal dune scrub	B1.6b	Mediterranean and Black Sea coastal dune scrub			
B1.6c	Macaronesian coastal dune scrub	B1.6c	Macaronesian coastal dune scrub			
B1.7a	Atlantic and Baltic broad-leaved coastal dune woodland	B1.7a	Atlantic and Baltic broad-leaved coastal dune woodland		B1.7	Coastal dune woods
B1.7b	Mediterranean wooded dunes with Quercus spp.		former B1.7b merged with G2.1			
B1.7c	Black Sea broad-leaved coastal dune woodland	B1.7b	Black Sea broad-leaved coastal dune woodland			
B1.7d	Baltic coniferous coastal dune woodland	B1.7c	Baltic coniferous coastal dune woodland			
B1.7e	Mediterranean coniferous coastal dune woodland	B1.7d	Mediterranean coniferous coastal dune woodland			
		B1.8a	Atlantic and Baltic moist and wet dune slack		B1.8	Moist and wet dune slacks
		B1.8b	Mediterranean and Black Sea moist and wet dune slack			
B1.9	Machair grassland	B1.9	Machair		B1.9	Machair
		B2.1a	Atlantic, Baltic and Arctic coastal shingle		B2.1-B2.4	Shingle beach driftlines; Unvegetated mobile shingle beaches above the driftline: Upper shingle beaches with open vegetation:
		B2.1b	Mediterranean and Black Sea coastal shingle			
	merged with other F habitats in EUNIS revision		merged with F habitats in Red List		B2.5	Shingle and gravel beaches with scrub
	merged with other G habitats in EUNIS revision		merged with G habitats in Red List		B2.6	Shingle and gravel beach woodland
		B3.1a	Atlantic and Baltic rocky sea cliff and		B3.1-B3.3	Supralittoral rock, Unvegetated rock cliffs, ledges, shores and
		B3.1b	Mediterranean and Black Sea rocky sea cliff and shore			
		B3.1c	Macaronesian rocky sea diff and shore			
				Arctic rocky sea cliff could be added		
		B3.4a	Atlantic and Baltic soft sea cliff		B3.4	Soft sea cliffs, often vegetated
		B3.4b	Mediterranean and Black Sea soft sea cliff			

New EUNIS-3 code	New EUNIS-3 habitat name	Red List code	Red List habitat name	Possible revisions	Original EUNIS-3 code	Original EUNIS-3 habitat name
		C1.1a	Permanent oligotrophic waterbody with very soft-water species	Revision needs to take account of water quality, base-richness and fauna as well as vegetation	C1.1-C1.3	Permanent oligotrophic lakes, ponds and pools; mesotrophic lakes, ponds and pools; permanent eutrophic lakes, ponds and pools
		C1.1b	Permanent oligotrophic to mesotrophic waterbody with soft-water species			
		C1.2a	Permanent oligotrophic to			
		C1.2b	Mesotrophic to eutrophic waterbody with angiosperms			
		C1.4	Permanent dystrophic waterbody		C1.4	Permanent dystrophic waters
		C1.5	Permanent inland saline and brackish waterbody		C1.5	Permanent inland saline and brackish waters
		C1.6a	Temperate temporary waterbody		C1.6	Temporary lakes, ponds and pools
		C1.6b	Mediterranean temporary waterbody	Isoetes-dominated type could be separated		
				New habitat needed for alpine lakes with submerged bryophytes & algae		
		C1.7	Permanent lake of glaciers and ice sheets		C1.7	Permanent lakes of glaciers and ice sheets
		C2.1a	Base-poor spring and spring brook		C2.1	Springs, spring brooks and geysers
		C2.1b	Calcareous spring and spring brook			
				New habitat needed for hot water springs		
		C2.2a	Permanent non-tidal, fast, turbulent watercourse of montane to alpine regions with mosses		C2.2	Permanent non-tidal, fast, turbulent watercourses
		C2.2b	Permanent non-tidal, fast, turbulent watercourse of plains and mountane regions with Ranunculus spp.			
				New habitat needed for middle-altitude rivers		
		C2.3	Permanent non-tidal, smooth-flowing watercourse	Could be split into upper, middle and lower river sections	C2.3	Permanent non-tidal, smooth-flowing watercourses
		C2.4	Tidal river, upstream from the estuary		C2.4	Tidal rivers, upstream from the estuary
		C2.5a	Temperate temporary running watercourse		C2.5	Temporary running waters
			merged with H types		C2.6	Films of water flowing over rocky watercourse margins
			merged with C5.1a, C5.1b		C3.1	Species-rich helophyte beds
			merged with C5.1a		C3.2	Water-fringing reedbeds and tall helophytes other than canes
			C3.3 omitted from Red List as intensively anthropogenic		C3.3	Water-fringing beds of tall canes
			merged with other habitats (C3.5, C5.1b) in Red List		C3.4	Species-poor beds of low-growing water-fringing or amphibious vegetation
		C3.5a	Periodically exposed shore with stable, eutrophic sediments with pioneer or ephemeral vegetation		C3.5	Periodically inundated shores with pioneer and ephemeral vegetation
		C3.5b	Periodically exposed shore with stable, mesotrophic sediments with pioneer or ephemeral vegetation			
		C3.5c	Periodically exposed saline shore-with pioneer or ephemeral vegetation			
		C3.5d	Unvegetated or sparsely vegetated shore with mobile sediments in montane and alpine regions			
		C3.5e	Unvegetated or sparsely vegetated shore with mobile sediments in the Mediterranean region			
			Merged with H-types, including H3.4		C3.8	Inland spray- and steam-dependent habitats
		C5.1a	Tall-helophyte bed	Coastal and estuarine types could be separated	D5.1	Helophyte dominated freshwater vegetation
		C5.1b	Small-helophyte bed			
		C5.2	Tall-sedge bed		D5.2	Large sedge dominated freshwater vegetation and meadows
			C5.3 omitted from Red List as intensively anthropogenic		D5.3	Swamps and marshes dominanted by Juncus effusus and other large Juncus spp.
		C5.4	Inland saline or brackish helophyte bed		D6.2	Inland saline or brackish species-poor helophyte beds
		C6.1	Underground standing and running waterbody		H1.5	Underground standing water bodies
					H1.6	Underground running water bodies

New EUNIS-3 code	New EUNIS-3 habitat name	Red List code	Red List habitat name	Possible revisions	Original EUNIS-3 code	Original EUNIS-3 habitat name
		D1.1	Raised bog		D1.1	Raised bogs
		D1.2	Blanket bog		D1.2	Blanket bogs
		D2.1	Oceanic valley bog		D2.1	Valley mires
		D2.2a	Poor fen		D2.2	Poor fens and soft-water spring mires
		D2.2b	Relict mire of mediterranean mountains			
		D2.2c	Intermediate fen and soft water spring mire			
		D2.3a	Non-calcareous quaking mire		D2.3	Transition mirtes and quaking bogs
		D3.1	Palsa mire	Seasonally-frozen pounikko mire could be separated	D3.1	Palsa mires
		D3.2	Aapa mire	Northern boreal/subarctic type with distinctive fauna in pools could be distinguished	D3.2	Aapa mires
			D3.3 omitted from Red List as beyond geographic limit		D3.3	Polygon mires
		D4.1a	Small-sedge base-rich fen and calcareous spring mire	Could be split into Travertine Carpathian, Temperate mountain & Atlantic dune-slack fens	D4.1	Rich fens, including eutrophic tall-herb fens and calcareous flushes and soaks
		D4.1b	Tall-sedge base-rich fen			
		D4.1c	Calcareous quaking mire			
		D4.2	Arctic-alpine rich fen		D4.2	Basic mountain flushes and streamsides, with a rich arctic-montane flora
			Moved in Red List to C		D5.1	Helophyte dominated freshwater vegetation
			Moved in Red List to C			
			Moved in Red List to C		D5.2	Large sedge dominated freshwater vegetation and meadows
			Moved in Red List to C; not assessed under the Red List of Habitats (largely anthropogenic)		D5.3	Swamps and marshes dominanted by Juncus effusus and other large Juncus spp.
			Moved in Red List to E		D6.1	Inland saltmarshes
			Moved in Red List to C		D6.2	Inland saline or brackish species-poor helophyte beds

New EUNIS-3 code	New EUNIS-3 habitat name	Red List code	Red List habitat name	Possible revisions	Original EUNIS-3 code	Original EUNIS-3 habitat name
E1.1a	Pannonian and Pontic sandy steppe	E1.1a	Pannonian and Pontic sandy steppe		E1.1	Inland sand and rock with open vegetation
E1.1b	Temperate and boreal pioneer grassland on shallow soils on siliceous rock outcrops	E1.1b	Cryptogam- and annual-dominated vegetation on siliceous rock outcrops			
E1.1c	Boreal open, sub-thermophilous grassland on shallow soils on siliceous rock outcrops		E1.1c merged with E1.1b			
E1.1d	Submediterranean and temperate pioneer grassland on calcareous and ultramafic rock outcrops	E1.1d	Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops			
E1.1e	Submediterranean xeric open grassland of skeletal calcareous and ultramafic soils	E1.1e	Perennial rocky grassland of the Italian peninsula			
E1.1f	Continental dry rocky steppic grasslands and dwarf scrub on chalk outcrops		E1.1f omitted from Red List as beyond geographic limit			
E1.1g	Perennial grassland on rocky outcrops at low altitudes in Central and Southeastern Europe	E1.1g	Perennial rocky grassland of Central Europe and the Carpathians			
E1.1h	Submontane to supramontane ultramafic rocky grassland of the Balkans	E1.1h	Heavy-metal dry grassland of the Balkans			
E1.1i	Subatlantic and submediterranean perennial grassland on calcareous shallow soils	E1.1i	Perennial rocky calcareous grassland of subatlantic-submediterranean Europe			
E1.1j	Dry steppic, submediterranean pasture of Southeastern Europe	E1.1j	Dry steppic, submediterranean pasture of South-Eastern Europe			
E1.2a	Semi-dry perennial calcareous grassland	E1.2a	Semi-dry perennial calcareous grassland		E1.2	Perennial calcareous grassland and basic steppes
E1.2b	Continental dry steppe	E1.2b	Continental dry steppe			
E1.3a	Mediterranean closely grazed dry grassland	E1.3a	Mediterranean closely grazed dry grassland		E1.3	Mediterraenan xeric grassland
E1.3b	Mediterranean tall perennial dry grassland	E1.3b	Mediterranean tall perennial dry grassland			
E1.3c	Mediterranean annual-rich dry grassland	E1.3c	Mediterranean annual-rich dry grassland			
	merged with other habitats in EUNIS revision		E1.4 was merged with other habitats in Red List	Is this really separable from E1.3?	E1.4	Mediterranean tallgrass and Artemisia steppes
E1.5a	Iberian oromediterranean siliceous dry grassland	E1.5a	Iberian oromediterranean siliceous dry grassland	Some further differentiation is needed to recognise distinctive serpentine forms.	E1.5	Mediterranean montane grassland
E1.5b	Iberian oromediterranean basiphilous dry grassland	E1.5b	Iberian oromediterranean basiphilous dry grassland			
E1.5c	Corsican oromediterranean siliceous dry grassland	E1.5c	Cyrno-Sardean oromediterranean siliceous dry grassland			
E1.5d	Greek and Anatolian oromediterranean siliceous dry grassland	E1.5d	Greek and Anatolian oromediterranean siliceous dry grassland			
E1.5e	Madeiran oromediterranean siliceous dry grassland	E1.5e	Madeiran oromediterranean siliceous dry grassland			
E1.6	Subnitrophilous annual grasslands		E1.6 was omitted from Red List as intensively anthropogenic		E1.6	Subnitrophilous annual grasslands
E1.7a	Lowland to submontane, dry to mesic Nardus grassland	E1.7	Lowland to submontane, dry to mesic Nardus grassland		E1.7	Non-Mediterranean dry acid and neutral closed grassland
E1.8	Open Iberian supra-mediterranean dry acid and neutral grassland	E1.8	Open Iberian supramediterranean dry acid and neutral grassland		E1.8	Mediterranean dry acid and neutral closed grassland
E1.9a	Oceanic to subcontinental inland sand grassland on dry acid and neutral soils	E1.9a	Oceanic to subcontinental inland sand grassland on dry acid and neutral soils		E1.9	Non-Mediterranean dry acid and neutral open grassland, including inland dune grassland
E1.9b	Inland sanddrifts and dunes with siliceous grassland	E1.9b	Inland sanddrift and dune with siliceous grassland			
E1.A	Mediterranean to Atlantic open, dry, acid and neutral grassland	E1.A	Mediterranean to Atlantic open, dry, acid and neutral grassland		E1.A	Mediterranean dry acid and neutral open grassland
E1.B	Heavy-metal grassland	E1.B	Heavy-metal grassland in Western and Central Europe		E1.B	Heavy-metal grassland
E1.C	Dry Mediterranean lands with unpalatable non-vernal herbaceous vegetation		E1.C was omitted from Red List as intensively anthropogenic	Further thought is needed about omitting anthropogenic grasslands particularly as boundaries with these are often indistinct.	E1.C	Dry mediterranean lands with unpalatable non-vernal herbaceous vegetation
E1.D	Unmanaged dry grassland		E1.D was omitted from Red List as intensively anthropogenic		E1.D	Unmanaged xeric grassland
E1.E	Trampled dry grassland with annuals		E1.E was omitted from Red List as intensively anthropogenic		E1.E	Trampled xeric grasslands with annuals
E1.F	Azorean open, dry, acid to neutral grassland	E1.F	Azorean open, dry, acid to neutral grassland			
E2.1a	Mesic permanent pasture of lowlands and mountains	E2.1a	Mesic permanent pasture of lowlands and mountains		E2.1	Permenant mesotrophic pastures and aftermath-grazed meadows
E2.2	Low and medium altitude hay meadow	E2.2	Low and medium altitude hay meadow		E2.2	Low and medium altitude hay meadows
E2.3	Mountain hay meadow	E2.3	Mountain hay meadow		E2.3	Mountain hay meadows
E2.4	Iberian summer pastures (vallicar)	E2.4	Iberian summer pasture (vallicar)		E2.4	Iberian summer pastures (vallicares)
	merged with other habitats in EUNIS revision		E2.5 was omitted from Red List and divided into other types		E2.5	Meadows of the steppe zone

New EUNIS-3 code	New EUNIS-3 habitat name	Red List code	Red List habitat name	Possible revisions	Original EUNIS-3 code	Original EUNIS-3 habitat name
E3.1a	Mediterranean tall humid inland grassland	E3.1a	Mediterranean tall humid inland grassland		E3.1	Mediterranean tall humid grassland
E3.2a	Mediterranean short moist grassland of lowlands	E3.2a	Mediterranean short moist grassland of lowlands		E3.2	Mediterranean short humid grassland
E3.2b	Mediterranean short moist grassland of mountains	E3.2b	Mediterranean short moist grassland of mountains			
E3.3	Submediterranean moist meadow	E3.3	Submediterranean moist meadow		E3.3	Sub-mediterranean humid meadows
E3.4a	Moist or wet mesotrophic to eutrophic hay meadow	E3.4a	Moist or wet mesotrophic to eutrophic hay meadow	Could be split into temperate/boreal and mediterranean types.	E3.4	Moist or wet mesotrophic to eutrophic grassland
E3.4b	Moist or wet mesotrophic to eutrophic pasture	E3.4b	Moist or wet mesotrophic to eutrophic pasture			
E3.5	Non-Mediterranean moist or wet oligotrophic grassland	E3.5	Temperate and boreal moist or wet oligotrophic grassland		E3.5	Moist or wet oligotrophic grassland
E4.1	Vegetated snow-patch	E4.1	Vegetated snow patch		E4.1	Vegetated snow-patch
E4.2	Moved in EUNIS revision to H		Moved in Red List to H		E4.2	Moss and lichen dominated mountain summits, ridges and exposed slopes
E4.3a	Boreal and arctic acidophilous alpine grassland	E4.3a	Boreal and arctic acidophilous alpine grassland		E4.3	Acid alpine and subalpine grassland
E4.3b	Temperate acidophilous alpine grassland	E4.3b	Temperate acidophilous alpine grassland			
E4.4a	Arctic-alpine calcareous grassland	E4.4a	Arctic-alpine calcareous grassland		E4.4	Calcareous alpine and subalpine grassland
E4.4b	Alpine and subalpine calcareous grassland of the Balkan and Apennines	E4.4b	Alpine and subalpine calcareous grassland of the Balkans and Apennines			
E5.2a	Thermophilous woodland fringe of base-rich soils	E5.2a	Thermophilous woodland fringe of base-rich soils		E5.2	Thermophile woodland fringes
E5.2b	Thermophilous woodland fringe of acidic soils	E5.2b	Thermophilous woodland fringe of acidic soils			
E5.2c	Macaronesian thermophilous woodland fringe	E5.2c	Macaronesian thermophilous woodland fringe			
E5.3	Pteridium aquilinum stand	E5.3	Pteridium aquilinum stand		E5.3	Pteridium aquilinum fields
E5.4	Moist or wet tall-herb and fern fringe of the lowlands	E5.4	Lowland moist or wet tall-herb and fern fringe		E5.4	Moist or wet tall-herb and fern fringes and meadows
E5.5	Subalpine moist or wet tall-herb and fern stand	E5.5	Subalpine moist or wet tall-herb and fern fringe		E5.5	Subalpine moist or wet tall-herb and fern stands
E6.1	Mediterranean inland salt steppe	E6.1	Mediterranean inland salt steppe		E6.1	Mediterranean inland salt steppes
E6.2	Continental inland salt steppe	E6.2	Continental inland salt steppe		E6.2	Continental inland salt steppes
E6.3	Temperate inland salt marsh	E6.3	Temperate inland salt marsh		D6.1	Inland saltmarshes
E7.1	Temperate and hemi-boreal wooded pasture and meadow	E7.1	Temperate wooded pasture and meadow		E7.1	Atlantic parkland
E7.2	Hemi-boreal and Boreal wooded pasture and meadow	E7.2	Hemiboreal and boreal wooded pasture and meadow		E7.2	Sub-continental parkland
E7.3	Mediterranean wooded pasture and meadow	E7.3	Mediterranean wooded pasture and meadow		E7.3	Dehesa

New EUNIS-3 code	New EUNIS-3 habitat name	Red List code	Red List habitat name	Possible revisions	Original EUNIS-3 code	Original EUNIS-3 habitat name
F1.1	Shrub tundra	F1.1	Shrub tundra		F1.1	Shrub tundra
F1.2	Moss and lichen tundra	F1.2	Moss and lichen tundra		F1.2	Moss and lichen tundra
F2.1	Subarctic and alpine dwarf Salix scrub	F2.1	Subarctic and alpine dwarf Salix scrub		F2.1	Subarctic and alpine dwarf willow scrub
F2.2a	Alpine and subalpine ericoid heath	F2.2a	Alpine and subalpine ericoid heath		F2.2	Evergreen alpine and subalpine heath and scrub
F2.2b	Alpine and subalpine Juniperus scrub	F2.2b	Alpine and subalpine Juniperus scrub			
F2.2c	Balkan subalpine genistoid scrub	F2.2c	Balkan subalpine genistoid scrub			
F2.3	Subalpine deciduous scrub	F2.3	Subalpine deciduous scrub		F2.3	Subalpine deciduous scrub
F2.4	Subalpine Pinus mugo scrub	F2.4	Subalpine Pinus mugo scrub		F2.4	Conifer scrub close to the tree limit
F3.1a	Lowland to montane temperate and submediterranean Juniperus scrub	F3.1a	Lowland to montane temperate and	Could be split into basipholous and	F3.1 & 3.2	Temperate thickets and scrub & Sub-Mediterranean deciduous thickets & brushes
F3.1b	Temperate Rubus scrub	F3.1b	Temperate Rubus scrub			
F3.1c	Lowland to montane temperate and submediterranean genistoid scrub	F3.1c	Lowland to montane temperate and			
F3.1d	Balkan-Anatolian submontane genistoid scrub	F3.1d	Balkan-Anatolian submontane genistoid scrub			
F3.1e	Temperate and submediterranean thorn scrub	F3.1e	Temperate and submediterranean thorn scrub			
F3.1f	Low steppic scrub	F3.1f	Low steppic scrub			
F3.1g	Corylus avellana scrub	F3.1g	Corylus avellana scrub			
F3.1h	Temperate forest clearing scrub		F3.1h omitted from Red List as intensively anthropogenic or merged with different G habitats			
F4.1	Wet heath	F4.1	Wet heath		F4.1	Wet heath
F4.2	Dry heath	F4.2	Dry heath		F4.2	Dry heath
F4.3	Macaronesian heath	F4.3	Macaronesian heath		F4.3	Macaronesian heath
F5.1	Mediterranean maquis and arborescent matorral	F5.1	Mediterranean maquis and arborescent matorral		F5.1	Arboresecent matorral
					F5.2	Maquis
F5.3	Submediterranean pseudomaquis	F5.3	Submediterranean pseudomaquis		F5.3	Pseudomaquis
F5.4	Spartium junceum stand		F5.4 omitted from Red List as intensively anthropogenic		F5.4	Spartium junceum fields
F5.5	Thermo-Mediterranean scrub	F5.5	Thermomediterranean scrub		F5.5	Thermo-Mediterranean scrub
				A separate 'Mediterranean serpentine/dolomite garrigue' could be distinguished		
F6.1a	Western basiphilous garrigue	F6.1a	Western basiphilous garrigue		F6.1	Western garrigues
F6.1b	Western acidophilous garrigue	F6.1b	Western acidophilous garrigue			
F6.2	Eastern garrigue	F6.2	Eastern garrigue		F6.2	Eastern non-Illyrian garrigues
					F6.3	Illyrian garrigues
					F6.4	Black Sea garrigues
	merged with other F habitats in EUNIS revision		F6.5 definition unclear; merged with other F habitats in Red List (F8.1, F8.2, F4.3)		F6.5	Macaronesian garrigues
F6.6	Supra-Mediterranean garrigue	F6.6	Supramediterranean garrigue		F6.6	Supra-Mediterranean garrigues
F6.7	Mediterranean gypsum scrub	F6.7	Mediterranean gypsum scrub		F6.7	Mediterranean gypsum scrubs
F6.8a	Mediterranean halo-nitrophilous scrub	F6.8a	Mediterranean halo-nitrophilous scrub	Better termed 'Mediterranean nitrophilous scrub' to avoid confusion with E6.1	F6.8	Xero-halophile scrub
F6.8b	Caspian halo-nitrophilous scrub		F6.8b omitted from Red List as beyond geographic limit			

New EUNIS-3 code	New EUNIS-3 habitat name	Red List code	Red List habitat name	Possible revisions	Original EUNIS-3 code	Original EUNIS-3 habitat name
F7.1	Western Mediterranean spiny heath	F7.1	Western Mediterranean spiny heath	Better termed 'West Mediterranean coastal garrigue' to avoid confusion	F7.1	West Mediterranean spiny heaths
					F7.2	Central Mediterranean spiny heaths
F7.3	Eastern Mediterranean spiny heath (phrygana)	F7.3	Eastern Mediterranean spiny heath (phrygana)		F7.3	East Mediterranean phrygana
F7.4a	Western Mediterranean mountain hedgehog-heath	F7.4a	Western Mediterranean mountain hedgehog-heath		F7.4	Hedgehog-heaths
F7.4b	Central Mediterranean mountain hedgehog-heath	F7.4b	Central Mediterranean mountain hedgehog-heath			
F7.4c	Eastern Mediterranean mountain hedgehog-heath	F7.4c	Eastern Mediterranean mountain hedgehog-heath			
F7.4d	Canarian mountain hedgehog-heath	F7.4d	Canarian mountain hedgehog-heath			
F8.1	Canarian xerophytic scrub	F8.1	Canarian xerophytic scrub		F8.1	Canary Island xerophytic scrub
F8.2	Madeiran xerophytic scrub	F8.2	Madeiran xerophytic scrub		F8.2	Madeiran xerophytic scrub
F9.1a	Arctic, boreal and alpine riparian scrub	F9.1	Temperate and boreal riparian scrub		F9.1	Riverine scrub
F9.1b	Temperate riparian scrub					
F9.2	Salix fen scrub	F9.2	Salix fen scrub		F9.2	Salix carr and fen scrub
F9.3	Mediterranean riparian scrub	F9.3	Mediterranean riparian scrub		F9.3	Southern riparian galleries and thickets
G1.1	Temperate and boreal softwood riparian woodland	G1.1	Temperate and boreal softwood riparian woodland		G1.1	Riparian and gallery woodland, with dominant Alnus, Betula, Populus or Salix
G1.2a	Alnus woodland on riparian and mineral soils	G1.2a	Alnus woodland on riparian and upland soils		G1.2	Mixed riparian floodplain and gallery woodland
G1.2b	Temperate and boreal hardwood riparian woodland	G1.2b	Temperate and boreal hardwood riparian woodland			
G1.3	Mediterranean and Macaronesian riparian woodland	G1.3	Mediterranean and Macaronesian riparian woodland		G1.3	Mediterranean riparian woodland
G1.4	Broadleaved swamp woodland on non-acid peat	G1.4	Broadleaved swamp woodland on non-acid peat		G1.4	Broadleaved swamp woodland not on acid peat
G1.5	Broadleaved bog woodland on acid peat	G1.5	Broadleaved bog woodland on acid peat		G1.5	Broadleaved swamp woodland on acid peat
G1.6a	Fagus woodland on non-acid soils	G1.6a	Fagus woodland on non-acid soils	Could be split into various upland and lowland types	G1.6	Fagus woodland
G1.6b	Fagus woodland on acid soils	G1.6b	Fagus woodland on acid soils			
G1.7a	Temperate and submediterranean thermophilous deciduous woodland	G1.7a	Temperate and submediterranean	Steppic types could be separated off	G1.7	Thermophilous deciduous woodland
G1.7b	Mediterranean thermophilous deciduous woodland	G1.7b	Mediterranean thermophilous deciduous woodland			
G1.8	Acidophilous Quercus woodland	G1.8	Acidophilous Quercus woodland	Could be separated into sub-types in different biogeographic zones	G1.8	Acidophilous Quercus-dominated woodland
G1.9a	Boreal-nemoral montane Betula and Populus tremula woodland on mineral soils	G1.9a	Temperate and boreal mountain		G1.9	Non-riverine woodland with Betula, Populus tremula or Sorbus aucuparia
G1.9b	Mediterranean mountain Betula and Populus tremula woodland on mineral soils	G1.9b	Mediterranean mountain Betula and			
G1.Aa	Carpinus and Quercus mesic deciduous woodland	G1.Aa	Carpinus and Quercus mesic	Could be separated into sub-types in	G1.A	Meso- and eutrophic Quercus, Carpinus, Fraxinus, Acer, Tilia, Ulmus and related woodland
G1.Ab	Ravine woodland	G1.Ab	Ravine woodland			
G1.Ba	Alnus cordata woodland	G1.Ba	Alnus cordata woodland		G1.B	Non-riverine Alnus woodland
G1.C	Highly artificial broadleaved deciduous forestry plantations		G1.C omitted from Red List as intensively anthropogenic		G1.C	Highly artificial broadleaved deciduous forestry plantations
G1.D	Fruit and nut tree orchards		G1.D omitted from Red List as intensively anthropogenic		G1.D	Fruit and nut tree orchards
G2.1	Mediterranean evergreen Quercus woodland	G2.1	Mediterranean evergreen Quercus woodland		G2.1	Mediterranean evergreen Quercus woodland
G2.2	Mainland laurophyllous woodland	G2.2	Mainland laurophyllous woodland		G2.2	Eurasian continental sclerophyllous woodland
G2.3	Macaronesian laurophyllous woodland	G2.3	Macaronesian laurophyllous woodland		G2.3	Macaronesian Laurus woodland
G2.4	Olea europaea-Ceratonia siliqua woodland	G2.4	Olea europaea-Ceratonia siliqua woodland		G2.4	Olea europaea - Ceratonia siliqua woodland
G2.5a	South-Aegean Phoenix grove	G2.5a	South-Aegean Phoenix grove	These are very diverse.	G2.5	Phoenix groves
G2.5b	Canarian Phoenix grove	G2.5b	Canarian Phoenix grove			
G2.6	Ilex aquifolium woodland	G2.6	Ilex aquifolium woodland		G2.6	Ilex aquifolium woods
G2.7	Macaronesian heathy woodland	G2.7	Macaronesian heathy woodland		G2.7	Canary Island heath woodland
G2.8	Highly artificial broadleaved evergreen forestry plantations		G2.8 omitted from Red List as intensively anthropogenic		G2.8	Highly artificial broadleaved evergreen forestry plantations
G2.9	Evergreen orchards and groves		G2.9 omitted from Red List as intensively anthropogenic	Ancient olive orchards should be included. And some deciduous fruit orchards too.	G2.9	Evergreen orchards and groves

New EUNIS-3 code	New EUNIS-3 habitat name	Red List code	Red List habitat name	Possible revisions	Original EUNIS-3 code	Original EUNIS-3 habitat name
G3.1a	Temperate mountain Picea woodland	G3.1a	Temperate mountain Picea woodland		G3.1	Abies and Picea woodland
G3.1b	Temperate mountain Abies woodland	G3.1b	Temperate mountain Abies woodland			
G3.1c	Mediterranean mountain Abies woodland	G3.1c	Mediterranean mountain Abies woodland			
G3.2	Temperate subalpine Larix, Pinus cembra and Pinus uncinata woodland	G3.2	Temperate subalpine Larix, Pinus cembra and Pinus uncinata woodland		G3.2	Alpine Larix - Pinus cembra woodland
					G3.3	Pinus uncinata woodland
G3.4a	Temperate and continental Pinus sylvestris woodland	G3.4a	Temperate and continental Pinus	Could be separated into sub-types in	G3.4 & G3.5	Pinus sylvestris woodland south of the taiga & Pinus nigra wolodland
G3.4b	Temperate and submediterranean montane Pinus sylvestris-nigra	G3.4b	Temperate and submediterranean			
G3.4c	Mediterranean montane Pinus sylvestris-nigra woodland	G3.4c	Mediterranean montane Pinus			
G3.4d	Mediterranean montane Cedrus woodland	G3.4d	Mediterranean montane Cedrus woodland		G3.9	Coniferous woodland dominated by Cupressaceae or Taxaceae
G3.6	Mediterranean and Balkan subalpine Pinus heldreichii-peuce woodland	G3.6	Mediterranean and Balkan subalpine		G3.6	Subalpine mediterranean Pinus woodland
G3.7	Mediterranean lowland to submontane Pinus woodland	G3.7	Mediterranean lowland to submontane Pinus woodland		G3.7	Lowland to montane mediterranean Pinus woodland (excluding Pinus nigra)
G3.8	Pinus canariensis woodland	G3.8	Pinus canariensis woodland		G3.8	Canary Island Pinus canariensis woodland
G3.9a	Taxus baccata woodland	G3.9a	Taxus baccata woodland	This group need some further thought to recognise the different Taxus woodlands and submediterranean juniper woods	G3.9	Coniferous woodland dominated by Cupressaceae or Taxaceae
G3.9b	Mediterranean Cupressaceae woodland	G3.9b	Mediterranean Cupressaceae woodland			
G3.9c	Macaronesian Juniperus woodland	G3.9c	Macaronesian Juniperus woodland			
G3.A	Picea taiga woodland	G3.A	Picea taiga woodland		G3.A	Picea taiga woodland
G3.B	Pinus sylvestris taiga woodland	G3.B	Pinus sylvestris taiga woodland		G3.B	Pinus taiga woodland
G3.C	Larix sibirica taiga woodland		G3.C omitted from Red List as beyond geographic limit		G3.C	Larix taiga woodland
G3.Da	Pinus bog woodland	G3.Da	Pinus mire woodland		G3.D & G.3E	Boreal bog conifer woodland & Nemoral bog conifer woodland
G3.Db	Picea bog woodland	G3.Db	Picea mire woodland			
G3.Dc	Larix sibirica bog woodland		G3.Dc omitted from Red List as beyond geographic limit			
G3.F	Highly artificial coniferous plantations		G3.F omitted from Red List as intensively anthropogenic		G3.F	Highly artificial coniferous plantations
		H1.1	Cave		H1.1	Cave entrancess
					H1.2	Cave interiors
					H1.3	Dark underground passages
					H1.4	Lava tubes
			H1.5 and H1.6 merged and moved to C		H1.5	Underground standing water bodies
					H1.6	Underground running water bodies
			omitted from Red List as intensively anthropogenic		H1.7	Disused underground mines and tunnels
		H2.1	Boreal and arctic siliceous scree and block field		H2.1	Boreal and arctic siliceous screes
		H2.2	Boreal and arctic baserich scree and block field		H2.2	Boreal and arctic base-rich screes
		H2.3	Temperate high-mountain siliceous scree	Should also include moraines, as H2.4	H2.3	Temperate high-mountain siliceous screes
		H2.4	Temperate high-mountain baserich scree and moraine		H2.4	Temperate high-mountain baserich screes
		H2.5	Temperate, lowland to montane siliceous scree		H2.5	Temperate, lowland to montane siliceous screes
		H2.6a	Temperate, lowland to montane baserich scree		H2.6	Calcareous and ultra-basic screes of warm exposures
		H2.6b	Western Mediterranean baserich scree			
		H2.6c	Eastern Mediterranean baserich scree	Could be better termed 'Central Eastern ...'		
H2.6d	Crimean base-rich screes		H2.6d omitted from Red List as beyond geographic limit			

New EUNIS-3 code	New EUNIS-3 habitat name	Red List code	Red List habitat name	Possible revisions	Original EUNIS-3 code	Original EUNIS-3 habitat name
		H3.1a	Boreal and arctic siliceous inland cliff		H3.1	Acid siliceous inland cliffs
		H3.1b	Temperate high-mountain siliceous inland cliff			
		H3.1c	Temperate, lowland to montane siliceous inland cliff			
		H3.1d	Mediterranean siliceous inland cliff			
		H3.2a	Boreal and arctic base-rich inland cliff		H3.2	Basic and ultra-basic inland cliffs
		H3.2b	Temperate high-mountain base-rich inland cliff			
		H3.2c	Temperate, lowland to montane base-rich inland cliff	Could be split into sunny and shady types		
		H3.2d	Mediterranean base-rich inland cliff	Could be split unti lowland and high altitude types		
		H3.2e	Boreal ultramafic inland cliff			
		H3.2f	Temperate ultramafic inland cliff			
		H3.2g	Mediterranean ultramafic inland cliff			
		H3.3	Macaronesian inland cliff		H3.3	Macaronesian inland cliffs
		H3.4	Wet inland cliff		H3.4	Wet inland cliffs
		H3.5a	Limestone pavement		H3.5	Almost bare rock pavements, including limestone pavements
			H3.6 merged with E habitats in Red List (E1.1b, E1.1d)		H3.6	Weathered rock and outcrop types
		H4.1	Snow pack		H4.1	Snow packs
		H4.2	Ice cap and glacier		H4.2	Ice caps and true glaciers
		H4.3	Rock glacier and unvegetated ice-dominated moraine		H4.3	Rock glaciers and unvegetated ice-dominated moraines
		H5.1a	Fjell field	Needs revision in light of forthcoming Icelandic data	H5.1	Fjell-fields and other freeze-thaw features with very sparse or no vegetation
		H5.1b	Polar desert			
			H5.2 merged with H4.3	Should be reinstated	H5.2	Glacial moraines with very sparse or no vegetation
			H5.3 merged with different other habitats, including H and E		H5.3	Sparsely- or un-vegetated habitats on mineral substrates not from recent ice activity
			H5.4 merged with different other habitats, including H and E		H5.4	Dry organic substrates with very sparse or no vegetation
			H5.6 merged with many different other habitats		H5.5	Burnt areas with very sparse or no vegetation
			H5.6 merged with many different other habitats, esp. E and H		H5.6	Tramped areas
		H5.1c	Subarctic volcanic field (partly also		H6.1 &	Active and recent volcanic features, Inactive recent volcanic
		H6.1	Mediterranean and temperate		H6.2	features
		I1.3	Arable land with unmixed crops grown		I1.3	Arable land with unmixed crops grown by low-intensity

Appendix C: Formal definitions of EUNIS grassland habitat types used in the expert system

5 B14a Atlantic and Baltic coastal dune grassland (grey dune)
<##Q B14a-Atlantic-and-Baltic-coastal-dune-grassland-grey-dune> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 B14a Atlantic and Baltic coastal dune grassland (grey dune)
<#02 B14a-Atlantic-and-Baltic-coastal-dune-grassland-grey-dune-specialists> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 B14b Mediterranean and Macaronesian coastal dune grassland (grey dune)
<##Q B14b-Mediterranean-and-Macaronesian-coastal-dune-grassland-grey-dune> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 B14b Mediterranean and Macaronesian coastal dune grassland (grey dune)
<#02 B14b-Mediterranean-and-Macaronesian-coastal-dune-grassland-grey-dune-specialists> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 B14c Black Sea coastal dune grassland (grey dune)
<##Q B14c-Black-Sea-coastal-dune-grassland-grey-dune> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 B14c Black Sea coastal dune grassland (grey dune)
<#02 B14c-Black-Sea-coastal-dune-grassland-grey-dune-specialists> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)
5 E11a Pannonian and Pontic sandy steppe
(<##Q E11a-Pannonian-and-Pontic-sandy-steppe> AND <#03 E11a-Pannonian-and-Pontic-sandy-steppe>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E11a Pannonian and Pontic sandy steppe
<#TC E11a-Pannonian-and-Pontic-sandy-steppe-specialists GR15> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E11b Cryptogam- and annual-dominated vegetation on siliceous rock outcrops
((<##Q E11b-Cryptogam-and-annual-dominated-vegetation-on-siliceous-rock-outcrops> AND <#03 E11b-Cryptogam-and-annual-dominated-vegetation-on-siliceous-rock-outcrops>) AND <#TC E11b-Cryptogam-and-annual-dominated-vegetation-on-siliceous-rock-outcrops GR #TC Hemicryptophytes>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E11d Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops
((<##Q E11d-Cryptogam-and-annual-dominated-vegetation-on-calcareous-and-ultramafic-rock-outcrops> AND <#03 E11d-Cryptogam-and-annual-dominated-vegetation-on-calcareous-and-ultramafic-rock-outcrops>) AND <#TC E11d-Cryptogam-and-annual-dominated-vegetation-on-calcareous-and-ultramafic-rock-outcrops GR #TC Hemicryptophytes>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E11e Perennial rocky grassland of the Italian Peninsula
(<##Q E11e-Perennial-rocky-grassland-of-the-Italian-Peninsula> AND <#03 E11e-Perennial-rocky-grassland-of-the-Italian-Peninsula>) NOT (<#TC Trees GR05> OR (<#TC Shrubs GR05> OR <#TC Garrigue-and-micro-garrigue-species GR25>))

6 E11f Continental dry rocky steppic grassland and dwarf scrub on chalk outcrops
(<#TC E11f-Continental-dry-rocky-steppic-grassland-and-dwarf-scrub-on-chalk-outcrops-specialists GR25> OR <#02 E11f-Continental-dry-rocky-steppic-grassland-and-dwarf-scrub-on-chalk-outcrops-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E11g Perennial rocky grassland of Central Europe and the Carpathians
(<##Q E11g-Perennial-rocky-grassland-of-Central-Europe-and-the-Carpathians> AND <#03 E11g-Perennial-rocky-grassland-of-Central-Europe-and-the-Carpathians>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E11h Heavy-metal dry grassland of the Balkans
(<##Q E11h-Heavy-metal-dry-grassland-of-the-Balkans> AND <#03 E11h-Heavy-metal-dry-grassland-of-the-Balkans>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E11i Perennial rocky calcareous grassland of subatlantic-submediterranean Europe
(<##Q E11i-Perennial-rocky-calcareous-grassland-of-subatlantic-submediterranean-Europe> AND <#03 E11i-Perennial-rocky-calcareous-grassland-of-subatlantic-submediterranean-Europe>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E11j Dry steppic, submediterranean pasture of South-Eastern Europe
(<##Q E11j-Dry-steppic-submediterranean-pasture-of-South-Eastern-Europe> AND <#03 E11j-Dry-steppic-submediterranean-pasture-of-South-Eastern-Europe>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E12a Semi-dry perennial calcareous grassland
(<##Q E12a-Semi-dry-perennial-calcareous-grassland> AND <#03 E12a-Semi-dry-perennial-calcareous-grassland>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E12b Continental dry steppe
(<##Q E12b-Continental-dry-steppe> AND <#02 E12b-Continental-dry-steppe>) NOT ((<#TC Trees GR05> OR <#TC Shrubs GR05>) OR (<#TC Dwarf-shrubs GR05> OR <#TC Garrigue-and-micro-garrigue-species GR05>))

6 E12b Continental dry steppe
(<#TC E12b-Continental-dry-steppe-specialists GR25> AND <#03 E12b-Continental-dry-steppe>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E13a Mediterranean closely grazed dry grassland
(<##Q E13a-Mediterranean-closely-grazed-dry-grassland> AND <#03 E13a-Mediterranean-closely-grazed-dry-grassland>) NOT (<#TC Trees GR05> OR (<#TC Shrubs GR05> OR <#TC Crop-species GR05>))

5 E13b Mediterranean tall perennial dry grassland
(<##Q E13b-Mediterranean-tall-perennial-dry-grassland> AND <#03 E13b-Mediterranean-tall-perennial-dry-grassland>) NOT (<#TC Trees GR05> OR (<#TC Shrubs GR05> OR <#TC Garrigue-and-micro-garrigue-species GR05>))

5 E13c Mediterranean annual-rich dry grassland
(<##Q E13c-Mediterranean-annual-rich-dry-grassland> AND <#03 E13c-Mediterranean-annual-rich-dry-grassland>) NOT <#TC Trees|#TC Shrubs|#TC Chamaephytes|#TC Hemicryptophytes GR10>)

5 E15a Iberian oromediterranean siliceous dry grassland
(<##Q E15a-Iberian-oromediterranean-siliceous-dry-grassland> AND <#02 E15a-Iberian-oromediterranean-siliceous-dry-grassland>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E15a Iberian oromediterranean siliceous dry grassland
<#TC E15a-Iberian-oromediterranean-siliceous-dry-grassland-specialists GR10> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E15b Iberian oromediterranean basiphilous dry grassland
(<##Q E15b-Iberian-oromediterranean-basiphilous-dry-grassland> AND <#01 E15b-Iberian-oromediterranean-basiphilous-dry-grassland-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E15b Iberian oromediterranean basiphilous dry grassland

<#TC E15b-Iberian-oromediterranean-basiphilous-dry-grassland-specialists GR10> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E15c Cyrno-Sardean-oromediterranean siliceous dry grassland <##Q E15c-Cyrno-Sardean-oromediterranean-siliceous-dry-grassland> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E15c Cyrno-Sardean-oromediterranean siliceous dry grassland <#TC E15c-Cyrno-Sardean-oromediterranean-siliceous-dry-grassland-specialists GR10> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E15d Greek and Anatolian oromediterranean siliceous dry grassland (<##Q E15d-Greek-and-Anatolian-oromediterranean-siliceous-dry-grassland> AND <#01 E15d-Greek-and-Anatolian-oromediterranean-siliceous-dry-grassland-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E15d Greek and Anatolian oromediterranean siliceous dry grassland <#TC E15d-Greek-and-Anatolian-oromediterranean-siliceous-dry-grassland-specialists GR10> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E15e Madeiran oromediterranean siliceous dry grassland <##Q E15e-Madeiran-oromediterranean-siliceous-dry-grassland> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E15e Madeiran oromediterranean siliceous dry grassland <#TC E15e-Madeiran-oromediterranean-siliceous-dry-grassland-specialists GR10> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E17 Lowland to submontane, dry to mesic Nardus grassland (<##Q E17-Lowland-to-submontane-dry-to-mesic-Nardus-grassland> AND <#03 E17-Lowland-to-submontane-dry-to-mesic-Nardus-grassland>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E18 Open Iberian supra-mediterranean dry acid and neutral grassland <##Q E18-Open-Iberian-supramediterranean-dry-acid-and-neutral-grassland> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E18 Open Iberian supra-mediterranean dry acid and neutral grassland <#TC E18-Open-Iberian-supramediterranean-dry-acid-and-neutral-grassland-specialists GR10> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E19a Oceanic to subcontinental inland sand grassland on dry acid and neutral soils

(<##Q E19a-Oceanic-to-subcontinental-inland-sand-grassland-on-dry-acid-and-neutral-soils> AND <#03 E19a-Oceanic-to-subcontinental-inland-sand-grassland-on-dry-acid-and-neutral-soils>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E19b Inland sanddrift and dune with siliceous grassland (<##Q E19b-Inland-sanddrift-and-dune-with-siliceous-grassland> AND <#03 E19b-Inland-sanddrift-and-dune-with-siliceous-grassland>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E19b Inland sanddrift and dune with siliceous grassland <#TC E19b-Inland-sanddrift-and-dune-with-siliceous-grassland-specialists GR50> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E1A Mediterranean to Atlantic open, dry, acid and neutral grassland (<##Q E1A-Mediterranean-to-Atlantic-open-dry-acid-and-neutral-grassland> AND <#03 E1A-Mediterranean-to-Atlantic-open-dry-acid-and-neutral-grassland>) NOT (<#TC Trees GR05> OR (<#TC Shrubs GR05> OR (<#TC Crop-species GR05> OR (<#03 B14b-Mediterranean-and-Macaronesian-coastal-dune-grassland-grey-dune-specialists> OR <#TC E13c-Mediterranean-annual-rich-dry-grassland GR25>))))

6 E1B Heavy-metal grassland in Western and Central Europe (<#02 E1B-Heavy-metal-grassland-in-Western-and-Central-Europe-specialists> OR <#TC E1B-Heavy-metal-grassland-in-Western-and-Central-Europe-specialists GR05>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E1F Azorean open dry, acid to neutral grassland <##Q E1F-Azorean-open-dry-acid-to-neutral-grassland> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E21 Mesic permanent pasture of lowlands and mountains (<##Q E21-Mesic-permanent-pasture-of-lowlands-and-mountains> AND <#03 E21-Mesic-permanent-pasture-of-lowlands-and-mountains>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E22 Low and medium altitude hay meadow (<##Q E22-Low-and-medium-altitude-hay-meadow> AND <#03 E22-Low-and-medium-altitude-hay-meadow>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E23 Mountain hay meadow (<##Q E23-Mountain-hay-meadow> AND <#02 E23-Mountain-hay-meadow-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E23 Mountain hay meadow
<#03 E23-Mountain-hay-meadow-specialists> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E24 Iberian summer pasture (vallicar)
(<##Q E24-Iberian-summer-pasture-vallicar> AND <#01 E24-Iberian-summer-pasture-vallicar-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E24 Iberian summer pasture (vallicar)
(<#TC E24-Iberian-summer-pasture-vallicar-specialists GR25> AND <#02 E24-Iberian-summer-pasture-vallicar-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E31a Mediterranean tall humid inland grassland
(<##Q E31a-Mediterranean-tall-humid-inland-grassland> AND <#01 E31a-Mediterranean-tall-humid-inland-grassland-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E32a Mediterranean short moist grassland of lowlands
(<##Q E32a-Mediterranean-short-moist-grassland-of-lowlands> AND <#03 E32a-Mediterranean-short-moist-grassland-of-lowlands>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E32a Mediterranean short moist grassland of lowlands
<#TC E32a-Mediterranean-short-moist-grassland-of-lowlands-specialists GR25> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E32b Mediterranean short moist grassland of mountains
(<##Q E32b-Mediterranean-short-moist-grassland-of-mountains> AND <#01 E32b-Mediterranean-short-moist-grassland-of-mountains-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E33 Submediterranean moist meadow
(<##Q E33-Submediterranean-moist-meadow> AND <#02 E33-Submediterranean-moist-meadow-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E34a Moist or wet mesotrophic to eutrophic hay meadow
(<##Q E34a-Moist-or-wet-mesotrophic-to-eutrophic-hay-meadow> AND <#03 E34a-Moist-or-wet-mesotrophic-to-eutrophic-hay-meadow>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E34b Moist or wet mesotrophic to eutrophic pasture
(<##Q E34b-Moist-or-wet-mesotrophic-to-eutrophic-pasture> AND <#03 E34b-Moist-or-wet-mesotrophic-to-eutrophic-pasture>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E35 Temperate and boreal moist or wet oligotrophic grassland
(<##Q E35-Temperate-and-boreal-moist-or-wet-oligotrophic-grassland> AND <#03 E35-Temperate-and-boreal-moist-or-wet-oligotrophic-grassland>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E41 Vegetated snow-patch
(<##Q E41-Vegetated-snow-patch> AND <#01 E41-Vegetated-snow-patch-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E41 Vegetated snow-patch
<#03 E41-Vegetated-snow-patch-specialists> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E43a Boreal and arctic acidophilous alpine grassland
(<##Q E43a-Boreal-and-arctic-acidophilous-alpine-grassland> AND <#02 E43a-Boreal-and-arctic-acidophilous-alpine-grassland>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E43a Boreal and arctic acidophilous alpine grassland
<#TC E43a-Boreal-and-arctic-acidophilous-alpine-grassland-specialists GR10> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E43b Temperate acidophilous alpine grassland
(<##Q E43b-Temperate-acidophilous-alpine-grassland> AND <#02 E43b-Temperate-acidophilous-alpine-grassland>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E43b Temperate acidophilous alpine grassland
<#TC E43b-Temperate-acidophilous-alpine-grassland-specialists GR25> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E44a Arctic-alpine calcareous grassland
(<##Q E44a-Arctic-alpine-calcareous-grassland> AND <#01 E44a-Arctic-alpine-calcareous-grassland-specialists>) NOT ((<#01 E43b-Temperate-acidophilous-alpine-grassland-specialists> OR <#01 E15b-Iberian-oromediterranean-basiphilous-dry-grassland-specialists>) OR (<#TC Trees GR05> OR <#TC Shrubs GR05>))

5 E44b Alpine and subalpine calcareous grassland of the Balkan and Apennines
(<##Q E44b-Alpine-and-subalpine-calcareous-grassland-of-the-Balkan-and-Apennines> AND <#01 E44b-Alpine-and-subalpine-calcareous-grassland-of-the-Balkan-and-Apennines-specialists>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E44b Alpine and subalpine calcareous grassland of the Balkan and Apennines
<#TC E44b-Alpine-and-subalpine-calcareous-grassland-of-the-Balkan-and-Apennines-specialists GR10> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E52a Thermophilous woodland fringe of base-rich soils
(<##Q E52a-Thermophilous-woodland-fringe-of-base-rich-soils> AND <#02 E52a-Thermophilous-woodland-fringe-of-base-rich-soils>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E52a Thermophilous woodland fringe of base-rich soils
<#TC E52a-Thermophilous-woodland-fringe-of-base-rich-soils-specialists GR50> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E52b Thermophilous woodland fringe of acidic soils
(<##Q E52b-Thermophilous-woodland-fringe-of-acidic-soils> AND <#02 E52b-Thermophilous-woodland-fringe-of-acidic-soils>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E52b Thermophilous woodland fringe of acidic soils
<#TC E52b-Thermophilous-woodland-fringe-of-acidic-soils-specialists GR50> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E52c Macaronesian thermophilous woodland fringe
<##Q E52c-Macaronesian-thermophilous-woodland-fringe> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

6 E52c Macaronesian thermophilous woodland fringe
<#TC E52c-Macaronesian-thermophilous-woodland-fringe-specialists GR25> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E54 Lowland moist or wet tall-herb and fern fringe
(<##Q E54-Lowland-moist-or-wet-tall-herb-and-fern-fringe> AND <#03 E54-Lowland-moist-or-wet-tall-herb-and-fern-fringe>) NOT (<#TC Trees GR05> OR (<#TC Shrubs GR05> OR (<#TC C51a-Tall-helophyte-bed GR25> OR <#TC C52-Tall-sedge-bed GR25>)))

5 E55 Subalpine moist or wet tall-herb and fern fringe
(<##Q E55-Subalpine-moist-or-wet-tall-herb-and-fern-fringe> AND <#03 E55-Subalpine-moist-or-wet-tall-herb-and-fern-fringe>) NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E61 Mediterranean inland salt steppe
<##Q E61-Mediterranean-inland-salt-steppe> NOT (<#01 Oriental-inland-salt-steppe-species> OR(<#TC Trees GR05> OR <#TC Shrubs GR05>))

5 E62 Continental inland salt steppe
<##Q E62-Continental-inland-salt-steppe> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

5 E63 Temperate inland salt marsh
<##Q E63-Temperate-inland-salt-marsh> NOT (<#TC Trees GR05> OR <#TC Shrubs GR05>)

Appendix D: Lists of indicator species of the revised EUNIS grassland habitat types

B1.4a - Atlantic and Baltic coastal dune grassland (grey dune)

*Diagnostic species (phi coefficient * 100)*

Dianthus hyssopifolius subsp. gallicus	48.3	Calystegia soldanella	46.8
Helichrysum stoechas	46.0	Euphorbia portlandica	39.9
Koeleria glauca	37.6	Galium arenarium	32.8
Eryngium maritimum	32.6	Malcolmia littorea	30.2
Euphorbia paralias	30.0	Reichardia gaditana	29.9
Festuca juncifolia	29.0	Herniaria maritima	28.8
Thymus carnosus	27.4	Crucianella maritima	27.1
Ammophila arenaria	26.5	Herniaria ciliolata subsp. robusta	26.3
Carpobrotus edulis	25.0	Mibora minima	25.0
Cerastium diffusum	23.8	Leontodon saxatilis	23.2
Tortula ruraliformis	23.2	Anchusa calcarea	22.1
Linaria supina	21.9	Lagurus ovatus	21.0
Carex arenaria	19.8	Festuca vasconcensis	19.8
Phleum arenarium	19.3	Calendula suffruticosa subsp. algarbiensis	19.2
Armeria pungens	18.4	Pancratium maritimum	18.0
Omphalodes littoralis	17.6	Anagallis monelli	16.7
Armeria welwitschii	15.5	Helichrysum italicum	15.4

Constant species (occurrence frequencies)

Calystegia soldanella	43.0	Helichrysum stoechas	43.0
Ammophila arenaria	41.0	Eryngium maritimum	40.0
Carex arenaria	39.0	Koeleria glauca	39.0
Leontodon saxatilis	38.0	Plantago lanceolata	28.0
Crucianella maritima	26.0	Euphorbia paralias	26.0
Sedum acre	25.0	Dianthus hyssopifolius subsp. gallicus	24.0
Festuca rubra	23.0	Euphorbia portlandica	22.0
Pancratium maritimum	22.0	Lagurus ovatus	20.0
Phleum arenarium	20.0	Artemisia campestris	19.0
Ononis spinosa	19.0	Cerastium diffusum	17.0
Elytrigia juncea	16.0	Malcolmia littorea	16.0
Eryngium campestre	14.0	Polygala vulgaris	14.0
Asperula cynanchica	13.0	Corynephorus canescens	13.0
Helichrysum italicum	13.0	Mibora minima	13.0
Ononis natrix	12.0	Galium arenarium	11.0
Tortula ruraliformis	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Helichrysum stoechas	29.0	Ammophila arenaria	7.0
Crucianella maritima	7.0	Tortula ruraliformis	6.0
Koeleria glauca	5.0		

B1.4b - Mediterranean and Macaronesian coastal dune grassland (grey dune)

*Diagnostic species (phi coefficient * 100)*

Pancratium maritimum	63.8	Elytrigia juncea	57.8
Medicago marina	53.8	Lotus cytisoides	51.7
Echinophora spinosa	51.1	Silene niceensis	48.4
Eryngium maritimum	46.5	Sporobolus pungens	46.2
Crucianella maritima	45.3	Cyperus capitatus	43.3
Euphorbia terracina	39.5	Silene succulenta	39.4
Anthemis maritima	39.2	Achillea maritima	38.9
Launaea fragilis	38.4	Lotus creticus	38.2
Pseudorlaya pumila	36.9	Cakile maritima	35.4
Cutandia maritima	35.3	Vulpia fasciculata	35.3
Ononis variegata	34.1	Medicago littoralis	34.0
Euphorbia paralias	33.8	Matthiola sinuata	33.3
Silene colorata	32.7	Lagurus ovatus	32.3
Centaurea sphaerocephala	30.2	Malcolmia ramosissima	28.4
Erodium laciniatum	26.9	Helichrysum italicum	26.8
Pycnocomon rutifolium	26.8	Ammophila arenaria	26.6
Calystegia soldanella	26.3	Sonchus bulbosus	26.0
Silene sericea	23.4	Scrophularia ramosissima	22.9
Cutandia divaricata	22.4	Anisantha rigida	21.8
Scolymus hispanicus	21.8	Armeria pungens	21.4
Senecio leucanthemifolius	21.0	Matthiola tricuspidata	20.7
Lobularia maritima	19.9	Ononis diffusa	19.7
Rumex bucephalophorus	19.0	Maresia nana	16.8
Echium humile	16.7	Corynephorus divaricatus	16.6
Senecio glaucus	16.4	Polycarpon tetraphyllum subsp. diphyllum	15.9
Senecio glaucus subsp. coronopifolius	15.8	Glaucium flavum	15.7
Catapodium marinum	15.5	Ononis natrix	15.5
Polygonum maritimum	15.4		

Constant species (occurrence frequencies)

Pancratium maritimum	49.0	Elytrigia juncea	47.0
Eryngium maritimum	38.0	Ammophila arenaria	34.0
Medicago marina	34.0	Lotus cytisoides	29.0
Crucianella maritima	28.0	Echinophora spinosa	27.0
Cyperus capitatus	24.0	Silene niceensis	24.0
Sporobolus pungens	22.0	Lagurus ovatus	21.0
Euphorbia paralias	19.0	Vulpia fasciculata	19.0
Lotus creticus	18.0	Achillea maritima	17.0
Helichrysum italicum	17.0	Medicago littoralis	17.0
Anthemis maritima	16.0	Euphorbia terracina	16.0
Silene succulenta	16.0	Cakile maritima	15.0
Calystegia soldanella	15.0	Launaea fragilis	15.0
Pseudorlaya pumila	15.0	Cutandia maritima	13.0

Silene colorata	13.0	Matthiola sinuata	12.0
Ononis variegata	12.0	Rumex bucephalophorus	12.0
Sonchus bulbosus	12.0	Ononis natrix	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Crucianella maritima	11.0	Ammophila arenaria	10.0
Elytrigia juncea	9.0		

B1.4c - Black Sea coastal dune grassland (grey dune)

*Diagnostic species (phi coefficient * 100)*

Carex colchica	58.3	Secale sylvestre	57.9
Centaurea arenaria	56.2	Leymus racemosus	53.7
Silene thymifolia	50.0	Jurinea kilaea	49.4
Lepidotrichum uechtritzianum	46.4	Odontarrhena borzaeana	37.5
Alyssum hirsutum	36.2	Cionura erecta	34.7
Lomelosia ucranica	33.4	Linaria genistifolia	32.7
Silene euxina	32.5	Syrenia montana	32.0
Peucedanum arenarium	31.0	Cynanchum acutum	30.8
Astragalus varius	29.3	Ephedra distachya	29.2
Verbascum purpureum	28.9	Crambe maritima	28.1
Stachys atherocalyx	28.0	Euphorbia seguieriana	27.5
Festuca beckeri	27.3	Seseli tortuosum	26.4
Jasione heldreichii	25.9	Astrodaucus littoralis	25.1
Verbascum pinnatifidum	24.8	Anisantha tectorum	24.6
Corispermum nitidum	23.4	Scabiosa argentea	22.6
Centaurea scabiosa subsp. adpressa	22.3	Festuca arenicola	22.3
Gypsophila perfoliata	22.1	Asperula setulosa	20.1
Eryngium maritimum	19.9	Alyssum minutum	19.7
Teucrium polium	18.4	Galium humifusum	18.3
Tribulus terrestris	18.2	Silene subconica	17.9
Stipa borysthenica	17.9	Artemisia campestris	17.7
Lactuca tatarica	17.7	Thymus dimorphus	17.5
Elymus uralensis subsp. viridiglumis	17.4	Chondrilla juncea	17.3
Polygonum arenarium	16.4	Anchusa leptophylla	16.2
Salsola tragus	16.1	Marrubium peregrinum	15.9
Plantago arenaria	15.9	Alyssum turkestanicum	15.6
Jurinea longifolia	15.6	Agropyron dasyanthum	15.4
Asperula graveolens	15.4	Tragopogon brevirostris subsp. brevirostris	15.4

Constant species (occurrence frequencies)

Carex colchica	46.0	Centaurea arenaria	43.0
Secale sylvestre	43.0	Artemisia campestris	40.0
Euphorbia seguieriana	32.0	Leymus racemosus	31.0
Linaria genistifolia	31.0	Medicago falcata	26.0
Jurinea kilaea	25.0	Silene thymifolia	25.0
Eryngium maritimum	24.0	Anisantha tectorum	23.0

Lepidotrichum uechtritzianum	22.0	Chondrilla juncea	20.0
Ephedra distachya	20.0	Seseli tortuosum	20.0
Teucrium polium	20.0	Syntrichia ruralis	18.0
Alyssum hirsutum	17.0	Festuca beckeri	16.0
Odontarrhena borzaeana	16.0	Ammophila arenaria	15.0
Astragalus onobrychis	14.0	Cynanchum acutum	14.0
Cynodon dactylon	14.0	Cionura erecta	13.0
Cyperus capitatus	13.0	Poa bulbosa	13.0
Scabiosa argentea	13.0	Astragalus varius	12.0
Cladonia foliacea	12.0	Peucedanum arenarium	12.0
Syrenia montana	12.0	Erysimum diffusum	11.0
Lomelosia ucranica	11.0	Scirpoides holoschoenus	11.0
Silene euxina	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Carex colchica	11.0	Artemisia campestris	7.0
Ephedra distachya	6.0		

E1.1a - Pannonian and Pontic sandy steppe

*Diagnostic species (phi coefficient * 100)*

Koeleria glauca	49.3	Festuca vaginata	45.6
Bassia laniflora	42.5	Festuca beckeri	41.7
Polygonum arenarium	41.2	Euphorbia seguieriana	38.4
Stipa borysthenica	36.4	Silene borysthenica	32.6
Syrenia cana	31.8	Centaurea arenaria	29.7
Festuca psammophila	29.0	Festuca polesica	28.9
Helichrysum arenarium	28.7	Secale sylvestre	28.2
Achillea micrantha	27.9	Thymus pallasianus	27.1
Asperula graveolens	26.7	Gypsophila paniculata	26.2
Jurinea cyanoides	25.5	Jacobaea borysthenica	25.3
Artemisia campestris	24.5	Dianthus platyodon	23.5
Dianthus arenarius	22.2	Agropyron dasyanthum	22.1
Tragopogon floccosus	21.8	Odontarrhena tortuosa	21.0
Tragopogon ucrainicus	20.7	Jurinea longifolia	20.5
Veronica dillenii	20.3	Syntrichia ruralis	19.9
Alyssum minutum	19.5	Carex colchica	19.3
Minuartia glomerata	19.3	Astragalus varius	19.2
Anchusa gmelinii	19.1	Centaurea breviceps	19.0
Tragopogon borysthenicus	18.5	Jurinea polyclonos	17.7
Herniaria polygama	17.6	Chondrilla juncea	16.6
Dianthus serotinus	16.5	Tragopogon brevirostris subsp. brevirostris	16.2
Corispermum nitidum	15.9	Dianthus borbasii	15.9
Minuartia viscosa	15.6	Scabiosa ucranica	15.6
Alyssum montanum	15.2	Cladonia polycarpoides	15.2
Silene otites aggr.	15.2		

Constant species (occurrence frequencies)

Artemisia campestris	54.0	Koeleria glauca	49.0
Euphorbia seguieriana	43.0	Helichrysum arenarium	30.0
Syntrichia ruralis	27.0	Festuca vaginata	25.0
Bassia laniflora	24.0	Poa bulbosa	24.0
Festuca beckeri	23.0	Ceratodon purpureus	22.0
Polygonum arenarium	21.0	Cerastium semidecandrum	20.0
Cladonia foliacea	20.0	Silene otites aggr.	20.0
Chondrilla juncea	19.0	Corynephorus canescens	19.0
Centaurea arenaria	18.0	Stipa borysthenica	18.0
Rumex acetosella	17.0	Erophila verna	16.0
Euphorbia cyparissias	16.0	Myosotis stricta	16.0
Secale sylvestre	16.0	Sedum acre	16.0
Veronica dillenii	16.0	Alyssum montanum	15.0
Cetraria aculeata	15.0	Cladonia rangiformis	15.0
Festuca polesica	14.0	Festuca psammophila	14.0
Potentilla cinerea	14.0	Arenaria serpyllifolia	13.0
Polytrichum piliferum	13.0	Silene borysthenica	13.0
Carex colchica	12.0	Galium verum	12.0
Hieracium umbellatum	12.0	Linaria genistifolia	12.0
Syrenia cana	12.0	Thymus serpyllum	12.0
Anisantha tectorum	11.0	Brachythecium albicans	11.0
Eryngium campestre	11.0	Fumana procumbens	11.0
Gypsophila paniculata	11.0	Jasione montana	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca polesica	8.0	Festuca psammophila	8.0
Festuca vaginata	8.0	Festuca beckeri	7.0
Syntrichia ruralis	6.0		

E1.1b - Cryptogam- and annual-dominated vegetation on siliceous rock outcrops

*Diagnostic species (phi coefficient * 100)*

Scleranthus perennis	33.5	Polytrichum piliferum	32.4
Sedum rupestre	21.5	Sedum album	20.2
Veronica dillenii	19.7	Racomitrium canescens	19.5
Gagea bohemica	18.8	Cladonia foliacea	17.7
Ceratodon purpureus	16.5	Erophila verna	15.7

Constant species (occurrence frequencies)

Polytrichum piliferum	49.0	Rumex acetosella	40.0
Scleranthus perennis	38.0	Ceratodon purpureus	32.0
Pilosella officinarum	31.0	Sedum album	31.0
Trifolium arvense	30.0	Erophila verna	26.0
Sedum acre	26.0	Sedum rupestre	26.0
Festuca ovina	25.0	Jasione montana	25.0
Cladonia foliacea	24.0	Poa bulbosa	24.0

Artemisia campestris	22.0	Arenaria serpyllifolia	20.0
Potentilla argentea	20.0	Potentilla tabernaemontani	20.0
Hypnum cupressiforme	19.0	Plantago lanceolata	18.0
Veronica arvensis	18.0	Aira caryophyllea	17.0
Corynephorus canescens	17.0	Racomitrium canescens	17.0
Hypochaeris radicata	16.0	Veronica dillenii	16.0
Agrostis capillaris	15.0	Erodium cicutarium	15.0
Euphorbia cyparissias	15.0	Hypericum perforatum	15.0
Myosotis stricta	15.0	Cerastium semidecandrum	14.0
Cladonia furcata	14.0	Sedum sexangulare	14.0
Achillea millefolium	13.0	Cerastium pumilum	13.0
Echium vulgare	13.0	Thymus praecox	13.0
Cladonia rangiformis	12.0	Sanguisorba minor	12.0
Teesdalia nudicaulis	12.0	Thymus pulegioides	12.0
Veronica verna	12.0	Agrostis vinealis	11.0
Centaurea stoebe	11.0	Scleranthus annuus aggr.	11.0
Syntrichia ruralis	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Polytrichum piliferum	19.0	Sedum album	10.0
Racomitrium canescens	7.0		

E1.1d - Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops

*Diagnostic species (phi coefficient * 100)*

Sedum album	34.6	Saxifraga tridactylites	33.4
Erophila verna	25.4	Hornungia petraea	25.1
Arenaria serpyllifolia	21.7	Clinopodium acinos	20.8
Sedum acre	20.2	Encalypta vulgaris	18.5
Minuartia hybrida	18.5	Medicago minima aggr.	18.0
Alyssum alyssoides	17.8	Cladonia symphycarpa	17.7
Tortella inclinata	17.4	Cerastium pumilum	17.3
Barbula convoluta	17.0	Homalothecium sericeum	16.3

Constant species (occurrence frequencies)

Sedum album	51.0	Arenaria serpyllifolia	48.0
Sedum acre	43.0	Erophila verna	39.0
Clinopodium acinos	35.0	Saxifraga tridactylites	31.0
Festuca ovina	24.0	Medicago minima aggr.	23.0
Potentilla tabernaemontani	23.0	Cerastium pumilum	22.0
Artemisia campestris	20.0	Poa bulbosa	20.0
Alyssum alyssoides	19.0	Cerastium semidecandrum	19.0
Sanguisorba minor	18.0	Hypnum cupressiforme	17.0
Abietinella abietina	16.0	Erodium cicutarium	16.0
Euphorbia cyparissias	16.0	Hornungia petraea	16.0
Poa compressa	16.0	Sedum sexangulare	16.0

Syntrichia ruralis	16.0	Tortella tortuosa	16.0
Echium vulgare	15.0	Veronica arvensis	15.0
Ditrichum flexicaule	13.0	Centaurea stoebe	12.0
Ceratodon purpureus	12.0	Galium verum	12.0
Medicago lupulina	12.0	Minuartia hybrida	12.0
Pilosella officinarum	12.0	Plantago lanceolata	12.0
Teucrium chamaedrys	12.0	Allium sphaerocephalon	11.0
Potentilla cinerea	11.0	Thymus praecox	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Sedum album	12.0

E1.1e - Perennial rocky grassland of the Italian Peninsula

*Diagnostic species (phi coefficient * 100)*

Festuca circummediterranea	65.3	Phleum ambiguum	61.0
Koeleria lobata	59.6	Thymus longicaulis	53.4
Brachypodium genuense	51.9	Eryngium amethystinum	51.3
Potentilla rigoana	48.2	Armeria canescens	48.1
Helictochloa versicolor subsp. praetutiana	44.5	Erysimum pseudorhaeticum	42.7
Crepis lacera	40.8	Knautia purpurea	38.5
Centaurea ambigua	38.2	Valeriana tuberosa	37.2
Cytisus spinescens	31.4	Muscari neglectum	31.4
Carex macrolepis	30.8	Asperula purpurea	30.7
Dianthus sylvestris	29.1	Galium lucidum	29.1
Arabis collina	28.9	Leontodon cichoraceus	28.9
Galium corrudifolium	28.3	Globularia meridionalis	27.7
Bunium bulbocastanum	27.3	Festuca inops	26.4
Cerastium tomentosum	26.0	Viola eugeniae	25.7
Petrorhagia saxifraga	25.6	Festuca robustifolia	25.3
Sedum rupestre	24.2	Koeleria splendens	23.6
Sideritis syriaca	23.6	Centaurea rupestris aggr.	23.4
Festuca curvula subsp. curvula	22.2	Inula montana	21.6
Bupleurum baldense	21.5	Centaurea triumfetti aggr.	21.1
Ranunculus pollinensis	20.9	Ranunculus millefoliatus	20.6
Linaria purpurea	20.5	Helianthemum oelandicum	20.2
Cytisus hirsutus subsp. polytrichus	19.7	Senecio scopolii	19.4
Verbascum longifolium	19.4	Ornithogalum comosum	19.2
Minuartia verna	19.1	Cerastium arvense	19.0
Clinopodium alpinum	19.0	Sedum amplexicaule	18.8
Bromopsis erecta	18.6	Achillea virescens subsp. tenorei	18.5
Centaurea alba	18.4	Stipa dasyvaginata	18.3
Prangos ferulacea	18.1	Euphorbia myrsinites	17.7
Carlina acanthifolia subsp. acanthifolia	17.5	Dactylorhiza sambucina	17.5
Alyssum diffusum	17.4	Cynoglossum magellense	17.4
Anthemis cretica	17.3	Sesleria nitida	17.3
Erysimum majellense	17.2	Aethionema saxatile	17.0

Artemisia alba	17.0	Allium sphaerocephalon	16.9
Astracantha nebrodensis	16.6	Silene roemeri	16.6
Cynosurus echinatus	16.5	Helichrysum italicum	16.4
Cerastium ligusticum	16.2	Micromeria graeca	16.2
Silene italica	16.2	Bunium alpinum	16.1
Sesleria juncifolia	16.1	Carlina nebrodensis	15.9
Knautia calycina	15.8	Achillea tenorii	15.6
Asperula aristata	15.6	Trinia dalechampii	15.4
Armeria aspromontana	15.3	Plantago argentea	15.1
Polygala flavescens	15.1		

Constant species (occurrence frequencies)

Bromopsis erecta	67.0	Thymus longicaulis	61.0
Festuca circummediterranea	59.0	Pilosella officinarum	49.0
Koeleria lobata	46.0	Lotus corniculatus	45.0
Phleum ambiguum	44.0	Cerastium arvense	43.0
Eryngium amethystinum	43.0	Sanguisorba minor	40.0
Anthyllis vulneraria	38.0	Armeria canescens	34.0
Galium lucidum	34.0	Brachypodium genuense	33.0
Dianthus sylvestris	31.0	Potentilla rigoana	31.0
Helictochloa versicolor subsp. praetutiana	30.0	Sedum rupestre	30.0
Asperula cynanchica	29.0	Clinopodium alpinum	27.0
Helianthemum oelandicum	27.0	Knautia purpurea	26.0
Teucrium chamaedrys	26.0	Helianthemum nummularium	25.0
Muscari neglectum	25.0	Petrorhagia saxifraga	25.0
Galium corrudifolium	24.0	Plantago lanceolata	24.0
Anthoxanthum odoratum aggr.	23.0	Asperula purpurea	23.0
Erysimum pseudorhaeticum	23.0	Minuartia verna	23.0
Valeriana tuberosa	23.0	Hippocrepis comosa	22.0
Trifolium pratense	21.0	Centaurea ambigua	20.0
Crepis lacera	20.0	Luzula campestris	20.0
Allium sphaerocephalon	19.0	Medicago lupulina	19.0
Bunium bulbocastanum	18.0	Carex caryophyllea	17.0
Carlina acaulis	17.0	Centaurea triumfetti aggr.	17.0
Inula montana	16.0	Koeleria splendens	16.0
Poa alpina	16.0	Sedum sexangulare	16.0
Silene otites aggr.	16.0	Trifolium campestre	16.0
Bupleurum baldense	15.0	Carex macrolepis	15.0
Galium verum	15.0	Trifolium montanum	15.0
Dactylis glomerata	14.0	Globularia meridionalis	14.0
Helichrysum italicum	14.0	Leontodon cichoraceus	14.0
Poa bulbosa	14.0	Teucrium montanum	14.0
Cytisus spinescens	13.0	Helianthemum apenninum	13.0
Leontodon hispidus	13.0	Plantago subulata	13.0
Trinia glauca	13.0	Viola eugeniae	13.0
Agrostis capillaris	12.0	Arabis collina	12.0
Cerastium tomentosum	12.0	Cynosurus echinatus	12.0
Dactylorhiza sambucina	12.0	Festuca nigrescens	12.0

Leontodon crispus	12.0	Rumex acetosella	12.0
Seseli montanum	12.0	Arenaria serpyllifolia	11.0
Artemisia alba	11.0	Asperula aristata	11.0
Brachypodium pinnatum	11.0	Hypericum perforatum	11.0
Rumex acetosa	11.0	Sedum album	11.0
Stachys recta	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Bromopsis erecta	19.0	Brachypodium genuense	16.0
Festuca circummediterranea	11.0		

E1.1f - Continental dry rocky steppic grassland and dwarf scrub on chalk outcrops

*Diagnostic species (phi coefficient * 100)*

Onosma simplicissima	84.6	Gypsophila altissima	82.4
Salvia dumetorum	56.9	Rhaponticoides ruthenica	54.9
Caragana frutex	54.0	Carex pediformis	51.0
Helictotrichon desertorum	50.4	Psephellus sibiricus	47.5
Allium rubens	47.1	Scabiosa isetensis	46.2
Cytisus ruthenicus	45.9	Potentilla humifusa	45.5
Polygala sibirica	44.7	Campanula sibirica	44.6
Hieracium virosum	42.5	Galium octonarium	41.2
Artemisia sericea	40.9	Asperula tephrocarpa	40.9
Artemisia commutata	40.0	Pulsatilla patens	40.0
Gypsophila oligosperma	39.7	Clausia aprica	39.5
Stipa pennata	39.3	Hedysarum grandiflorum	38.9
Thymus talijevii	38.1	Thymus calcareus	37.9
Galatella angustissima	37.7	Asperula tinctoria	37.1
Polygala wolfgangiana	37.0	Tanacetum kittaryanum	36.6
Allium saxatile	36.5	Scorzonera purpurea	35.7
Hypericum elegans	35.6	Hyssopus officinalis subsp. montanus	34.8
Onobrychis arenaria	34.6	Psephellus sumensis	34.6
Koeleria sclerophylla	34.5	Scorzonera hispanica subsp. asphodeloides	33.8
Artemisia hololeuca	33.4	Spiraea crenata	33.4
Nonea pulla	33.3	Stipa capillata	33.3
Dianthus acicularis	33.1	Inula hirta	33.1
Prunus tenella	32.9	Astragalus austriacus	32.7
Matthiola fragrans	32.7	Phlomis tuberosa	32.6
Adonis vernalis	31.9	Artemisia salsoloides	31.9
Helictochloa hookeri subsp. schelliana	31.8	Pimpinella tragium	31.6
Campanula stevenii	31.5	Hedysarum argyrophyllum	30.9
Artemisia latifolia	30.6	Euphorbia seguieriana	30.0
Allium lineare	29.9	Oxytropis spicata	29.9
Veronica spicata	29.9	Dianthus versicolor	29.6
Odontarrhena tortuosa	29.4	Linum ucranicum	28.5
Artemisia austriaca	28.4	Echinops ritro	28.2

Scrophularia cretacea	28.1	Aster alpinus	27.9
Poa transbaicalica	27.6	Artemisia frigida	27.3
Koeleria talievii	27.3	Vincetoxicum hirundinaria	26.9
Arenaria longifolia	26.8	Achillea stepposa	26.6
Oxytropis hippolytii	26.5	Brassica elongata subsp. pinnatifida	26.4
Elytrigia lolioides	26.2	Elytrigia strigosa subsp. reflexiaristata	26.2
Euphorbia petrophila	26.0	Stipa zalesskyi	25.9
Artemisia armeniaca	25.8	Stipa sareptana	25.8
Astragalus albicaulis	25.5	Carex supina	25.3
Thalictrum minus	25.1	Silene chlorantha	24.9
Oxytropis pilosa	24.7	Prunus fruticosa	24.7
Dianthus capitatus subsp. andrzejowskianus	24.3	Hedysarum gmelinii	24.2
Pilosella echioides	24.2	Festuca valesiaca	24.1
Galatella villosa	24.1	Stipa pulcherrima	24.1
Trinia muricata	24.1	Eremogone koriniana	23.6
Asperula petraea	23.5	Ephedra distachya	23.2
Anemone sylvestris	23.0	Malva thuringiaca	22.7
Artemisia nutans	22.6	Agropyron cristatum	22.5
Seseli libanotis	22.4	Jurinea cyanoides	22.3
Psephellus marschallianus	21.9	Polygala cretacea	21.5
Jurinea arachnoidea	21.1	Jurinea ledebourii	21.0
Veronica spuria	20.6	Jurinea stoechadifolia	20.5
Stipa korshinskyi	20.1	Atraphaxis frutescens	20.0
Pedicularis sibirica subsp. uralensis	20.0	Rosa majalis	19.9
Pedicularis kaufmannii	19.8	Thesium arvense	19.8
Hylotelephium stepposum	19.7	Linum flavum	19.6
Adonis volgensis	19.5	Astragalus helmii	19.4
Galatella sedifolia subsp. biflora	19.4	Trifolium lupinaster	19.4
Viola accrescens	19.4	Astragalus testiculatus	19.3
Astragalus wolgensis	18.5	Dracocephalum thymiflorum	18.4
Lappula squarrosa	18.4	Viola ambigua	18.4
Euphorbia semivillosa	18.3	Cotoneaster melanocarpus	18.2
Asparagus officinalis	18.1	Gentiana cruciata	18.0
Scutellaria alpina	18.0	Psephellus carbonatus	17.9
Allium ascalonicum	17.8	Falcaria vulgaris	17.8
Goniolimon elatum	17.6	Scorzonera austriaca	17.6
Galium ruthenicum	17.5	Thesium ebracteatum	17.5
Euphrasia pectinata	17.3	Thalictrum foetidum	17.3
Alyssum lenense	17.2	Androsace maxima	17.2
Androsace septentrionalis	17.1	Genista tinctoria	17.0
Astragalus danicus	16.7	Festuca cretacea	16.7
Linaria cretacea	16.7	Silene cretacea	16.7
Astragalus zingeri	16.6	Thalictrum simplex	16.6
Asperula exasperata	16.5	Nepeta nuda	16.4
Serratula coronata	16.4	Medicago falcata	16.3
Echinops ritrodes	16.2	Krascheninnikovia ceratoides	16.0
Fragaria viridis	15.7	Lathyrus pallescens	15.6

Astragalus karelinianus	15.5	Astragalus macropus	15.5
Helianthemum cretaceum	15.2	Helianthemum cretophilum	15.2
Linum czerniaevii	15.2	Campanula bononiensis	15.1

Constant species (occurrence frequencies)

Onosma simplicissima	74.0	Gypsophila altissima	70.0
Festuca valesiaca	57.0	Campanula sibirica	51.0
Stipa pennata	50.0	Stipa capillata	49.0
Veronica spicata	47.0	Vincetoxicum hirundinaria	42.0
Medicago falcata	39.0	Euphorbia seguieriana	37.0
Salvia dumetorum	37.0	Thalictrum minus	37.0
Caragana frutex	35.0	Filipendula vulgaris	33.0
Galium verum	33.0	Adonis vernalis	32.0
Helictotrichon desertorum	32.0	Inula hirta	32.0
Asperula tinctoria	31.0	Fragaria viridis	31.0
Rhaponticoides ruthenica	31.0	Cytisus ruthenicus	30.0
Elymus repens aggr.	30.0	Carex pediformis	29.0
Onobrychis arenaria	29.0	Potentilla humifusa	27.0
Artemisia campestris	26.0	Aster alpinus	26.0
Astragalus austriacus	26.0	Nonea pulla	26.0
Plantago media	26.0	Psephellus sibiricus	26.0
Allium rubens	25.0	Koeleria pyramidata	25.0
Galium octonarium	24.0	Leontodon taraxacoides subsp. taraxacoides	24.0
Poa pratensis aggr.	24.0	Seseli libanotis	24.0
Thymus pulegioides	24.0	Artemisia austriaca	23.0
Galium boreale	23.0	Genista tinctoria	23.0
Polygala sibirica	23.0	Scabiosa isetensis	22.0
Calamagrostis epigejos	21.0	Centaurea scabiosa	21.0
Hieracium virosum	21.0	Hypericum elegans	21.0
Phlomis tuberosa	21.0	Pulsatilla patens	21.0
Achillea millefolium	20.0	Artemisia commutata	20.0
Artemisia sericea	20.0	Echinops ritro	20.0
Falcaria vulgaris	20.0	Potentilla cinerea	20.0
Stipa pulcherrima	20.0	Asparagus officinalis	19.0
Origanum vulgare	19.0	Trifolium montanum	19.0
Hypochaeris maculata	18.0	Pimpinella tragium	18.0
Scorzonera purpurea	18.0	Asperula tephrocarpa	17.0
Carex supina	17.0	Clausia aprica	17.0
Jacobaea vulgaris	17.0	Odontarrhena tortuosa	17.0
Oxytropis pilosa	17.0	Tanacetum kittaryanum	17.0
Ephedra distachya	16.0	Galatella angustissima	16.0
Gypsophila oligosperma	16.0	Hedysarum grandiflorum	16.0
Phleum phleoides	16.0	Pilosella echioides	16.0
Pimpinella saxifraga	16.0	Sanguisorba officinalis	16.0
Agrimonia eupatoria	15.0	Agropyron cristatum	15.0
Allium saxatile	15.0	Polygala wolfgangiana	15.0
Prunus tenella	15.0	Taraxacum sect. Taraxacum	15.0

Thymus calcareus	15.0	Thymus talijevii	15.0
Anemone sylvestris	14.0	Astragalus onobrychis	14.0
Dianthus versicolor	14.0	Koeleria sclerophylla	14.0
Polygonatum odoratum	14.0	Potentilla argentea	14.0
Astragalus danicus	13.0	Campanula stevenii	13.0
Dianthus acicularis	13.0	Galatella villosa	13.0
Gentiana cruciata	13.0	Helictochloa hookeri subsp. schelliana	13.0
Knautia arvensis	13.0	Psephellus sumensis	13.0
Scorzonera austriaca	13.0	Scorzonera hispanica subsp. asphodeloides	13.0
Spiraea crenata	13.0	Allium lineare	12.0
Cerastium arvense	12.0	Clinopodium acinos	12.0
Euphrasia pectinata	12.0	Hyssopus officinalis subsp. montanus	12.0
Verbascum lychnitis	12.0	Artemisia hololeuca	11.0
Artemisia latifolia	11.0	Aster amellus	11.0
Linum flavum	11.0	Matthiola fragrans	11.0
Plantago maritima	11.0	Poa transbaicalica	11.0
Silene chlorantha	11.0	Stipa zalesskyi	11.0
Teucrium polium	11.0	Thesium arvense	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Plantago maritima	7.0	Thymus calcareus	6.0

E1.1g - Perennial rocky grassland of Central Europe and the Carpathians

*Diagnostic species (phi coefficient * 100)*

Festuca pallens	65.9	Jovibarba globifera subsp. hirta	42.5
Seseli elatum	41.1	Minuartia setacea	34.4
Allium flavum	33.1	Melica ciliata	32.6
Teucrium montanum	32.6	Poa badensis	32.0
Scorzonera austriaca	31.0	Helianthemum canum	30.6
Erysimum odoratum	30.5	Alyssum montanum	30.0
Asplenium ruta-muraria	30.0	Thymus comosus	29.8
Campanula sibirica	29.2	Carex humilis	29.0
Potentilla cinerea	28.3	Helictotrichon decorum	28.2
Seseli leucospermum	27.9	Inula ensifolia	27.6
Draba lasiocarpa	27.5	Leontodon incanus	25.6
Anthericum ramosum	25.2	Sesleria rigida	23.1
Dianthus praecox subsp. lumnitzeri	22.2	Jurinea mollis	22.0
Euphorbia segueriana subsp. minor	19.9	Dianthus spiculifolius	19.8
Linum tenuifolium	19.4	Viola jooi	19.2
Paronychia cephalotes	18.9	Sedum album	18.8
Erysimum witmannii	18.4	Sempervivum marmoreum	18.4
Allium senescens	18.1	Fumana procumbens	17.9
Pulsatilla vulgaris subsp. grandis	17.3	Vincetoxicum hirundinaria	17.3
Seseli hippomarathrum	17.1	Seseli gracile	16.8
Asplenium trichomanes	16.6	Asperula cynanchica	16.5

Jovibarba globifera subsp. globifera	16.0	Genista pilosa	15.9
Selinum silaifolium	15.6	Linum dolomiticum	15.2
Dianthus plumarius subsp. regis-stephani	15.0		

Constant species (occurrence frequencies)

Festuca pallens	74.0	Carex humilis	59.0
Potentilla cinerea	57.0	Teucrium montanum	56.0
Euphorbia cyparissias	51.0	Asperula cynanchica	46.0
Seseli elatum	42.0	Teucrium chamaedrys	40.0
Thymus praecox	39.0	Sanguisorba minor	38.0
Melica ciliata	36.0	Anthericum ramosum	35.0
Helianthemum canum	32.0	Helianthemum nummularium	32.0
Allium flavum	30.0	Alyssum montanum	30.0
Campanula sibirica	29.0	Jovibarba globifera subsp. hirta	29.0
Sedum album	29.0	Stachys recta	29.0
Anthyllis vulneraria	28.0	Vincetoxicum hirundinaria	26.0
Inula ensifolia	25.0	Leontodon taraxacoides subsp. taraxacoides	23.0
Poa badensis	23.0	Asplenium ruta-muraria	22.0
Linum tenuifolium	22.0	Clinopodium acinos	21.0
Fumana procumbens	21.0	Globularia bisnagarica	21.0
Scorzonera austriaca	21.0	Centaurea stoebe	19.0
Dorycnium pentaphyllum	19.0	Koeleria macrantha	19.0
Erysimum odoratum	18.0	Minuartia setacea	18.0
Allium senescens	17.0	Galium mollugo aggr.	17.0
Genista pilosa	17.0	Sesleria caerulea	17.0
Silene otites aggr.	16.0	Artemisia campestris	15.0
Bupleurum falcatum	15.0	Echium vulgare	15.0
Leontodon incanus	15.0	Bothriochloa ischaemum	14.0
Galium glaucum	14.0	Stipa capillata	14.0
Stipa pennata	14.0	Arenaria serpyllifolia	13.0
Jurinea mollis	13.0	Seseli hippomarathrum	13.0
Veronica spicata	13.0	Campanula rotundifolia	12.0
Sedum sexangulare	12.0	Thymus comosus	12.0
Festuca stricta subsp. sulcata	11.0	Hypericum perforatum	11.0
Pilosella bauhini	11.0	Pilosella officinarum	11.0
Polygonatum odoratum	11.0	Pulsatilla vulgaris subsp. grandis	11.0
Scabiosa canescens	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca pallens	17.0	Carex humilis	16.0

E1.1h - Heavy-metal dry grassland of the Balkans

*Diagnostic species (phi coefficient * 100)*

Euphorbia glabriflora	79.1	Odontarrhena markgrafii	75.6
Plantago subulata	67.7	Bromopsis riparia	66.0

Stachys scardica	62.3	Poa badensis	49.8
Silene bupleuroides	48.6	Fumana bonapartei	47.9
Thesium arvense	47.4	Paragymnopteris marantae	43.9
Centaurea kosanini	40.8	Silene paradoxa	40.4
Potentilla visianii	39.1	Leontodon crispus	39.0
Astragalus onobrychis	38.8	Galium lucidum	38.4
Hypericum barbatum	38.3	Linum tauricum	38.1
Euphorbia barrelieri	37.6	Saponaria intermedia	37.4
Halascya sendtneri	36.0	Iris reichenbachii	35.9
Thymus longicaulis	34.8	Asyneuma limonifolium	34.3
Dorycnium pentaphyllum	34.0	Festuca panciciana	33.8
Goniolimon collinum	33.7	Pontechium maculatum	32.9
Artemisia alba	32.8	Scleranthus perennis subsp. dichotomus	32.7
Alyssum montanum	32.5	Stachys chrysophaea	32.4
Centaurea alba	31.6	Genista hassertiana	31.4
Potentilla astracanica	31.3	Erysimum diffusum	30.9
Centaurea kosaninii	30.6	Medicago prostrata	30.6
Aethionema saxatile	30.0	Minuartia hamata	29.6
Odontarrhena muralis	29.3	Convolvulus cantabrica	29.2
Halacsya sendtneri	28.5	Melica ciliata	28.5
Teucrium montanum	28.3	Achillea coarctata	28.1
Minuartia verna	27.9	Asplenium adiantum-nigrum subsp. serpentini	26.7
Plantago argentea	26.6	Veronica austriaca subsp. jacquinii	26.5
Cephalaria leucantha	26.0	Polygala doerferi	25.8
Podospermum laciniatum	25.1	Cynanchum athoum	24.8
Stipa mayeri	24.6	Achnatherum calamagrostis	24.4
Convolvulus boissieri	24.4	Linum perenne	24.4
Potentilla hirta var. zlatiborensis	24.3	Potentilla zlatiborensis	24.3
Scorzonera austriaca	24.1	Sedum ochroleucum	24.1
Paronychia kapela	23.7	Cytisus decumbens	23.6
Onobrychis alba	23.6	Allium flavum	23.3
Phleum montanum	23.0	Scabiosa fumarioides	23.0
Aurinia saxatilis subsp. orientalis	22.9	Dianthus pinifolius subsp. serbicus	22.9
Orobanche gracilis	22.7	Euphrasia pectinata	22.4
Festuca pancici	22.4	Onosma echioides	22.3
Agropyron cristatum	22.1	Sedum urvillei	22.0
Stachys recta	21.8	Allium cupani	21.2
Veronica andrasovzkyi	21.2	Silene anthelopum	21.1
Stipa pulcherrima	21.1	Thymus teucrioides subsp. candilicus	21.1
Tragopogon pterodes	21.1	Bornmuellera dieckii	20.9
Odontarrhena chalcidica	20.9	Pilosella piloselloides subsp. praealta	20.6
Campanula lingulata	19.6	Polygala doerfleri	19.6
Cerastium decalvans	19.2	Poa thessala	19.0
Juniperus oxycedrus	18.5	Senecio squalidus subsp. rupestris	18.2
Sedum hispanicum	18.1	Bupleurum baldense	18.0
Potentilla pedata	17.9	Sedum album	17.9
Anthemis cretica	17.4	Centaurea grisebachii	17.2

Potentilla heptaphylla	17.2	Trinia glauca	17.1
Polygala supina	17.0	Cytisus pseudoprocumbens	16.7
Clinopodium alpinum	16.4	Festuca callieri	16.4
Silene armeria	16.4	Centaurea stereophylla	16.3
Galatella linosyris	16.2	Linum hologynum	16.2
Galium hellenicum	15.9	Prospero autumnale	15.5
Stipa pennata	15.5	Trifolium trichopterum	15.4
Cytisus jankae	15.1	Pilosella cymosa	15.1

Constant species (occurrence frequencies)

Plantago subulata	81.0	Euphorbia glabriflora	66.0
Odontarrhena markgrafii	62.0	Bromopsis riparia	58.0
Dorycnium pentaphyllum	53.0	Teucrium montanum	51.0
Astragalus onobrychis	49.0	Sanguisorba minor	49.0
Galium lucidum	47.0	Poa badensis	46.0
Stachys scardica	45.0	Stachys recta	44.0
Leontodon crispus	43.0	Thymus longicaulis	38.0
Alyssum montanum	36.0	Minuartia verna	35.0
Melica ciliata	34.0	Scabiosa columbaria	34.0
Thesium arvense	34.0	Silene bupleuroides	30.0
Rumex acetosella	29.0	Sedum album	29.0
Convolvulus cantabrica	25.0	Erysimum diffusum	25.0
Artemisia alba	24.0	Clinopodium alpinum	24.0
Fumana bonapartei	24.0	Allium flavum	23.0
Hippocrepis comosa	23.0	Euphorbia cyparissias	22.0
Hypericum barbatum	21.0	Paragymnopteris marantae	21.0
Potentilla heptaphylla	21.0	Filipendula vulgaris	20.0
Lotus corniculatus	20.0	Silene vulgaris	20.0
Vincetoxicum hirundinaria	20.0	Asperula cynanchica	19.0
Euphorbia barrelieri	19.0	Potentilla cinerea	19.0
Stipa pennata	19.0	Anthyllis vulneraria	18.0
Asyneuma limonifolium	18.0	Hypericum perforatum	18.0
Linum tauricum	18.0	Medicago prostrata	18.0
Pontechium maculatum	18.0	Scorzonera austriaca	18.0
Silene paradoxa	18.0	Trinia glauca	18.0
Carex caryophyllea	17.0	Centaurea kosanini	17.0
Centaurea stoebe	17.0	Eryngium campestre	17.0
Galatella linosyris	17.0	Stipa pulcherrima	17.0
Aethionema saxatile	16.0	Centaurea alba	16.0
Cerastium arvense	16.0	Euphrasia pectinata	16.0
Festuca panciciana	16.0	Potentilla visianii	16.0
Scleranthus perennis subsp. dichotomus	16.0	Sedum ochroleucum	16.0
Agropyron cristatum	15.0	Dianthus sylvestris	15.0
Iris reichenbachii	15.0	Leontodon hispidus	15.0
Orobanche gracilis	15.0	Paronychia kapela	15.0
Plantago argentea	15.0	Poa bulbosa	15.0
Chrysopogon gryllus	14.0	Halascya sendtneri	14.0
Plantago lanceolata	14.0	Podospermum laciniatum	14.0

Potentilla astracanica	14.0	Saponaria intermedia	14.0
Goniolimon collinum	13.0	Veronica austriaca subsp. jacquinii	13.0
Achillea coarctata	12.0	Bupleurum baldense	12.0
Odontarrhena muralis	12.0	Anacamptis morio	11.0
Cephalaria leucantha	11.0	Cerastium pumilum	11.0
Cytisus decumbens	11.0	Galium verum	11.0
Koeleria macrantha	11.0	Minuartia hamata	11.0
Pilosella bauhini	11.0	Pilosella officinarum	11.0
Prospero autumnale	11.0	Sedum urvillei	11.0
Stachys chrysophaea	11.0	Verbascum phoeniceum	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Euphorbia glabriflora	11.0	Convolvulus boissieri	5.0
Genista hassertiana	5.0		

E1.1i - Perennial rocky calcareous grassland of subatlantic-submediterranean Europe

*Diagnostic species (phi coefficient * 100)*

Koeleria vallesiana	48.3	Helianthemum apenninum	39.7
Fumana procumbens	38.3	Coronilla minima	37.9
Inula montana	36.1	Trinia glauca	30.8
Ononis pusilla	29.8	Anthyllis montana	29.3
Seseli montanum	27.4	Globularia bisnagarica	26.9
Galium corrudifolium	26.7	Teucrium montanum	26.3
Ononis striata	25.0	Helianthemum oelandicum	24.9
Carex humilis	24.7	Allium sphaerocephalon	24.0
Carex halleriana	24.0	Helianthemum canum	23.9
Lavandula angustifolia	23.7	Linum suffruticosum	21.0
Thymus vulgaris	21.0	Thesium humifusum	20.8
Teucrium chamaedrys	20.4	Argyrolobium zanonii	20.2
Aphyllanthes monspeliensis	19.0	Artemisia alba	18.9
Dianthus sylvestris	18.0	Teucrium polium	17.7
Potentilla tabernaemontani	17.4	Buxus sempervirens	17.0
Genista pulchella	16.8	Arenaria aggregata	16.3
Thymus serpyllum	16.2	Stipa pennata	16.0
Linum tenuifolium	15.7	Ranunculus gramineus	15.2

Constant species (occurrence frequencies)

Koeleria vallesiana	64.0	Teucrium chamaedrys	56.0
Carex humilis	50.0	Teucrium montanum	44.0
Bromopsis erecta	42.0	Fumana procumbens	42.0
Coronilla minima	39.0	Potentilla tabernaemontani	39.0
Globularia bisnagarica	37.0	Anthyllis vulneraria	36.0
Helianthemum apenninum	34.0	Seseli montanum	34.0
Asperula cynanchica	33.0	Hippocrepis comosa	32.0
Helianthemum oelandicum	31.0	Sanguisorba minor	29.0
Trinia glauca	29.0	Thymus serpyllum	28.0

Festuca ovina	26.0	Pilosella officinarum	26.0
Allium sphaerocephalon	25.0	Eryngium campestre	25.0
Helianthemum canum	24.0	Inula montana	23.0
Anthyllis montana	22.0	Ononis pusilla	21.0
Galium corrudifolium	20.0	Helianthemum nummularium	19.0
Carex halleriana	18.0	Dianthus sylvestris	18.0
Linum tenuifolium	18.0	Stachys recta	18.0
Stipa pennata	18.0	Teucrium polium	18.0
Euphorbia cyparissias	17.0	Scabiosa columbaria	17.0
Thesium humifusum	17.0	Festuca rubra	16.0
Sedum album	16.0	Thymus praecox	16.0
Melica ciliata	15.0	Thymus vulgaris	15.0
Lotus corniculatus	14.0	Ononis striata	14.0
Helictochloa pratensis	13.0	Lavandula angustifolia	13.0
Linum suffruticosum	13.0	Leontodon crispus	12.0
Sesleria coerulans	12.0	Aphyllanthes monspeliensis	11.0
Artemisia alba	11.0	Artemisia campestris	11.0
Globularia cordifolia	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Carex humilis	13.0	Bromopsis erecta	6.0
Koeleria vallesiana	6.0		

E1.1j - Dry steppic, submediterranean pasture of South-Eastern Europe

*Diagnostic species (phi coefficient * 100)*

Koeleria splendens	50.6	Satureja montana	46.8
Sesleria juncifolia	46.6	Asperula purpurea	38.7
Leontodon crispus	38.3	Medicago prostrata	35.4
Eryngium amethystinum	31.6	Fumana procumbens	30.2
Centaurea rupestris aggr.	29.4	Teucrium montanum	28.6
Plantago subulata	28.3	Asperula aristata	27.0
Edraianthus tenuifolius	26.9	Stipa austroitalica	26.6
Euphorbia myrsinites	26.0	Juniperus oxycedrus	25.1
Genista sylvestris	24.4	Stachys iva	24.3
Inula verbascifolia	23.2	Leontodon apulus	23.0
Teucrium polium	22.0	Anthyllis montana	21.9
Festuca illyrica	21.6	Chrysopogon gryllus	21.3
Festuca hirtovaginata	21.3	Scabiosa webbiana	21.1
Thymus longicaulis	20.8	Galium corrudifolium	20.6
Euphorbia spinosa	20.5	Inula aschersoniana	20.5
Artemisia alba	20.4	Astragalus sericophyllus	20.4
Thymus striatus	20.3	Scleranthus perennis subsp. dichotomus	20.2
Clinopodium suaveolens	19.6	Asperula scutellaris	19.5
Stipa endotricha	19.2	Stipa eriocaulis	19.1
Scorzonera villosa	18.8	Aethionema saxatile	18.5
Globularia cordifolia	18.5	Poa molinerii	18.5

Onobrychis alba	18.4	Dianthus sylvestris	18.3
Thymus sibthorpii	18.3	Centaurea subtilis	18.2
Pontechium maculatum	18.2	Genista sericea	17.6
Euphorbia taurinensis	17.5	Salvia ringens	17.5
Euphorbia glabriflora	17.4	Globularia meridionalis	17.3
Hypericum rumeliacum	17.3	Matthiola fruticulosa	17.2
Linum tenuifolium	17.0	Cytisus spinescens	16.6
Silene radicosa	16.6	Galium lucidum	16.4
Trinia glauca	16.3	Satureja subspicata subsp. liburnica	16.1
Noccaea praecox	16.0	Onosma echioides	15.9
Thymus spinulosus	15.9	Stachys scardica	15.8
Centaurea cristata	15.7	Salvia officinalis	15.7
Centaurea grisebachii	15.5	Carlina corymbosa	15.4
Lomelosia crenata	15.4	Achillea ageratifolia subsp. aizoon	15.2
Asperula garganica	15.1		

Constant species (occurrence frequencies)

Teucrium montanum	51.0	Koeleria splendens	42.0
Leontodon crispus	41.0	Satureja montana	38.0
Fumana procumbens	37.0	Anthyllis vulneraria	34.0
Bromopsis erecta	34.0	Sesleria juncifolia	32.0
Asperula purpurea	31.0	Sanguisorba minor	31.0
Chrysopogon gryllus	27.0	Plantago subulata	27.0
Carex humilis	26.0	Eryngium amethystinum	24.0
Teucrium polium	24.0	Festuca valesiaca	22.0
Asperula aristata	21.0	Thymus longicaulis	21.0
Linum tenuifolium	20.0	Medicago prostrata	20.0
Anthyllis montana	19.0	Dianthus sylvestris	19.0
Galium lucidum	19.0	Globularia cordifolia	19.0
Minuartia verna	18.0	Teucrium chamaedrys	18.0
Dorycnium pentaphyllum	17.0	Galium corrudifolium	17.0
Trinia glauca	17.0	Asperula cynanchica	16.0
Helianthemum oelandicum	16.0	Lotus corniculatus	16.0
Helianthemum nummularium	15.0	Hippocrepis comosa	15.0
Melica ciliata	15.0	Eryngium campestre	14.0
Euphorbia myrsinites	14.0	Artemisia alba	13.0
Centaurea rupestris aggr.	13.0	Juniperus oxycedrus	13.0
Stachys recta	13.0	Thesium humifusum	13.0
Pilosella officinarum	12.0	Petrorhagia saxifraga	11.0
Thymus praecox	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Sesleria juncifolia	20.0	Chrysopogon gryllus	7.0
Satureja montana	7.0	Carex humilis	6.0

E1.2a - Semi-dry perennial calcareous grassland

*Diagnostic species (phi coefficient * 100)*

Brachypodium pinnatum	22.8	Sanguisorba minor	18.4
Cirsium acaulon	18.3	Helianthemum nummularium	16.5
Bromopsis erecta	16.0	Koeleria pyramidata	16.0
Helictochloa pratensis	15.6	Hippocrepis comosa	15.6
Scabiosa columbaria	15.2		

Constant species (occurrence frequencies)

Lotus corniculatus	54.0	Sanguisorba minor	51.0
Briza media	46.0	Brachypodium pinnatum	44.0
Plantago lanceolata	42.0	Plantago media	40.0
Bromopsis erecta	39.0	Galium verum	39.0
Pimpinella saxifraga	38.0	Euphorbia cyparissias	35.0
Helianthemum nummularium	35.0	Linum catharticum	35.0
Achillea millefolium	34.0	Dactylis glomerata	34.0
Pilosella officinarum	33.0	Festuca ovina	32.0
Leontodon hispidus	32.0	Carex flacca	31.0
Carex caryophyllea	30.0	Anthyllis vulneraria	28.0
Poa pratensis aggr.	28.0	Centaurea scabiosa	26.0
Trifolium montanum	26.0	Asperula cynanchica	25.0
Leucanthemum vulgare aggr.	25.0	Salvia pratensis	25.0
Teucrium chamaedrys	25.0	Trifolium pratense	25.0
Scabiosa columbaria	24.0	Cirsium acaulon	23.0
Hippocrepis comosa	23.0	Hypericum perforatum	23.0
Thymus pulegioides	23.0	Festuca rubra	22.0
Knautia arvensis	22.0	Helictochloa pratensis	21.0
Ranunculus bulbosus aggr.	21.0	Koeleria pyramidata	20.0
Anthoxanthum odoratum aggr.	19.0	Campanula rotundifolia	19.0
Medicago lupulina	19.0	Galium mollugo aggr.	18.0
Koeleria macrantha	18.0	Centaurea jacea	17.0
Eryngium campestre	17.0	Primula veris	17.0
Agrostis capillaris	16.0	Arrhenatherum elatius	16.0
Carlina acaulis	16.0	Daucus carota	16.0
Festuca stricta subsp. sulcata	16.0	Filipendula vulgaris	16.0
Ononis spinosa	16.0	Potentilla tabernaemontani	16.0
Thymus praecox	16.0	Viola hirta	16.0
Avenula pubescens	15.0	Medicago falcata	15.0
Carlina vulgaris	14.0	Prunella vulgaris	14.0
Galium pumilum	13.0	Polygala vulgaris	13.0
Prunella grandiflora	13.0	Securigera varia	13.0
Agrimonia eupatoria	12.0	Carex montana	12.0
Fragaria viridis	12.0	Gymnadenia conopsea	12.0
Stachys officinalis	12.0	Carex humilis	11.0
Dianthus carthusianorum	11.0	Luzula campestris	11.0
Origanum vulgare	11.0	Potentilla erecta	11.0
Stachys recta	11.0	Trifolium repens	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Bromopsis erecta	17.0	Brachypodium pinnatum	12.0

E1.2b - Continental dry steppe

*Diagnostic species (phi coefficient * 100)*

Stipa capillata	38.3	Festuca valesiaca	35.6
Potentilla cinerea	23.8	Galatella villosa	22.9
Artemisia austriaca	22.4	Bothriochloa ischaemum	22.1
Iris pumila	21.6	Stipa lessingiana	20.7
Elytrigia intermedia	20.2	Salvia nutans	19.5
Stipa pulcherrima	19.5	Salvia nemorosa	19.3
Tanacetum millefolium	17.6	Eryngium campestre	17.4
Centaurea stoebe	17.3	Agropyron cristatum	16.7
Koeleria macrantha	16.3	Verbascum phoeniceum	16.0
Medicago falcata	15.8	Cephalaria uralensis	15.7
Falcaria vulgaris	15.4	Stipa pennata	15.3

Constant species (occurrence frequencies)

Festuca valesiaca	71.0	Eryngium campestre	44.0
Potentilla cinerea	43.0	Stipa capillata	42.0
Euphorbia cyparissias	41.0	Koeleria macrantha	41.0
Teucrium chamaedrys	37.0	Medicago falcata	35.0
Asperula cynanchica	30.0	Galium verum	30.0
Artemisia campestris	29.0	Bothriochloa ischaemum	27.0
Centaurea stoebe	27.0	Stachys recta	27.0
Carex humilis	26.0	Poa pratensis aggr.	22.0
Sanguisorba minor	21.0	Thymus pulegioides	20.0
Elytrigia intermedia	19.0	Phleum phleoides	19.0
Plantago lanceolata	19.0	Convolvulus arvensis	18.0
Hypericum perforatum	18.0	Poa bulbosa	18.0
Salvia pratensis	18.0	Clinopodium acinos	17.0
Securigera varia	17.0	Achillea millefolium	16.0
Arenaria serpyllifolia	16.0	Echium vulgare	16.0
Leontodon taraxacoides subsp. taraxacoides	16.0	Silene otites aggr.	16.0
Stipa pennata	16.0	Veronica spicata	16.0
Falcaria vulgaris	15.0	Festuca stricta subsp. sulcata	15.0
Plantago media	15.0	Potentilla argentea	15.0
Salvia nemorosa	15.0	Dianthus carthusianorum	14.0
Thymus odoratissimus	14.0	Astragalus onobrychis	13.0
Elymus repens aggr.	13.0	Lotus corniculatus	13.0
Verbascum lychnitis	13.0	Artemisia austriaca	12.0
Euphorbia seguieriana	12.0	Filipendula vulgaris	12.0
Fragaria viridis	12.0	Pilosella officinarum	12.0
Stipa pulcherrima	12.0	Campanula sibirica	11.0
Centaurea scabiosa	11.0	Dorycnium pentaphyllum	11.0
Galium glaucum	11.0	Pimpinella saxifraga	11.0

Thymus praecox	11.0	Trifolium arvense	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca valesiaca	34.0	Stipa capillata	14.0
Stipa pulcherrima	6.0	Bothriochloa ischaemum	5.0

E1.3a - Mediterranean closely grazed dry grassland

*Diagnostic species (phi coefficient * 100)*

Trifolium subterraneum	57.4	Parentucellia latifolia	45.0
Trifolium suffocatum	42.7	Poa bulbosa	42.1
Trifolium nigrescens	40.9	Ranunculus paludosus	36.5
Trifolium tomentosum	36.2	Plantago lagopus	36.0
Bellis annua	35.2	Plantago coronopus	30.7
Galium murale	29.3	Trifolium glomeratum	29.1
Trifolium scabrum	28.4	Anthemis arvensis	28.3
Sherardia arvensis	27.8	Erodium cicutarium	27.2
Sagina apetala	27.1	Hypochaeris cretensis	26.9
Petrorhagia dubia	26.2	Trifolium uniflorum	26.2
Trifolium cherleri	26.1	Anthemis rigida	25.4
Crepis neglecta	24.9	Rostraria cristata	24.4
Moenchia erecta	23.3	Parvotrisetum myrianthum	23.3
Vulpia ciliata	23.3	Cerastium comatum	22.4
Plantago bellardii	22.1	Erodium botrys	21.7
Crassula tillaea	21.1	Petrorhagia candica	21.1
Hypochaeris glabra	20.8	Psilurus incurvus	20.8
Ornithopus compressus	20.4	Romulea ramiflora	19.3
Filago pyramidata	18.5	Crepis pusilla	18.2
Sedum caespitosum	18.1	Romulea bulbocodium	18.0
Centaurea idaea	17.7	Vulpia myuros	17.7
Astragalus pelecinus subsp. pelecinus	17.6	Cerastium glomeratum	17.6
Galium divaricatum	17.6	Leontodon tuberosus	17.1
Medicago polymorpha	17.1	Scleranthus annuus aggr.	17.1
Carthamus lanatus	17.0	Aphanes arvensis	16.9
Moraea sisyrinchium	16.8	Lotus angustissimus	16.7
Filago pygmaea	16.5	Cynodon dactylon	16.3
Tolpis virgata	16.1	Allium chamaemoly	15.9
Medicago rigidula	15.9	Hyoseris radiata	15.5
Isoetes duriei	15.2	Trifolium micranthum	15.1
Anthemis ruthenica	15.0		

Constant species (occurrence frequencies)

Poa bulbosa	75.0	Trifolium subterraneum	48.0
Erodium cicutarium	44.0	Plantago coronopus	36.0
Trifolium campestre	30.0	Plantago lanceolata	29.0
Parentucellia latifolia	28.0	Sherardia arvensis	28.0
Trifolium scabrum	28.0	Eryngium campestre	27.0

Trifolium nigrescens	25.0	Trifolium suffocatum	22.0
Cynodon dactylon	21.0	Veronica arvensis	21.0
Anthemis arvensis	20.0	Bromus hordeaceus	20.0
Hypochaeris glabra	20.0	Ranunculus paludosus	20.0
Plantago lagopus	19.0	Bellis annua	18.0
Dactylis glomerata	18.0	Scleranthus annuus aggr.	18.0
Trifolium arvense	18.0	Trifolium glomeratum	18.0
Vulpia ciliata	18.0	Sagina apetala	17.0
Vulpia myuros	17.0	Cerastium glomeratum	15.0
Cerastium pumilum	15.0	Trifolium cherleri	15.0
Trifolium tomentosum	15.0	Ornithopus compressus	14.0
Plantago bellardii	14.0	Galium murale	13.0
Moenchia erecta	13.0	Psilurus incurvus	13.0
Anagallis arvensis	12.0	Bellis perennis	12.0
Galium divaricatum	12.0	Rostraria cristata	12.0
Crassula tillaea	11.0	Filago pyramidata	11.0
Leontodon saxatilis	11.0	Sanguisorba minor	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Poa bulbosa	38.0	Trifolium subterraneum	15.0

E1.3b - Mediterranean tall perennial dry grassland

*Diagnostic species (phi coefficient * 100)*

Brachypodium retusum	62.1	Hyparrhenia hirta	43.6
Asphodelus ramosus	40.3	Reichardia picroides	40.0
Macrochloa tenacissima	39.8	Convolvulus althaeoides	38.8
Bituminaria bituminosa	38.5	Carlina corymbosa	37.8
Pallenis spinosa	32.7	Helictotrichon filifolium	31.4
Micromeria graeca	30.2	Phagnalon saxatile	30.0
Helictochloa bromoides	29.5	Ruta angustifolia	27.5
Stipa offneri	26.4	Allium subhirsutum	25.8
Rosmarinus officinalis	25.3	Drimia maritima	25.0
Foeniculum vulgare	24.4	Linum strictum	24.4
Sedum sediforme	24.1	Phlomis lychnitis	23.9
Teucrium pseudochamaepitys	22.3	Ampelodesmos mauritanicus	22.0
Asparagus horridus	21.6	Galactites tomentosus	21.4
Lathyrus clymenum	21.0	Melica minuta	20.8
Urospermum dalechampii	20.6	Avena barbata	20.3
Andropogon distachyos	20.0	Lobularia maritima	19.6
Festuca capillifolia	19.4	Festuca scariosa	19.3
Lapiedra martinezii	19.3	Asparagus acutifolius	18.9
Asparagus albus	18.4	Lotus ornithopodioides	18.4
Arrhenatherum album	18.3	Thymus vulgaris	18.2
Hyparrhenia sinaica	18.0	Ferula communis	17.9
Cistus albidus	17.5	Salvia verbenaca	17.5
Thapsia garganica	17.3	Asphodelus cerasiferus	17.2

Anthyllis cytisoides	17.1	Carlina gummifera	16.9
Cenchrus setaceus	16.8	Ruta chalepensis	16.8
Piptatherum miliaceum	16.5	Lygeum spartum	16.1
Stipa juncea	16.0	Cenchrus ciliaris	15.9
Sanguisorba verrucosa	15.9	Ulex parviflorus	15.9
Briza maxima	15.8	Euphorbia serrata	15.8
Atractylis humilis	15.7	Heteropogon contortus	15.7
Arisarum vulgare	15.5	Sixalix atropurpurea subsp. maritima	15.2
Polygala rupestris	15.0		

Constant species (occurrence frequencies)

Dactylis glomerata	57.0	Brachypodium retusum	51.0
Reichardia picroides	32.0	Carlina corymbosa	27.0
Asphodelus ramosus	24.0	Daucus carota	23.0
Bituminaria bituminosa	22.0	Hyparrhenia hirta	22.0
Sedum sediforme	19.0	Convolvulus althaeoides	18.0
Eryngium campestre	18.0	Linum strictum	18.0
Helictochloa bromoides	17.0	Macrochloa tenacissima	16.0
Pallenis spinosa	14.0	Plantago lanceolata	14.0
Thymus vulgaris	14.0	Micromeria graeca	13.0
Avena barbata	12.0	Foeniculum vulgare	11.0
Lobularia maritima	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Brachypodium retusum	20.0	Macrochloa tenacissima	13.0
Hyparrhenia hirta	9.0		

E1.3c - Mediterranean annual-rich dry grassland

*Diagnostic species (phi coefficient * 100)*

Trachynia distachya	50.4	Asterolinon linum-stellatum	47.3
Euphorbia exigua	45.1	Linum strictum	41.1
Catapodium rigidum	40.2	Filago pyramidata	38.3
Hippocrepis ciliata	36.8	Campanula erinus	35.8
Minuartia hybrida	34.1	Neatostema apulum	32.2
Trifolium scabrum	31.5	Atractylis cancellata	30.7
Hornungia petraea	30.6	Bombycilaena erecta	29.7
Galium parisiense	29.6	Plantago afra	29.1
Hypochaeris achyrophorus	28.9	Helianthemum salicifolium	28.8
Clypeola jonthlaspi	28.3	Vulpia unilateralis	28.2
Asteriscus aquaticus	27.1	Stipa capensis	27.0
Scorpiurus muricatus	26.7	Polygala monspeliaca	26.2
Medicago minima aggr.	26.0	Euphorbia falcata	25.8
Ononis reclinata	25.8	Aegilops geniculata	25.2
Coronilla scorpioides	25.0	Trifolium stellatum	24.7
Sherardia arvensis	24.3	Anisantha rubens	23.9
Echinaria capitata	23.7	Arenaria leptoclados	22.8

Cleonia lusitanica	22.2	Velezia rigida	22.0
Scabiosa stellata	21.6	Vulpia ciliata	21.3
Crucianella angustifolia	20.5	Valantia hispida	20.2
Narduroides salzmannii	19.8	Alyssum simplex	19.7
Arenaria obtusiflora subsp. ciliaris	19.6	Anisantha fasciculata	19.5
Campanula fastigiata	19.0	Helianthemum ledifolium	18.8
Valantia muralis	18.2	Xeranthemum inapertum	18.0
Limonium echioides	17.9	Anagallis arvensis	17.6
Astragalus sesameus	17.3	Bupleurum baldense	17.3
Cerastium gracile	17.3	Hedypnois rhagadioloides	16.9
Valerianella discoidea	16.7	Alyssum granatense	16.3
Crepis neglecta	16.3	Arabis auriculata	16.1
Sideritis romana	16.0	Arenaria modesta	15.9
Bupleurum semicompositum	15.7	Minuartia campestris	15.7
Anisantha madritensis	15.5	Tripodion tetraphyllum	15.4
Centranthus calcitrapae	15.3		

Constant species (occurrence frequencies)

Trachynia distachya	40.0	Asterolinon linum-stellatum	36.0
Catapodium rigidum	35.0	Euphorbia exigua	35.0
Medicago minima aggr.	35.0	Linum strictum	32.0
Trifolium scabrum	30.0	Minuartia hybrida	25.0
Filago pyramidata	24.0	Sherardia arvensis	24.0
Hornungia petraea	22.0	Arenaria leptoclados	21.0
Bombycilaena erecta	20.0	Galium parisiense	18.0
Helianthemum salicifolium	18.0	Anagallis arvensis	17.0
Erodium cicutarium	17.0	Leontodon saxatilis	17.0
Cerastium pumilum	16.0	Hippocrepis ciliata	16.0
Hypochaeris achyrophorus	16.0	Vulpia ciliata	16.0
Arenaria serpyllifolia	15.0	Campanula erinus	15.0
Neatostema apulum	15.0	Trifolium campestre	15.0
Erophila verna	14.0	Trifolium stellatum	13.0
Aegilops geniculata	12.0	Bupleurum baldense	11.0
Clypeola jonthlaspi	11.0	Coronilla scorpioides	11.0
Scorpiurus muricatus	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Trachynia distachya	10.0

E1.5a - Iberian oromediterranean siliceous dry grassland

*Diagnostic species (phi coefficient * 100)*

Festuca indigesta	69.9	Sedum brevifolium	59.8
Jasione crispa	56.4	Silene ciliata	51.4
Luzula caespitosa	48.8	Luzula spicata subsp. nevadensis	47.1
Pilosella vahlii	42.1	Neoschischkinia truncatula	38.5
Armeria caespitosa	35.9	Dianthus langeanus	35.5

Festuca clementei	34.7	Scorzoneroides cantabrica	33.1
Arenaria tetraquetra	29.7	Eryngium glaciale	29.0
Hormathophylla purpurea	29.0	Trisetum glaciale	28.7
Hormathophylla spinosa	28.0	Sedum candolleanum	25.8
Phalacrocarpum oppositifolium	25.7	Erigeron frigidus	25.0
Avenella flexuosa	24.9	Leontodon boryi	24.9
Minuartia recurva	24.4	Teesdaliopsis conferta	22.9
Chaenorhinum glareosum	22.7	Sideritis glacialis	21.5
Saxifraga pentadactylis subsp. willkommiana	21.3	Cryptogramma crispa	21.2
Jurinea humilis	21.0	Biscutella glacialis	20.4
Thymus serpylloides	20.4	Sempervivum vicentei	19.5
Juniperus communis subsp. nana	19.4	Armeria sampaioi	19.2
Festuca pseudeskia	18.1	Silene boryi	17.7
Koeleria crassipes	17.3	Arenaria pungens	17.0
Herniaria boissieri	16.9	Leucanthemopsis pectinata	16.5
Galium pyrenaicum	16.3	Genista obtusiramea	16.3
Agrostis nevadensis	16.2	Galium rosellum	16.2
Festuca summilusitana	15.7	Alchemilla saxatilis	15.5
Sempervivum minutum	15.4		

Constant species (occurrence frequencies)

Festuca indigesta	54.0	Jasione crispa	54.0
Sedum brevifolium	48.0	Avenella flexuosa	47.0
Silene ciliata	38.0	Luzula caespitosa	26.0
Luzula spicata subsp. nevadensis	26.0	Neoschischkinia truncatula	22.0
Minuartia recurva	18.0	Pilosella vahlii	18.0
Juniperus communis subsp. nana	15.0	Scorzoneroides cantabrica	14.0
Antennaria dioica	13.0	Arenaria tetraquetra	13.0
Armeria caespitosa	13.0	Dianthus langeanus	13.0
Phyteuma hemisphaericum	13.0	Agrostis rupestris	12.0
Festuca clementei	12.0	Nardus stricta	12.0
Festuca iberica	11.0	Lotus corniculatus	11.0
Plantago alpina	11.0	Sedum candolleanum	11.0
Solidago virgaurea	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca indigesta	29.0	Luzula caespitosa	14.0

E1.5b - Iberian oromediterranean basiphilous dry grassland

*Diagnostic species (phi coefficient * 100)*

Festuca hystrix	84.1	Poa ligulata	51.8
Teucrium expassum	49.1	Koeleria vallesiana	46.9
Arenaria grandiflora	40.3	Jurinea humilis	39.7
Dianthus pungens subsp. brachyanthus	38.2	Festuca burnatii	32.9
Arenaria aggregata	30.6	Saxifraga conifera	30.2

Helianthemum canum	27.9	Thymus munbyanus	27.1
Coronilla minima	26.9	Crepis albida	26.6
Erinacea anthyllis	26.6	Odontites longiflora	26.3
Festuca nevadensis	25.3	Anemone pavonina	25.1
Draba hispanica	25.0	Arenaria armerina	24.0
Helianthemum violaceum	24.0	Oreochloa confusa	23.5
Seseli montanum	23.3	Helianthemum croceum	23.2
Astragalus incanus	22.3	Lavandula latifolia	22.0
Paronychia kapela	21.9	Carduncellus monspeliensium	21.7
Hieracium bombycinum	21.6	Thymus mastigophorus	21.2
Sideritis hyssopifolia	20.9	Arenaria tetraquetra	20.4
Draba dedeana	20.2	Erodium daucoides	19.7
Saxifraga canaliculata	19.4	Ononis striata	19.2
Thymus willdenowii	19.0	Pimpinella tragium	18.9
Globularia repens	18.8	Helianthemum oelandicum	18.5
Festuca liviensis	18.4	Linum suffruticosum	18.3
Helianthemum apenninum	18.2	Chaenorhinum origanifolium	18.1
Matthiola fruticulosa	18.1	Coris monspeliensis	17.9
Plantago monosperma subsp. discolor	17.8	Silene legionensis	17.8
Achillea odorata	17.6	Thymus leptophyllus	17.6
Klasea nudicaulis	16.5	Androsace villosa	16.3
Genista scorpius	15.9	Thymelaea tinctoria subsp. nivalis	15.7
Campanula arvatica	15.6	Centaurea jaennensis	15.5
Astragalus tremolsianus	15.1		

Constant species (occurrence frequencies)

Festuca hystrix	76.0	Koeleria vallesiana	70.0
Arenaria grandiflora	34.0	Anthyllis vulneraria	33.0
Carex humilis	31.0	Seseli montanum	31.0
Coronilla minima	30.0	Helianthemum canum	30.0
Poa ligulata	30.0	Teucrium expassum	27.0
Thymus praecox	26.0	Helianthemum oelandicum	24.0
Jurinea humilis	22.0	Sedum album	19.0
Helictochloa pratensis	18.0	Potentilla tabernaemontani	18.0
Dianthus pungens subsp. brachyanthus	17.0	Helianthemum apenninum	17.0
Teucrium chamaedrys	17.0	Arenaria aggregata	16.0
Fumana procumbens	15.0	Crepis albida	13.0
Paronychia kapela	13.0	Globularia bisnagarica	12.0
Linum suffruticosum	12.0	Ononis striata	12.0
Sideritis hyssopifolia	12.0	Androsace villosa	11.0
Bromopsis erecta	11.0	Eryngium campestre	11.0
Festuca burnatii	11.0	Pilosella officinarum	11.0
Sedum sediforme	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca hystrix	36.0	Koeleria vallesiana	7.0

E1.5c - Cyrno-Sardean-oromediterranean siliceous dry grassland

*Diagnostic species (phi coefficient * 100)*

Sagina pilifera	95.6	Hypochaeris robertia	92.8
Cerastium soleirolii	83.5	Armeria multiceps	69.6
Pilosella lactucella	56.0	Sedum brevifolium	56.0
Galium corsicum	55.3	Ligusticum corsicum	53.8
Hypochaeris cretensis	51.9	Bellardiochloa variegata	49.6
Bromus grossus	47.5	Paronychia polygonifolia	47.4
Carlina macrocephala	47.2	Juniperus communis subsp. nana	47.2
Genista lobelii	47.0	Noccaea brevistyla	46.5
Plantago subulata	42.4	Agrostis castellana	40.0
Avenella flexuosa	37.1	Scleranthus perennis subsp. burnatii	36.4
Berberis aetnensis	36.2	Crocus corsicus	29.6
Brimeura fastigiata	29.5	Thymus herba-barona	29.3
Astragalus sirinicus	29.1	Veronica repens	28.8
Lepidium hirtum	28.7	Stachys corsica	28.4
Veronica verna	27.9	Bellium bellidioides	27.5
Digitalis purpurea	25.1	Luzula spicata	23.9
Spergularia rubra	22.4	Cyclamen hederifolium	21.0
Viscum album	21.0	Odontites corsica	20.8
Sesamoides purpurascens	20.7	Pinus nigra subsp. laricio	20.4
Helleborus lividus subsp. corsicus	19.9	Acinos corsicus	19.7
Carex caryophyllea	19.3	Anthyllis hermanniae	18.2
Galium cometerhizon	17.8	Luzula forsteri	16.6
Asphodelus cerasiferus	15.3		

Constant species (occurrence frequencies)

Sagina pilifera	95.0	Hypochaeris robertia	91.0
Pilosella lactucella	77.0	Avenella flexuosa	73.0
Cerastium soleirolii	73.0	Carex caryophyllea	64.0
Bellardiochloa variegata	55.0	Armeria multiceps	50.0
Sedum brevifolium	50.0	Juniperus communis subsp. nana	45.0
Plantago subulata	45.0	Nardus stricta	41.0
Rumex acetosella	41.0	Agrostis castellana	32.0
Galium corsicum	32.0	Hypochaeris cretensis	32.0
Ligusticum corsicum	32.0	Paronychia polygonifolia	32.0
Luzula spicata	27.0	Veronica verna	27.0
Bromus grossus	23.0	Carlina macrocephala	23.0
Genista lobelii	23.0	Noccaea brevistyla	23.0
Festuca rubra	18.0	Berberis aetnensis	14.0
Digitalis purpurea	14.0	Euphrasia salisburgensis	14.0
Scleranthus perennis subsp. burnatii	14.0	Spergularia rubra	14.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Plantago subulata	27.0	Sagina pilifera	27.0
Carex caryophyllea	9.0		

E1.5d - Greek and Anatolian oromediterranean siliceous dry grassland

*Diagnostic species (phi coefficient * 100)*

Trifolium parnassi	79.4	Alopecurus gerardi	76.7
Herniaria parnassica	67.5	Dianthus viscidus	59.2
Poa thessala	53.8	Campanula spatulata	53.3
Carduus tmoleus	46.4	Campanula radicosa	44.8
Phleum alpinum aggr.	43.9	Plantago atrata	43.1
Ranunculus sartorianus	41.2	Festuca varia	40.6
Luzula pindica	38.2	Campanula tymphaea	38.0
Armeria canescens	36.2	Crocus sieberi	34.6
Trifolium heldreichianum	34.3	Daphne oleoides	32.5
Astragalus depressus	30.3	Crocus veluchensis	29.1
Thesium parnassi	28.8	Festuca polita	26.7
Astragalus sirinicus	26.4	Astragalus angustifolius	25.7
Silene roemeri	23.8	Ornithogalum oligophyllum	23.7
Trinia frigida	23.5	Dianthus petraeus	22.7
Thymus thracicus	22.4	Cirsium hypopsilum	21.9
Crepis aurea subsp. glabrescens	21.1	Asperula lutea	20.1
Gnaphalium roeseri	20.1	Taraxacum cylleneum	20.1
Noccaea microphylla	20.0	Poa trichopoda	20.0
Hieracium sartorianum	19.9	Plantago subulata	19.6
Trifolium noricum	19.1	Myosotis suaveolens	18.8
Taraxacum fontanicola	17.9	Viola dukadjinica	17.9
Cerastium candidissimum	17.6	Hieracium pannosum	17.1
Pimpinella tragium	16.3	Silene saxifraga	16.1
Bellardiochloa variegata	15.8	Thymus boissieri	15.7
Asperula aristata	15.5	Verbascum cylleneum	15.5
Edraianthus parnassicus	15.4	Galium rhodopeum	15.4
Sesleria rigida	15.4	Viola graeca	15.4
Euphorbia heldreichii	15.3	Galium thymifolium	15.2
Myosotis alpestris subsp. suaveolens	15.2	Carex kitaibeliana	15.1
Ornithogalum exscapum	15.1	Festuca jeanpertii	15.0
Marrubium velutinum	15.0		

Constant species (occurrence frequencies)

Alopecurus gerardi	75.0	Trifolium parnassi	63.0
Phleum alpinum aggr.	61.0	Lotus corniculatus	48.0
Herniaria parnassica	46.0	Plantago atrata	44.0
Dianthus viscidus	36.0	Campanula spatulata	31.0
Poa thessala	30.0	Trifolium repens	28.0
Armeria canescens	25.0	Carduus tmoleus	24.0
Festuca varia	24.0	Medicago lupulina	22.0
Campanula radicosa	20.0	Plantago subulata	19.0
Nardus stricta	18.0	Ranunculus sartorianus	18.0
Bellardiochloa variegata	15.0	Campanula tymphaea	15.0
Crocus veluchensis	15.0	Daphne oleoides	15.0

Luzula pindica	15.0	Astragalus depressus	14.0
Luzula spicata	13.0	Taraxacum sect. Erythrosperma	13.0
Trifolium heldreichianum	13.0	Crocus sieberi	12.0
Dactylis glomerata	12.0	Asperula aristata	11.0
Carex kitaibeliana	11.0	Primula veris	11.0
Thesium parnassi	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Alopecurus gerardi	21.0	Plantago atrata	20.0
Nardus stricta	9.0	Trifolium parnassi	8.0
Festuca varia	6.0	Trifolium repens	6.0

E1.5e - Madeiran oromediterranean siliceous dry grassland

*Diagnostic species (phi coefficient * 100)*

Odontites holliana	77.3	Vicia capreolata	77.3
Ranunculus cortusifolius	70.3	Deschampsia maderensis	63.1
Festuca jubata	63.1	Parafestuca albida	63.1
Erysimum bicolor	63.0	Tolpis macrorhiza	63.0
Draba muralis	60.8	Geranium purpureum	59.3
Centranthus calcitrapae	57.8	Armeria maderensis	54.6
Erica maderensis	54.6	Cardamine hirsuta	54.4
Anthyllis lemanniana	44.5	Bupleurum salicifolium	44.5
Crepis vesicaria subsp. andryaloides	44.5	Galium productum	44.5
Pericaulis aurita	44.5	Fumaria capreolata	44.3
Origanum vulgare subsp. virens	42.1	Senecio vulgaris	40.0
Aphanes australis	38.3	Galium murale	37.1
Geranium rotundifolium	35.9	Aichryson villosum	31.5
Bunium brevifolium	31.5	Genista tenera	31.5
Helichrysum melaleucum	31.5	Ondontites holliana	31.5
Orchis scophulorum	31.5	Andryala glandulosa subsp. cheiranthifolia	31.4
Dactylis smithii subsp. hylodes	31.4	Plantago arborescens subsp. maderensis	31.4
Teucrium francoi	31.4	Viola paradoxa	31.4
Viola stellata	31.4	Neoschischkinia reuteri	31.3
Luzula elegans	31.2	Senecio sylvaticus	30.8
Agrostis castellana	27.8	Myosotis ramosissima	22.5
Hypericum humifusum	20.8	Hypochaeris glabra	20.6
Teesdalia nudicaulis	18.7	Ornithopus perpusillus	17.5
Briza maxima	15.7		

Constant species (occurrence frequencies)

Odontites holliana	60.0	Vicia capreolata	60.0
Cardamine hirsuta	50.0	Ranunculus cortusifolius	50.0
Centranthus calcitrapae	40.0	Deschampsia maderensis	40.0
Draba muralis	40.0	Erysimum bicolor	40.0
Festuca jubata	40.0	Geranium purpureum	40.0
Parafestuca albida	40.0	Senecio vulgaris	40.0

Tolpis macrorhiza	40.0	Anthoxanthum odoratum aggr.	30.0
Armeria maderensis	30.0	Erica maderensis	30.0
Myosotis ramosissima	30.0	Agrostis castellana	20.0
Anthyllis lemanniana	20.0	Aphanes australis	20.0
Bupleurum salicifolium	20.0	Clinopodium vulgare	20.0
Crepis vesicaria subsp. andryaloides	20.0	Fumaria capreolata	20.0
Galium murale	20.0	Galium productum	20.0
Geranium rotundifolium	20.0	Hypochaeris glabra	20.0
Leontodon saxatilis	20.0	Origanum vulgare subsp. virens	20.0
Ornithopus perpusillus	20.0	Pericaulis aurita	20.0
Senecio sylvaticus	20.0	Teesdalia nudicaulis	20.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Odontites holliana	40.0	Origanum vulgare subsp. virens	20.0
Deschampsia maderensis	10.0	Festuca jubata	10.0
Parafestuca albida	10.0		

E1.7 - Lowland to submontane, dry to mesic Nardus grassland

*Diagnostic species (phi coefficient * 100)*

Carex pilulifera	43.7	Galium saxatile	31.8
Nardus stricta	31.4	Calluna vulgaris	25.4
Polygala serpyllifolia	23.2	Arnica montana	22.9
Vaccinium myrtillus	21.5	Veronica officinalis	21.1
Potentilla erecta	21.0	Danthonia decumbens	20.4
Avenella flexuosa	19.6	Juncus squarrosus	18.3
Genista anglica	17.0	Pedicularis sylvatica	16.3
Festuca filiformis	16.1	Pleurozium schreberi	15.6

Constant species (occurrence frequencies)

Nardus stricta	82.0	Potentilla erecta	80.0
Agrostis capillaris	60.0	Carex pilulifera	54.0
Calluna vulgaris	47.0	Danthonia decumbens	47.0
Galium saxatile	44.0	Anthoxanthum odoratum aggr.	43.0
Luzula campestris	39.0	Festuca rubra	38.0
Avenella flexuosa	36.0	Veronica officinalis	36.0
Pilosella officinarum	34.0	Vaccinium myrtillus	32.0
Luzula multiflora	27.0	Arnica montana	25.0
Hypericum maculatum	24.0	Achillea millefolium	23.0
Viola canina	23.0	Festuca ovina	22.0
Lotus corniculatus	21.0	Polygala vulgaris	20.0
Briza media	19.0	Molinia caerulea aggr.	19.0
Rumex acetosa	19.0	Festuca filiformis	18.0
Pleurozium schreberi	18.0	Plantago lanceolata	17.0
Rhytidiadelphus squarrosus	17.0	Rumex acetosella	17.0
Campanula rotundifolia	16.0	Festuca nigrescens	16.0
Polygala serpyllifolia	16.0	Potentilla aurea	16.0

Succisa pratensis	16.0	Carex panicea	15.0
Holcus lanatus	14.0	Trifolium pratense	14.0
Deschampsia cespitosa	13.0	Hypochaeris radicata	13.0
Juncus squarrosus	13.0	Meum athamanticum	13.0
Stellaria graminea	13.0	Antennaria dioica	12.0
Cerastium fontanum subsp. vulgare	12.0	Leucanthemum vulgare aggr.	12.0
Pedicularis sylvatica	12.0	Thymus pulegioides	12.0
Bistorta officinalis	11.0	Carex leporina	11.0
Carex pallescens	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Nardus stricta	49.0	Festuca filiformis	8.0
Galium saxatile	5.0		

E1.8 - Open Iberian supra-mediterranean dry acid and neutral grassland

*Diagnostic species (phi coefficient * 100)*

Festuca rivas-martinezii	64.1	Agrostis truncatula	52.9
Arenaria querioides	47.3	Festuca summilusitana	46.7
Pilosella castellana	38.7	Sedum brevifolium	37.6
Ranunculus nigrescens	29.5	Molineriella laevis	26.5
Colchicum montanum	26.4	Grimmia montana	25.6
Carthamus mitissimus	24.6	Spergula morisonii	21.9
Arnoseris minima	21.7	Alchemilla alpigena	20.7
Cerastium gracile	20.6	Helianthemum croceum	20.6
Agrostis schleicheri	20.1	Gagea soleirolii	19.4
Galium gr. pinetorum	19.2	Paronychia polygonifolia	19.0
Cladonia cervicornis subsp. cervicornis	18.3	Erodium foetidum subsp. cheilanthifolium	18.2
Koeleria vallesiana	18.1	Trapeliopsis wallrothii	17.6
Koeleria crassipes	17.4	Teucrium pyrenaicum	17.4
Trapeliopsis granulosa	17.4	Arenaria grandiflora	17.3
Ornithogalum concinnum	16.8	Saxifraga trifurcata	16.4
Polytrichum piliferum	16.3	Cetraria aculeata	15.8
Cytisus balansae	15.8	Vicia pyrenaica	15.7

Constant species (occurrence frequencies)

Festuca rivas-martinezii	45.0	Thymus praecox	37.0
Agrostis truncatula	33.0	Sedum brevifolium	28.0
Lotus corniculatus	27.0	Rumex acetosella	27.0
Arenaria querioides	26.0	Koeleria vallesiana	26.0
Bromopsis erecta	25.0	Polytrichum piliferum	25.0
Festuca summilusitana	24.0	Helictochloa pratensis	23.0
Plantago lanceolata	22.0	Potentilla tabernaemontani	22.0
Spergula morisonii	21.0	Medicago lupulina	20.0
Ceratodon purpureus	19.0	Cetraria aculeata	19.0
Hypochaeris radicata	19.0	Pilosella officinarum	19.0
Carex caryophyllea	18.0	Colchicum montanum	18.0

Pilosella castellana	18.0	Carthamus mitissimus	17.0
Seseli montanum	16.0	Carex humilis	15.0
Helianthemum oelandicum	15.0	Anthyllis vulneraria	14.0
Arenaria grandiflora	14.0	Bellis perennis	14.0
Clinopodium alpinum	14.0	Nardus stricta	14.0
Sanguisorba minor	14.0	Helianthemum nummularium	13.0
Molineriella laevis	13.0	Plantago subulata	13.0
Teucrium pyrenaicum	12.0	Agrostis capillaris	11.0
Arnoseris minima	11.0	Brachypodium pinnatum	11.0
Coronilla minima	11.0	Festuca rubra	11.0
Filago minima	11.0	Sedum album	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca rivas-martinezii	24.0	Agrostis truncatula	6.0
Festuca summilusitana	6.0		

E1.9a - Oceanic to subcontinental inland sand grassland on dry acid and neutral soils

*Diagnostic species (phi coefficient * 100)*

Cerastium semidecandrum	32.3	Ceratodon purpureus	25.3
Phleum arenarium	23.1	Carex arenaria	22.7
Aira praecox	22.2	Sedum acre	21.1
Brachythecium albicans	19.9	Cladonia furcata	19.7
Trifolium arvense	18.7	Hypnum cupressiforme	18.2
Vicia lathyroides	17.7	Corynephorus canescens	17.6
Erodium cicutarium	17.6	Myosotis ramosissima	17.6
Jasione montana	17.2	Festuca stricta subsp. trachyphylla	16.7
Rumex acetosella	16.2	Syntrichia ruralis	16.1
Festuca filiformis	15.6		

Constant species (occurrence frequencies)

Cerastium semidecandrum	52.0	Rumex acetosella	45.0
Ceratodon purpureus	41.0	Hypochaeris radicata	41.0
Sedum acre	40.0	Carex arenaria	39.0
Hypnum cupressiforme	38.0	Trifolium arvense	35.0
Agrostis capillaris	32.0	Galium verum	31.0
Festuca rubra	30.0	Pilosella officinarum	30.0
Plantago lanceolata	28.0	Poa pratensis aggr.	28.0
Arenaria serpyllifolia	27.0	Brachythecium albicans	27.0
Corynephorus canescens	27.0	Artemisia campestris	26.0
Jasione montana	26.0	Achillea millefolium	25.0
Aira praecox	25.0	Erodium cicutarium	24.0
Cladonia furcata	23.0	Luzula campestris	22.0
Erophila verna	21.0	Veronica arvensis	21.0
Jacobaea vulgaris	19.0	Koeleria macrantha	19.0
Myosotis ramosissima	19.0	Syntrichia ruralis	19.0
Trifolium campestre	18.0	Phleum arenarium	17.0

Potentilla argentea	17.0	Cladonia foliacea	16.0
Festuca ovina	16.0	Bromus hordeaceus	15.0
Calamagrostis epigejos	15.0	Cladonia rangiformis	15.0
Festuca filiformis	15.0	Festuca stricta subsp. trachyphylla	15.0
Hypericum perforatum	15.0	Dicranum scoparium	14.0
Erigeron canadensis	14.0	Polytrichum piliferum	14.0
Vicia lathyroides	14.0	Cerastium arvense	13.0
Ornithopus perpusillus	13.0	Polytrichum juniperinum	13.0
Anthoxanthum odoratum aggr.	12.0	Euphorbia cyparissias	12.0
Helichrysum arenarium	12.0	Ammophila arenaria	11.0
Armeria maritima subsp. elongata	11.0	Elymus repens aggr.	11.0
Galium mollugo aggr.	11.0	Hieracium umbellatum	11.0
Leontodon saxatilis	11.0	Taraxacum sect. Erythrosperma	11.0
Thymus serpyllum	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Hypnum cupressiforme	13.0	Festuca stricta subsp. trachyphylla	6.0
Festuca filiformis	5.0	Syntrichia ruralis	5.0

E1.9b - Inland sanddrift and dune with siliceous grassland

*Diagnostic species (phi coefficient * 100)*

Corynephorus canescens	58.3	Spergula morisonii	40.7
Cetraria aculeata	37.6	Polytrichum piliferum	33.1
Cladonia glauca	32.7	Cladonia floerkeana	32.4
Carex arenaria	31.5	Cladonia portentosa	27.6
Cladonia coccifera	26.5	Cladonia foliacea	26.1
Campylopus introflexus	24.8	Cladonia cervicornis	24.3
Cladonia zopfii	24.0	Teesdalia nudicaulis	23.9
Cladonia uncialis	23.8	Cladonia ramulosa	23.5
Jasione montana	22.9	Cladonia macilenta	22.7
Cladonia furcata	22.2	Cladonia subulata	22.0
Cladonia gracilis	19.3	Placynthiella uliginosa	19.1
Cephaloziella divaricata	18.3	Hypogymnia physodes	17.2
Ceratodon purpureus	17.1	Cladonia chlorophaea	16.4
Cladonia arbuscula subsp. mitis	16.0	Cladonia grayi	15.1
Dicranum scoparium	15.1		

Constant species (occurrence frequencies)

Corynephorus canescens	86.0	Carex arenaria	56.0
Polytrichum piliferum	44.0	Rumex acetosella	40.0
Cetraria aculeata	38.0	Jasione montana	36.0
Ceratodon purpureus	31.0	Cladonia foliacea	31.0
Spergula morisonii	30.0	Cladonia furcata	29.0
Hypochaeris radicata	27.0	Dicranum scoparium	23.0
Festuca rubra	21.0	Hypnum cupressiforme	21.0
Teesdalia nudicaulis	21.0	Agrostis capillaris	20.0

Aira praecox	19.0	Cerastium semidecandrum	19.0
Pilosella officinarum	18.0	Cladonia glauca	17.0
Cladonia portentosa	17.0	Ammophila arenaria	16.0
Hieracium umbellatum	16.0	Cladonia coccifera	15.0
Festuca ovina	15.0	Campylopus introflexus	13.0
Cladonia uncialis	13.0	Galium verum	13.0
Agrostis vinealis	12.0	Cladonia floerkeana	12.0
Cladonia ramulosa	12.0	Cladonia rangiformis	12.0
Cladonia subulata	12.0	Filago minima	12.0
Luzula campestris	12.0	Cladonia arbuscula	11.0
Cladonia chlorophaea	11.0	Cladonia gracilis	11.0
Polytrichum juniperinum	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Corynephorus canescens	28.0	Carex arenaria	12.0
Polytrichum piliferum	11.0		

E1.A - Mediterranean to Atlantic open, dry, acid and neutral grassland

*Diagnostic species (phi coefficient * 100)*

Tuberaria guttata	69.2	Filago gallica	50.4
Hypochaeris glabra	48.7	Ornithopus compressus	42.6
Tolpis barbata	42.6	Aira cupaniana	40.7
Plantago bellardii	40.2	Galium divaricatum	37.3
Crassula tillaea	35.8	Vulpia bromoides	35.0
Filago minima	33.7	Trifolium glomeratum	33.4
Teesdalia coronopifolia	33.1	Vulpia ciliata	31.0
Silene gallica	30.8	Psilurus incurvus	30.5
Trifolium cherleri	30.4	Anthoxanthum aristatum	30.2
Briza maxima	30.0	Micropyrum tenellum	29.8
Linaria pelisseriana	27.7	Ornithopus pinnatus	27.7
Asterolinon linum-stellatum	27.0	Linum trigynum	26.5
Rumex bucephalophorus	26.4	Juncus capitatus	26.2
Vulpia myuros	25.5	Cistus monspeliensis	25.4
Filago carpetana	25.1	Moenchia erecta	24.8
Anthyllis lotoides	24.1	Molineriella laevis	23.7
Arnoseris minima	23.3	Paronychia cymosa	23.2
Lathyrus angulatus	23.0	Centaurium maritimum	22.9
Trifolium angustifolium	22.2	Aira caryophyllea	22.1
Linaria spartea	21.8	Sagina apetala	20.7
Silene scabriflora	20.6	Coronilla repanda subsp. dura	20.5
Hispidella hispanica	20.3	Sedum caespitosum	19.9
Crucianella angustifolia	19.7	Lavandula stoechas	19.5
Tolpis umbellata	18.9	Romulea columnae	18.8
Trisetaria ovata	18.6	Andryala integrifolia	18.5
Sherardia arvensis	18.5	Poa bulbosa	18.3
Bellis annua	18.2	Aira tenorii	17.9

Stachys arvensis	17.8	Trifolium arvense	17.8
Sedum andegavense	17.7	Aira elegantissima	17.6
Trifolium bocconei	17.0	Euphorbia exigua	16.9
Trifolium sylvaticum	16.8	Lotus subbiflorus	16.6
Anagallis arvensis	16.3	Polycarpon tetraphyllum	16.3
Sedum arenarium	16.1	Campanula lusitanica	15.9
Vulpia muralis	15.9	Trifolium campestre	15.8
Tuberaria lignosa	15.2	Trifolium scabrum	15.1
Trachynia distachya	15.0		

Constant species (occurrence frequencies)

Tuberaria guttata	61.0	Hypochaeris glabra	43.0
Trifolium campestre	38.0	Trifolium arvense	37.0
Filago minima	33.0	Filago gallica	32.0
Poa bulbosa	31.0	Vulpia bromoides	30.0
Ornithopus compressus	27.0	Aira caryophyllea	25.0
Galium divaricatum	23.0	Plantago bellardii	23.0
Vulpia myuros	22.0	Aira cupaniana	21.0
Vulpia ciliata	21.0	Rumex bucephalophorus	20.0
Tolpis barbata	20.0	Leontodon saxatilis	19.0
Erodium cicutarium	18.0	Trifolium glomeratum	18.0
Asterolinon linum-stellatum	17.0	Briza maxima	17.0
Crassula tillaea	17.0	Sherardia arvensis	17.0
Silene gallica	17.0	Micropyrum tenellum	16.0
Psilurus incurvus	16.0	Anagallis arvensis	15.0
Anthoxanthum aristatum	15.0	Rumex acetosella	15.0
Trifolium cherleri	15.0	Ornithopus perpusillus	14.0
Scleranthus annuus aggr.	14.0	Bromus hordeaceus	13.0
Eryngium campestre	13.0	Linum trigynum	13.0
Teesdalia coronopifolia	13.0	Trifolium angustifolium	13.0
Trifolium scabrum	13.0	Jasione montana	12.0
Petrorhagia prolifera	12.0	Aira elegantissima	11.0
Aira praecox	11.0	Euphorbia exigua	11.0
Linaria pelisseriana	11.0	Moenchia erecta	11.0
Ornithopus pinnatus	11.0	Plantago coronopus	11.0
Plantago lanceolata	11.0	Sagina apetala	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Tuberaria guttata	7.0

E1.B - Heavy-metal grassland in Western and Central Europe

*Diagnostic species (phi coefficient * 100)*

Armeria alpina subsp. halleri	86.6	Viola calaminaria	41.0
Arabidopsis halleri	39.0	Viola guestphalica	35.1
Minuartia verna	34.7	Cladonia macilenta subsp. floerkeana	27.6
Cladonia pyxidata	25.9	Cladonia furcata	24.7

Silene vulgaris	24.4	Thlaspi caerulescens	24.4
Pohlia nutans	23.0	Weissia controversa	21.1
Cladonia cervicornis subsp. verticillata	20.4	Cladonia squamosa	18.5
Cladonia subulata	17.7	Cladonia phyllophora	16.0

Constant species (occurrence frequencies)

Armeria alpina subsp. halleri	78.0	Rumex acetosa	59.0
Silene vulgaris	54.0	Agrostis capillaris	53.0
Festuca ovina	52.0	Minuartia verna	44.0
Campanula rotundifolia	42.0	Arabidopsis halleri	38.0
Cladonia furcata	36.0	Plantago lanceolata	29.0
Cladonia pyxidata	27.0	Holcus lanatus	27.0
Thymus pulegioides	24.0	Pimpinella saxifraga	22.0
Ranunculus acris	22.0	Euphrasia stricta	20.0
Cerastium fontanum subsp. vulgare	18.0	Hypnum cupressiforme	18.0
Avenella flexuosa	17.0	Ceratodon purpureus	17.0
Pohlia nutans	17.0	Viola calaminaria	17.0
Cetraria aculeata	15.0	Achillea millefolium	13.0
Viola guestphalica	13.0	Cladonia macilenta subsp. floerkeana	12.0
Cladonia subulata	12.0	Pseudoscleropodium purum	12.0
Arrhenatherum elatius	11.0	Lotus corniculatus	11.0
Molinia caerulea aggr.	11.0	Rhytidiadelphus squarrosus	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca ovina	29.0	Armeria alpina subsp. halleri	22.0
Agrostis capillaris	10.0	Arabidopsis halleri	7.0

E1.F - Azorean open dry, acid to neutral grassland

*Diagnostic species (phi coefficient * 100)*

Holcus rigidus	86.5	Agrostis congestiflora	70.5
Brachypodium gaditanum	70.5	Deschampsia foliosa	70.5
Festuca francoi	70.5	Rubia peregrina subsp. agostinhoi	70.5
Luzula elegans	70.4	Blechnum spicant	64.7
Agrostis castellana	55.5	Lysimachia nemorum	51.6
Carex hochstetteriana	49.8	Erica scoparia subsp. azorica	49.8
Euphorbia azorica	49.8	Festuca petraea	49.8
Huperzia dentata	49.8	Juniperus brevifolia	49.8
Thymus caespititius	49.8	Vaccinium cylindraceum	49.8
Sibthorpia europaea	49.4	Centaurium scilloides	49.2
Sphagnum palustre	36.0		

Constant species (occurrence frequencies)

Holcus rigidus	75.0	Agrostis castellana	50.0
Agrostis congestiflora	50.0	Blechnum spicant	50.0
Brachypodium gaditanum	50.0	Deschampsia foliosa	50.0
Festuca francoi	50.0	Luzula elegans	50.0

Lysimachia nemorum	50.0	Rubia peregrina subsp. agostinhoi	50.0
Carex echinata	25.0	Carex hochstetteriana	25.0
Centaurium scilloides	25.0	Clinopodium vulgare	25.0
Daucus carota	25.0	Erica scoparia subsp. azorica	25.0
Euphorbia azorica	25.0	Festuca petraea	25.0
Huperzia dentata	25.0	Juncus effusus	25.0
Juniperus brevifolia	25.0	Lotus pedunculatus	25.0
Plantago lanceolata	25.0	Potentilla erecta	25.0
Sibthorpia europaea	25.0	Sphagnum palustre	25.0
Thymus caespititius	25.0	Vaccinium cylindraceum	25.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Brachypodium gaditanum	25.0	Deschampsia foliosa	25.0
Holcus rigidus	25.0		

E2.1 - Mesic permanent pasture of lowlands and mountains

*Diagnostic species (phi coefficient * 100)*

Lolium perenne	16.1

Constant species (occurrence frequencies)

Trifolium repens	74.0	Festuca rubra	56.0
Plantago lanceolata	53.0	Cerastium fontanum subsp. vulgare	52.0
Lolium perenne	51.0	Agrostis capillaris	48.0
Ranunculus repens	43.0	Holcus lanatus	42.0
Anthoxanthum odoratum aggr.	38.0	Achillea millefolium	37.0
Poa pratensis aggr.	37.0	Trifolium pratense	37.0
Agrostis stolonifera	35.0	Bellis perennis	35.0
Poa trivialis	35.0	Scorzoneroides autumnalis	35.0
Cynosurus cristatus	34.0	Taraxacum sect. Taraxacum	32.0
Ranunculus acris	31.0	Hypochaeris radicata	27.0
Lotus corniculatus	27.0	Plantago major	27.0
Rumex acetosa	27.0	Dactylis glomerata	26.0
Phleum pratense	26.0	Prunella vulgaris	24.0
Schedonorus pratensis	21.0	Ochlopoa annua	20.0
Cardamine pratensis	19.0	Luzula campestris	17.0
Cirsium arvense	16.0	Alopecurus geniculatus	15.0
Elymus repens aggr.	13.0	Argentina anserina	12.0
Bromus hordeaceus	12.0	Pilosella officinarum	12.0
Ranunculus bulbosus aggr.	11.0	Rhytidiadelphus squarrosus	11.0
Rumex acetosella	11.0	Trifolium dubium	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca rubra	14.0	Lolium perenne	12.0
Agrostis capillaris	9.0	Trifolium repens	9.0
Agrostis stolonifera	6.0		

E2.2 - Low and medium altitude hay meadow

*Diagnostic species (phi coefficient * 100)*

Arrhenatherum elatius	15.9	Trisetum flavescens	15.3

Constant species (occurrence frequencies)

Dactylis glomerata	68.0	Festuca rubra	67.0
Plantago lanceolata	66.0	Achillea millefolium	59.0
Rumex acetosa	58.0	Anthoxanthum odoratum aggr.	53.0
Holcus lanatus	53.0	Ranunculus acris	52.0
Trifolium pratense	52.0	Poa pratensis aggr.	47.0
Arrhenatherum elatius	46.0	Agrostis capillaris	43.0
Veronica chamaedrys	40.0	Cerastium fontanum subsp. vulgare	39.0
Leucanthemum vulgare aggr.	39.0	Lotus corniculatus	39.0
Trifolium repens	39.0	Galium mollugo aggr.	36.0
Taraxacum sect. Taraxacum	35.0	Trisetum flavescens	34.0
Schedonorus pratensis	33.0	Vicia cracca	33.0
Lathyrus pratensis	32.0	Centaurea jacea	27.0
Briza media	26.0	Heracleum sphondylium	26.0
Leontodon hispidus	25.0	Luzula campestris	25.0
Poa trivialis	25.0	Knautia arvensis	24.0
Alopecurus pratensis	22.0	Avenula pubescens	21.0
Cynosurus cristatus	21.0	Galium verum	21.0
Prunella vulgaris	21.0	Stellaria graminea	21.0
Daucus carota	19.0	Lolium perenne	18.0
Pimpinella saxifraga	18.0	Ranunculus repens	18.0
Phleum pratense	17.0	Medicago lupulina	16.0
Ranunculus bulbosus aggr.	16.0	Anthriscus sylvestris	15.0
Plantago media	15.0	Bellis perennis	14.0
Campanula patula	14.0	Cirsium arvense	14.0
Crepis biennis	14.0	Deschampsia cespitosa	14.0
Elymus repens aggr.	14.0	Hypochaeris radicata	14.0
Potentilla erecta	14.0	Rhinanthus minor	14.0
Tragopogon pratensis aggr.	14.0	Bromus hordeaceus	13.0
Equisetum arvense	13.0	Sanguisorba officinalis	13.0
Hypericum perforatum	12.0	Pilosella officinarum	12.0
Ajuga reptans	11.0	Campanula rotundifolia	11.0
Cardamine pratensis	11.0	Hypericum maculatum	11.0
Sanguisorba minor	11.0	Silene flos-cuculi	11.0
Trifolium dubium	11.0	Vicia sepium	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca rubra	13.0	Arrhenatherum elatius	11.0
Agrostis capillaris	7.0		

E2.3 - Mountain hay meadow

*Diagnostic species (phi coefficient * 100)*

Phyteuma spicatum	50.2	Poa chaixii	45.4
Geranium sylvaticum	43.5	Astrantia major	30.0
Meum athamanticum	29.6	Arabidopsis halleri	27.9
Luzula luzuloides	25.3	Rumex alpestris	24.7
Crepis mollis	21.9	Hypericum maculatum	21.7
Phleum alpinum aggr.	21.2	Calamagrostis arundinacea	20.8
Bistorta officinalis	20.4	Ranunculus platanifolius	20.1
Hieracium prenanthoides	18.8	Knautia basaltica	17.9
Lilium martagon	17.9	Vaccinium myrtillus	17.6
Cyanus montanus	17.2	Viola cornuta	17.2
Polygonatum verticillatum	17.0	Trollius europaeus	16.9
Jacobaea subalpina	16.8	Luzula sylvatica	16.7
Euphorbia hyberna	16.6	Potentilla aurea	16.3
Crepis pyrenaica	16.2	Crepis conyzifolia	15.9
Gentiana asclepiadea	15.9	Gentiana lutea	15.7
Silene dioica	15.3		

Constant species (occurrence frequencies)

Geranium sylvaticum	71.0	Anthoxanthum odoratum aggr.	61.0
Agrostis capillaris	58.0	Festuca rubra	54.0
Phyteuma spicatum	54.0	Hypericum maculatum	49.0
Bistorta officinalis	45.0	Dactylis glomerata	43.0
Trifolium pratense	43.0	Achillea millefolium	42.0
Rumex acetosa	42.0	Poa chaixii	40.0
Potentilla erecta	38.0	Ranunculus acris	38.0
Leucanthemum vulgare aggr.	36.0	Lotus corniculatus	36.0
Veronica chamaedrys	36.0	Leontodon hispidus	35.0
Astrantia major	34.0	Alchemilla vulgaris aggr.	33.0
Heracleum sphondylium	31.0	Meum athamanticum	31.0
Silene vulgaris	31.0	Trisetum flavescens	31.0
Deschampsia cespitosa	30.0	Briza media	28.0
Avenella flexuosa	27.0	Nardus stricta	27.0
Trollius europaeus	27.0	Vaccinium myrtillus	26.0
Phleum alpinum aggr.	25.0	Plantago lanceolata	25.0
Potentilla aurea	25.0	Luzula luzuloides	24.0
Rumex alpestris	24.0	Pimpinella major	23.0
Trifolium repens	23.0	Arabidopsis halleri	22.0
Crepis mollis	22.0	Lathyrus pratensis	21.0
Luzula campestris	20.0	Primula elatior	20.0
Vicia cracca	20.0	Campanula rotundifolia	19.0
Carlina acaulis	19.0	Gentiana lutea	19.0
Solidago virgaurea	19.0	Stellaria graminea	19.0
Campanula scheuchzeri	18.0	Ajuga reptans	17.0
Cerastium fontanum subsp. vulgare	16.0	Silene dioica	16.0
Carex sempervirens	15.0	Chaerophyllum hirsutum	15.0
Phyteuma orbiculare	15.0	Ranunculus polyanthemos subsp.	15.0

		nemorosus	
Taraxacum sect. Taraxacum	15.0	Galium pumilum	14.0
Gymnadenia conopsea	14.0	Helianthemum nummularium	14.0
Laserpitium latifolium	14.0	Arrhenatherum elatius	13.0
Campanula patula	13.0	Cyanus montanus	13.0
Galium mollugo aggr.	13.0	Lilium martagon	13.0
Poa trivialis	13.0	Vicia sepium	13.0
Anemone nemorosa	12.0	Anthyllis vulneraria	12.0
Arnica montana	12.0	Avenula pubescens	12.0
Calamagrostis arundinacea	12.0	Campanula glomerata	12.0
Cruciata glabra	12.0	Ligusticum mutellina	12.0
Poa pratensis aggr.	12.0	Polygala vulgaris	12.0
Pulsatilla alpina	12.0	Rhinanthus minor	12.0
Rhytidiadelphus squarrosus	12.0	Sanguisorba officinalis	12.0
Tragopogon pratensis aggr.	12.0	Veratrum album	12.0
Alopecurus pratensis	11.0	Crepis conyzifolia	11.0
Crepis pyrenaica	11.0	Galium saxatile	11.0
Knautia arvensis	11.0	Lathyrus linifolius	11.0
Luzula multiflora	11.0	Luzula sylvatica	11.0
Persicaria vivipara	11.0	Prunella vulgaris	11.0
Stachys officinalis	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca rubra	12.0	Agrostis capillaris	11.0
Geranium sylvaticum	8.0	Meum athamanticum	6.0
Nardus stricta	6.0		

E2.4 - Iberian summer pasture (vallicar)

*Diagnostic species (phi coefficient * 100)*

Festuca ampla	75.6	Agrostis castellana	68.3
Celtica gigantea	48.2	Dactylorhiza maculata subsp. caramulensis	43.4
Festuca elegans	38.1	Carex laevigata	32.9
Ranunculus ollissiponensis	32.3	Erica arborea	30.5
Festuca arvernensis subsp. costei	27.4	Sedum forsterianum	27.2
Carduus carpetanus	26.6	Saxifraga fragosoi	26.5
Allium guttatum	25.6	Hyacinthoides hispanica	24.1
Helictochloa marginata	23.0	Lavandula stoechas	21.8
Chamaemelum nobile	21.0	Carum verticillatum	20.8
Trifolium strictum	20.8	Koeleria crassipes	20.4
Phalacrocarpum oppositifolium	20.4	Ajuga pyramidalis subsp. pyramidalis	20.3
Scilla beirana	20.3	Cytisus striatus	20.2
Thymus bracteatus	20.2	Erica australis	20.1
Sesamoides purpurascens	20.1	Wahlenbergia hederacea	20.1
Dianthus lusitanus	19.7	Paradisea lusitanica	19.7
Centranthus calcitrapae subsp. calcitrapae	19.6	Serapias cordigera	19.5

Festuca rothmaleri	19.2	Sanguisorba verrucosa	19.2
Genista tridentata	19.1	Bartramia pomiformis	18.6
Anthoxanthum aristatum	18.5	Bryum alpinum	17.5
Halimium lasianthum	17.3	Sedum hirsutum	17.1
Carex muricata	17.0	Cetraria muricata	16.6
Carduus pycnocephalus	16.4	Trifolium striatum	16.3
Agrostis truncatula	16.2	Campanula lusitanica	16.0
Anacamptis coriophora	15.6	Pedicularis sylvatica	15.6
Serapias lingua	15.6	Arenaria montana	15.2
Anarrhinum bellidifolium	15.0		

Constant species (occurrence frequencies)

Agrostis castellana	67.0	Festuca ampla	61.0
Hypochaeris radicata	46.0	Plantago lanceolata	46.0
Holcus lanatus	41.0	Ranunculus bulbosus aggr.	39.0
Trifolium pratense	37.0	Arrhenatherum elatius	26.0
Celtica gigantea	24.0	Trifolium repens	24.0
Galium verum	22.0	Nardus stricta	22.0
Cynosurus cristatus	20.0	Dactylorhiza maculata subsp. caramulensis	20.0
Rhinanthus minor	20.0	Achillea millefolium	17.0
Carum verticillatum	17.0	Danthonia decumbens	17.0
Juncus acutiflorus	17.0	Pilosella officinarum	17.0
Pteridium aquilinum	17.0	Trifolium striatum	17.0
Aira caryophyllea	15.0	Anthoxanthum odoratum aggr.	15.0
Carex laevigata	15.0	Dactylis glomerata	15.0
Festuca elegans	15.0	Luzula multiflora	15.0
Potentilla erecta	15.0	Prunella vulgaris	15.0
Trifolium dubium	15.0	Carex muricata	13.0
Chamaemelum nobile	13.0	Daucus carota	13.0
Erica arborea	13.0	Eryngium campestre	13.0
Helictochloa marginata	13.0	Lotus corniculatus	13.0
Pedicularis sylvatica	13.0	Allium guttatum	11.0
Anthoxanthum aristatum	11.0	Carex leporina	11.0
Festuca rothmaleri	11.0	Jasione montana	11.0
Juncus squarrosus	11.0	Ranunculus ollissiponensis	11.0
Rumex acetosella	11.0	Sanguisorba minor	11.0
Sedum forsterianum	11.0	Trifolium strictum	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Agrostis castellana	30.0	Festuca ampla	28.0
Celtica gigantea	22.0	Holcus lanatus	9.0
Nardus stricta	9.0	Festuca elegans	7.0
Rhinanthus minor	7.0	Saxifraga fragosoi	7.0

E3.1a - Mediterranean tall humid inland grassland

*Diagnostic species (phi coefficient * 100)*

Scirpoides holoschoenus	62.0	Dittrichia viscosa	47.3
Schoenus nigricans	46.5	Cirsium monspessulanum	44.5
Sonchus maritimus	42.9	Juncus acutus	42.1
Tripidium ravennae	33.8	Juncus maritimus	31.8
Cirsium pyrenaicum	30.5	Carex mairii	29.9
Lysimachia ephemerum	27.3	Dorycnium rectum	26.1
Linum maritimum	24.9	Imperata cylindrica	24.2
Equisetum ramosissimum	22.5	Pulicaria dysenterica	21.6
Lotus maritimus	21.5	Plantago crassifolia	21.0
Juncus littoralis	19.5	Brachypodium phoenicoides	19.3
Ranunculus macrophyllus	19.3	Periploca graeca	18.4
Oenanthe lachenalii	18.3	Samolus valerandi	18.2
Carex extensa	16.2	Cyperus longus	15.1

Constant species (occurrence frequencies)

Scirpoides holoschoenus	57.0	Schoenus nigricans	34.0
Agrostis stolonifera	33.0	Dittrichia viscosa	33.0
Cirsium monspessulanum	23.0	Molinia caerulea aggr.	23.0
Holcus lanatus	22.0	Schedonorus arundinaceus	21.0
Sonchus maritimus	21.0	Carex flacca	20.0
Juncus acutus	20.0	Pulicaria dysenterica	20.0
Juncus inflexus	19.0	Juncus maritimus	17.0
Lotus maritimus	17.0	Brachypodium phoenicoides	15.0
Phragmites australis	15.0	Daucus carota	14.0
Lythrum salicaria	14.0	Potentilla reptans	14.0
Briza media	13.0	Mentha longifolia	13.0
Trifolium pratense	13.0	Tripidium ravennae	13.0
Blackstonia perfoliata	12.0	Cirsium pyrenaicum	12.0
Equisetum ramosissimum	12.0	Juncus articulatus	12.0
Eupatorium cannabinum	11.0	Ranunculus repens	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Schoenus nigricans	22.0	Scirpoides holoschoenus	19.0
Molinia caerulea aggr.	14.0	Cirsium monspessulanum	7.0
Tripidium ravennae	7.0	Imperata cylindrica	5.0
Juncus inflexus	5.0		

E3.2a - Mediterranean short moist grassland of lowlands

*Diagnostic species (phi coefficient * 100)*

Deschampsia media	90.3	Prunella hyssopifolia	74.1
Leontodon hirtus	56.2	Jasonia tuberosa	47.7
Lotus tenuis	45.7	Plantago maritima	35.3
Centaurium pulchellum	33.9	Brachypodium phoenicoides	31.1
Scilla litardierei	29.9	Schoenus nigricans	25.8
Hypericum tomentosum	25.2	Peucedanum coriaceum	24.1
Fumana ericophylla	22.3	Trifolium lappaceum	21.6

Aphyllanthes monspeliensis	20.4	Sanguisorba verrucosa	19.2
Linum suffruticosum	19.0	Bellis sylvestris	18.6
Centaurea jacea subsp. vinyalsii	18.2	Seseli elatum	18.0
Thymelaea passerina	17.5	Carex flacca	16.6
Koeleria vallesiana	15.9	Edraianthus dalmaticus	15.4
Scirpoides holoschoenus	15.3	Genista scorpius	15.2
Leucanthemum pallens	15.1		

Constant species (occurrence frequencies)

Deschampsia media	83.0	Carex flacca	60.0
Prunella hyssopifolia	60.0	Plantago maritima	53.0
Lotus tenuis	50.0	Leontodon hirtus	41.0
Agrostis stolonifera	40.0	Centaurea jacea	35.0
Brachypodium phoenicoides	27.0	Jasonia tuberosa	26.0
Centaurium pulchellum	25.0	Koeleria vallesiana	23.0
Festuca rubra	21.0	Pilosella officinarum	21.0
Seseli elatum	19.0	Cichorium intybus	18.0
Schoenus nigricans	18.0	Thymus serpyllum	16.0
Briza media	15.0	Bromopsis erecta	15.0
Daucus carota	15.0	Dorycnium pentaphyllum	15.0
Festuca ovina	15.0	Lotus corniculatus	15.0
Potentilla reptans	15.0	Potentilla tabernaemontani	15.0
Juncus articulatus	14.0	Aphyllanthes monspeliensis	13.0
Linum catharticum	13.0	Linum suffruticosum	13.0
Sanguisorba minor	12.0	Scirpoides holoschoenus	12.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Deschampsia media	61.0	Prunella hyssopifolia	16.0
Plantago maritima	13.0		

E3.2b - Mediterranean short moist grassland of mountains

*Diagnostic species (phi coefficient * 100)*

Campanula herminii	52.6	Festuca rothmaleri	52.2
Narcissus bulbocodium	51.1	Juncus squarrosus	45.6
Festuca iberica	44.2	Nardus stricta	33.2
Scorzoneroides carpetana	32.3	Agrostis castellana	30.0
Carum verticillatum	26.2	Festuca henriquesii	25.1
Poa legionensis	24.6	Jasione laevis	23.5
Pedicularis sylvatica	22.4	Carex furva	19.3
Ranunculus abnormis	18.3	Genista anglica	17.9
Festuca rivularis	16.9	Galium saxatile	16.6
Gagea nevadensis	16.4	Neoschischkinia truncatula	15.9
Gentiana boryi	15.5	Sedum melanantherum	15.1
Euphrasia hirtella	15.0		

Constant species (occurrence frequencies)

Nardus stricta	89.0	Festuca iberica	38.0
Juncus squarrosus	38.0	Potentilla erecta	35.0
Ranunculus bulbosus aggr.	35.0	Festuca rothmaleri	33.0
Campanula herminii	31.0	Narcissus bulbocodium	29.0
Luzula campestris	27.0	Anthoxanthum odoratum aggr.	26.0
Pilosella officinarum	25.0	Trifolium repens	25.0
Galium saxatile	24.0	Lotus corniculatus	24.0
Carum verticillatum	21.0	Jasione laevis	21.0
Agrostis castellana	20.0	Danthonia decumbens	20.0
Holcus lanatus	20.0	Trifolium pratense	19.0
Pedicularis sylvatica	18.0	Cynosurus cristatus	16.0
Carex caryophyllea	15.0	Carex leporina	15.0
Agrostis capillaris	14.0	Briza media	14.0
Hypochaeris radicata	14.0	Calluna vulgaris	13.0
Deschampsia cespitosa	13.0	Galium verum	13.0
Plantago alpina	13.0	Carex nigra	12.0
Scorzoneroides carpetana	12.0	Juncus acutiflorus	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Nardus stricta	61.0	Juncus squarrosus	10.0
Festuca iberica	9.0	Festuca rothmaleri	5.0

E3.3 - Submediterranean moist meadow

*Diagnostic species (phi coefficient * 100)*

Trifolium patens	64.1	Trifolium resupinatum	57.5
Alopecurus rendlei	57.2	Ranunculus velutinus	45.4
Moenchia mantica	44.4	Galium debile	43.6
Bromus racemosus	41.7	Oenanthe silaifolia	34.6
Crepis setosa	34.1	Trifolium pallidum	33.4
Ranunculus sardous	31.3	Trifolium michelianum	28.1
Orchis laxiflora aggr.	27.9	Trifolium fragiferum	27.3
Ranunculus marginatus	26.9	Alopecurus utriculatus	25.7
Carex distans	24.4	Hordeum secalinum	23.5
Carex cuprina	22.0	Gratiola officinalis	21.5
Oenanthe peucedanifolia	19.3	Potentilla reptans	18.9
Bellevalia romana	18.2	Cichorium intybus	18.2
Mentha pulegium	17.7	Colchicum lusitanum	17.5
Leucojum aestivum	17.2	Hordeum marinum	16.2
Scilla litardierei	16.2	Oenanthe banatica	15.8
Cirsium canum	15.6		

Constant species (occurrence frequencies)

Plantago lanceolata	64.0	Poa trivialis	63.0
Trifolium pratense	59.0	Trifolium patens	57.0
Bromus racemosus	53.0	Cynosurus cristatus	52.0
Anthoxanthum odoratum aggr.	51.0	Schedonorus pratensis	48.0

Potentilla reptans	47.0	Taraxacum sect. Taraxacum	47.0
Lotus corniculatus	46.0	Alopecurus pratensis	44.0
Lolium perenne	41.0	Trifolium repens	41.0
Moenchia mantica	40.0	Ranunculus acris	39.0
Trifolium resupinatum	39.0	Silene flos-cuculi	37.0
Carex hirta	36.0	Alopecurus rendlei	34.0
Poa pratensis aggr.	34.0	Trifolium fragiferum	32.0
Rumex acetosa	31.0	Leucanthemum vulgare aggr.	29.0
Rumex crispus	29.0	Galium verum	28.0
Holcus lanatus	28.0	Prunella vulgaris	28.0
Ranunculus repens	28.0	Ranunculus sardous	28.0
Rhinanthus minor	27.0	Tragopogon pratensis aggr.	25.0
Cichorium intybus	24.0	Galium debile	24.0
Hordeum secalinum	24.0	Oenanthe silaifolia	24.0
Centaurea jacea	23.0	Crepis setosa	23.0
Lysimachia nummularia	23.0	Agrostis stolonifera	22.0
Carex distans	22.0	Daucus carota	22.0
Lathyrus pratensis	22.0	Ranunculus velutinus	22.0
Achillea millefolium	21.0	Convolvulus arvensis	20.0
Gratiola officinalis	20.0	Elymus repens aggr.	19.0
Bellis perennis	18.0	Carex cuprina	18.0
Stachys officinalis	17.0	Ononis spinosa	16.0
Bromus hordeaceus	15.0	Cirsium canum	15.0
Mentha pulegium	15.0	Scorzoneroides autumnalis	15.0
Cerastium fontanum subsp. vulgare	14.0	Medicago lupulina	14.0
Orchis laxiflora aggr.	14.0	Trifolium dubium	14.0
Briza media	13.0	Cynodon dactylon	13.0
Filipendula vulgaris	13.0	Hypochaeris radicata	13.0
Lythrum salicaria	13.0	Ranunculus polyanthemos	13.0
Rhinanthus rumelicus	13.0	Rorippa sylvestris	13.0
Trifolium pallidum	13.0	Dactylis glomerata	12.0
Leontodon hispidus	12.0	Deschampsia cespitosa	11.0
Lotus tenuis	11.0	Phleum pratense	11.0
Trifolium campestre	11.0	Trifolium michelianum	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Trifolium patens	10.0	Alopecurus rendlei	9.0
Cynosurus cristatus	8.0	Poa trivialis	8.0
Trifolium resupinatum	8.0	Bromus racemosus	7.0
Hordeum secalinum	7.0	Schedonorus pratensis	7.0
Holcus lanatus	6.0	Ranunculus velutinus	6.0
Ranunculus acris	5.0		

E3.4a - Moist or wet mesotrophic to eutrophic hay meadow

*Diagnostic species (phi coefficient * 100)*

Scirpus sylvaticus	26.7	Caltha palustris	24.3

Filipendula ulmaria	20.3	Equisetum palustre	19.1
Carex melanostachya	18.3	Galium uliginosum	17.3
Eleocharis palustris + uniglumis	16.4	Juncus effusus	15.8
Lythrum virgatum	15.7	Silene flos-cuculi	15.6
Hierochloe repens	15.4		

Constant species (occurrence frequencies)

Filipendula ulmaria	57.0	Holcus lanatus	45.0
Ranunculus acris	45.0	Rumex acetosa	42.0
Deschampsia cespitosa	39.0	Caltha palustris	38.0
Poa trivialis	38.0	Silene flos-cuculi	38.0
Juncus effusus	37.0	Ranunculus repens	37.0
Equisetum palustre	36.0	Lathyrus pratensis	36.0
Cardamine pratensis	35.0	Cirsium palustre	35.0
Festuca rubra	34.0	Alopecurus pratensis	30.0
Agrostis stolonifera	29.0	Carex nigra	28.0
Galium uliginosum	28.0	Scirpus sylvaticus	28.0
Anthoxanthum odoratum aggr.	27.0	Galium palustre	27.0
Angelica sylvestris	26.0	Lotus pedunculatus	26.0
Lysimachia vulgaris	24.0	Sanguisorba officinalis	23.0
Carex panicea	22.0	Myosotis scorpioides	22.0
Vicia cracca	22.0	Calliergonella cuspidata	19.0
Schedonorus pratensis	19.0	Lysimachia nummularia	18.0
Poa pratensis aggr.	18.0	Cerastium fontanum subsp. vulgare	17.0
Cirsium oleraceum	17.0	Lythrum salicaria	17.0
Bistorta officinalis	16.0	Carex acuta	16.0
Crepis paludosa	16.0	Geum rivale	16.0
Juncus conglomeratus	15.0	Potentilla erecta	15.0
Equisetum fluviatile	14.0	Carex disticha	13.0
Elymus repens aggr.	13.0	Plantago lanceolata	13.0
Agrostis canina	12.0	Cirsium rivulare	12.0
Epilobium palustre	12.0	Juncus articulatus	12.0
Mentha aquatica	12.0	Ranunculus auricomus aggr.	12.0
Carex acutiformis	11.0	Persicaria amphibia	11.0
Phalaroides arundinacea	11.0	Ranunculus flammula	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Filipendula ulmaria	13.0	Scirpus sylvaticus	8.0

E3.4b - Moist or wet mesotrophic to eutrophic pasture

*Diagnostic species (phi coefficient * 100)*

Oenanthe fistulosa	29.6	Alopecurus geniculatus	24.3
Juncus articulatus	21.6	Eleocharis palustris	21.2
Ranunculus sceleratus	20.7	Argentina anserina	19.8
Glyceria fluitans	19.7	Agrostis stolonifera	18.7
Bidens cernuus	17.8	Rorippa sylvestris	17.4

Polygonum hydropiper	15.4	Triglochin palustris	15.1

Constant species (occurrence frequencies)

Agrostis stolonifera	75.0	Ranunculus repens	66.0
Poa trivialis	51.0	Trifolium repens	50.0
Argentina anserina	43.0	Alopecurus geniculatus	42.0
Juncus articulatus	41.0	Plantago major	37.0
Rumex crispus	32.0	Glyceria fluitans	31.0
Holcus lanatus	28.0	Lolium perenne	27.0
Galium palustre	26.0	Cardamine pratensis	25.0
Carex hirta	24.0	Eleocharis palustris	24.0
Juncus effusus	24.0	Oenanthe fistulosa	21.0
Phalaroides arundinacea	21.0	Myosotis scorpioides	19.0
Persicaria amphibia	18.0	Elymus repens aggr.	17.0
Potentilla reptans	17.0	Cerastium fontanum subsp. vulgare	16.0
Polygonum hydropiper	16.0	Glyceria maxima	15.0
Ochlopoa annua	15.0	Cirsium arvense	14.0
Ranunculus flammula	14.0	Ranunculus sceleratus	14.0
Juncus inflexus	13.0	Mentha aquatica	13.0
Rorippa sylvestris	12.0	Schedonorus arundinaceus	12.0
Trifolium fragiferum	12.0	Triglochin palustris	12.0
Juncus bufonius	11.0	Rumex conglomeratus	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Agrostis stolonifera	26.0	Poa trivialis	11.0
Argentina anserina	7.0	Alopecurus geniculatus	6.0
Ranunculus repens	5.0		

E3.5 - Temperate and boreal moist or wet oligotrophic grassland

*Diagnostic species (phi coefficient * 100)*

Molinia caerulea aggr.	39.0	Carex panicea	30.6
Carex hostiana	29.6	Succisa pratensis	29.4
Cirsium dissectum	25.8	Potentilla erecta	23.2
Gentiana pneumonanthe	21.1	Carex davalliana	18.1
Carex pulicaris	17.6	Schoenus ferrugineus	16.4
Epipactis palustris	15.6	Scorzonera humilis	15.1

Constant species (occurrence frequencies)

Potentilla erecta	81.0	Molinia caerulea aggr.	75.0
Carex panicea	74.0	Succisa pratensis	69.0
Anthoxanthum odoratum aggr.	58.0	Holcus lanatus	48.0
Ranunculus acris	44.0	Festuca rubra	43.0
Briza media	41.0	Cirsium palustre	34.0
Sanguisorba officinalis	32.0	Filipendula ulmaria	31.0
Carex nigra	30.0	Galium uliginosum	30.0
Agrostis canina	26.0	Plantago lanceolata	26.0

Calliergonella cuspidata	24.0	Luzula multiflora	24.0
Prunella vulgaris	24.0	Deschampsia cespitosa	23.0
Carex flacca	22.0	Rumex acetosa	22.0
Agrostis stolonifera	21.0	Angelica sylvestris	21.0
Centaurea jacea	21.0	Equisetum palustre	21.0
Lotus pedunculatus	21.0	Lysimachia vulgaris	21.0
Agrostis capillaris	20.0	Cirsium dissectum	20.0
Danthonia decumbens	20.0	Galium boreale	20.0
Vicia cracca	20.0	Juncus conglomeratus	18.0
Lotus corniculatus	18.0	Stachys officinalis	18.0
Cardamine pratensis	17.0	Carex hostiana	17.0
Juncus acutiflorus	17.0	Nardus stricta	17.0
Rhytidiadelphus squarrosus	17.0	Serratula tinctoria	17.0
Silene flos-cuculi	17.0	Lathyrus pratensis	16.0
Phragmites australis	16.0	Selinum carvifolia	16.0
Valeriana dioica	16.0	Carex pulicaris	15.0
Galium palustre	15.0	Luzula campestris	15.0
Trifolium pratense	15.0	Achillea millefolium	14.0
Carex echinata	14.0	Carex pallescens	14.0
Juncus effusus	14.0	Lythrum salicaria	14.0
Climacium dendroides	13.0	Ranunculus flammula	13.0
Festuca ovina	12.0	Galium verum	12.0
Hydrocotyle vulgaris	12.0	Parnassia palustris	12.0
Scorzonera humilis	12.0	Viola palustris	12.0
Aulacomnium palustre	11.0	Carex davalliana	11.0
Crepis paludosa	11.0	Gentiana pneumonanthe	11.0
Juncus subnodulosus	11.0	Leontodon hispidus	11.0
Linum catharticum	11.0	Mentha aquatica	11.0
Pseudoscleropodium purum	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Molinia caerulea aggr.	43.0	Carex panicea	11.0
Succisa pratensis	5.0		

E4.1 - Vegetated snow-patch

*Diagnostic species (phi coefficient * 100)*

Salix herbacea	46.8	Salix polaris	45.1
Saxifraga androsacea	42.2	Veronica alpina	41.5
Saxifraga oppositifolia	39.4	Oxyria digyna	35.5
Ranunculus glacialis	34.4	Luzula confusa	34.2
Cerastium cerastoides	33.4	Luzula alpinopilosa	30.9
Gnaphalium supinum	30.3	Poa arctica	30.1
Saxifraga cernua	30.1	Anthelia juratzkana	29.1
Luzula nivalis	28.8	Aulacomnium turgidum	28.6
Sanionia uncinata	27.2	Alopecurus magellanicus	26.7
Saxifraga stellaris	26.5	Cardamine bellidifolia	26.4

Arabis caerulea	26.3	Ranunculus sulphureus	26.0
Persicaria vivipara	25.8	Stereocaulon rivulorum	25.7
Cerastium nigrescens	25.2	Timmia norvegica	25.1
Stellaria longipes	24.6	Sedum alpestre	23.8
Poa alpina	23.4	Cerastium uniflorum	23.3
Hutchinsia alpina	23.3	Gentiana bavarica	23.2
Polytrichastrum alpinum	23.2	Saxifraga cespitosa	22.8
Dactylina arctica	22.7	Polytrichastrum sexangulare	22.5
Sagina saginoides	22.4	Psoroma hypnorum	22.2
Orthothecium chryseon	22.1	Bartramia ithyphylla	21.9
Distichium capillaceum	21.2	Gnaphalium hoppeanum	21.2
Sibbaldia procumbens	21.2	Pohlia cruda	20.7
Ranunculus alpestris	20.7	Tomentypnum nitens	20.6
Juncus biglumis	20.4	Taraxacum alpinum aggr.	20.1
Alchemilla pentaphyllea	19.6	Peltigera leucophlebia	19.5
Blepharostoma trichophyllum	19.4	Geum reptans	19.3
Doronicum clusii	19.2	Oncophorus wahlenbergii	19.1
Potentilla hyparctica	18.7	Silene acaulis	18.6
Dicranum spadiceum	18.5	Pohlia drummondii	18.3
Saxifraga nivalis	17.9	Saxifraga bryoides	17.8
Bryocaulon divergens	17.7	Lophozia sudetica	17.7
Pedicularis hirsuta	17.6	Poa laxa	17.5
Soldanella carpatica	17.5	Leucanthemopsis alpina	17.3
Nephroma expallidum	17.3	Saxifraga seguieri	17.3
Androsace alpina	17.2	Thamnolia vermicularis	17.2
Arabis alpina	16.9	Alchemilla fissa	16.8
Draba subcapitata	16.8	Hypnum revolutum	16.8
Saxifraga hieracifolia	16.8	Festuca picturata	16.6
Kiaeria starkei	16.6	Pritzelago alpina subsp. brevicaulis	16.6
Arabidopsis neglecta	16.3	Saxifraga carpatica	16.1
Pannaria pezizoides	16.0	Achillea atrata	15.7
Lloydia serotina	15.7	Carex foetida	15.4
Dicranum elongatum	15.4	Moehringia ciliata	15.4
Saxifraga aizoides	15.4	Sphaerophorus globosus	15.4
Myurella tenerrima	15.3	Potentilla brauniana	15.3
Stereocaulon alpinum	15.3	Saxifraga moschata	15.1
Carex lachenalii	15.0		

Constant species (occurrence frequencies)

Poa alpina	45.0	Persicaria vivipara	43.0
Salix herbacea	42.0	Veronica alpina	30.0
Gnaphalium supinum	29.0	Luzula alpinopilosa	29.0
Saxifraga oppositifolia	28.0	Salix polaris	21.0
Silene acaulis	21.0	Saxifraga androsacea	20.0
Geum montanum	18.0	Leucanthemopsis alpina	18.0
Ligusticum mutellina	18.0	Cerastium cerastoides	17.0
Sedum alpestre	16.0	Oxyria digyna	15.0
Cetraria islandica	14.0	Homogyne alpina	14.0

Polytrichastrum alpinum	14.0	Sibbaldia procumbens	14.0
Hylocomium splendens	13.0	Myosotis alpestris	13.0
Ranunculus glacialis	13.0	Soldanella carpatica	13.0
Luzula confusa	12.0	Sagina saginoides	12.0
Agrostis rupestris	11.0	Campanula scheuchzeri	11.0
Cardamine bellidifolia	11.0	Hutchinsia alpina	11.0
Minuartia sedoides	11.0	Ranunculus alpestris	11.0
Saxifraga stellaris	11.0	Soldanella alpina	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Luzula alpinopilosa	6.0	Salix herbacea	6.0

E4.3a - Boreal and arctic acidophilous alpine grassland

*Diagnostic species (phi coefficient * 100)*

Carex bigelowii	69.6	Cassiope tetragona	61.6
Cassiope hypnoides	61.5	Ochrolechia frigida	61.5
Cladonia mitis	60.3	Sanionia uncinata	50.8
Vahlodea atropurpurea	46.8	Alchemilla glomerulans	46.6
Cladonia subfurcata	46.4	Carex brunnescens	45.8
Conostomum tetragonum	45.7	Gymnomitrion concinnatum	44.7
Salix polaris	43.6	Anthelia juratzkana	40.4
Calamagrostis lapponica	40.4	Betula nana	40.1
Cetraria delisei	39.7	Cladonia borealis	39.4
Anastrophyllum minutum	38.8	Trientalis europaea	36.9
Carex lachenalii	36.3	Kiaeria starkei	35.1
Tritomaria quinquedentata	34.4	Cladonia gracilis	34.1
Luzula confusa	34.0	Salix herbacea	33.8
Cladonia bellidiflora	33.7	Cetraria nivalis	33.4
Sauteria alpina	33.2	Diapensia obovata	33.1
Pertusaria dactylina	33.0	Cladonia sulphurina	32.8
Salix glauca	32.8	Phyllodoce caerulea	32.7
Cetraria islandica	32.6	Ptilidium ciliare	32.2
Andreaea rupestris	32.1	Cetrariella delisei	32.0
Cladonia macrophylla	32.0	Gymnomitrion corallioides	32.0
Persicaria vivipara	31.7	Polytrichum hyperboreum	31.5
Ranunculus nivalis	31.5	Carex vaginata	30.6
Barbilophozia floerkei	30.4	Dicranum elongatum	30.4
Polytrichastrum alpinum	30.3	Dicranum fuscescens	29.3
Cladonia ecmocyna	29.0	Cetraria cucullata	28.1
Lycopodium alpinum	28.1	Empetrum hermaphroditum	27.8
Saussurea alpina	27.7	Pohlia drummondii	27.5
Blepharostoma trichophyllum	27.1	Huperzia selago	27.0
Epilobium anagallidifolium	26.7	Cladonia rangiferina	24.0
Gnaphalium norvegicum	23.9	Viola biflora	23.8
Luzula wahlenbergii	23.5	Cladonia maxima	23.4
Marsupella condensata	23.4	Pohlia longicolla	23.3

Arctoa fulvella	23.2	Carex saxatilis	23.2
Cladonia uncialis	23.1	Trisetum spicatum subsp. spicatum	23.1
Cladonia stygia	23.0	Nephroma arcticum	23.0
Pseudobryum cinclidioides	23.0	Pedicularis lapponica	22.9
Lycopodium annotinum	22.8	Pseudephebe pubescens	22.7
Sibbaldia procumbens	22.6	Cladonia merochlorophaea	22.5
Festuca vivipara	22.5	Vaccinium vitis-idaea	22.5
Mnium blyttii	22.4	Racomitrium microcarpon	22.4
Pogonatum dentatum	22.2	Drepanocladus uncinatus	22.1
Dicranum majus	21.6	Drepanocladus sendtneri	21.5
Drepanocladus revolvens	21.2	Pleurocladula albescens	21.2
Barbilophozia hatcheri	21.1	Diplophyllum taxifolium	21.0
Oligotrichum hercynicum	20.9	Carex ferruginea	20.8
Cladonia verticillata	20.8	Hylocomium splendens	20.6
Cladonia deformis	20.4	Sphaerophorus globosus	20.4
Bryocaulon divergens	20.2	Mnium marginatum	20.2
Alectoria nigricans	20.0	Mnium thomsonii	19.8
Pyrola minor	19.8	Juncus triglumis	19.6
Hylocomiastrum pyrenaicum	19.4	Juncus biglumis	19.4
Dicranum spadiceum	18.8	Juncus trifidus	18.8
Psoroma hypnorum	18.4	Sphagnum girgensohnii	17.9
Stereocaulon rivulorum	17.8	Dicranum scoparium	17.2
Comarum palustre	17.1	Aulacomnium turgidum	16.9
Solorina crocea	16.6	Cetraria ericetorum	15.3
Cladonia coccifera	15.1		

Constant species (occurrence frequencies)

Carex bigelowii	56.0	Persicaria vivipara	56.0
Cladonia mitis	50.0	Anthoxanthum odoratum aggr.	39.0
Cassiope hypnoides	39.0	Cassiope tetragona	39.0
Cetraria islandica	39.0	Ochrolechia frigida	39.0
Salix herbacea	33.0	Sanionia uncinata	33.0
Cladonia gracilis	28.0	Dicranum scoparium	28.0
Hylocomium splendens	28.0	Salix polaris	28.0
Alchemilla glomerulans	22.0	Anthelia juratzkana	22.0
Carex brunnescens	22.0	Cetraria nivalis	22.0
Cladonia subfurcata	22.0	Conostomum tetragonum	22.0
Deschampsia cespitosa	22.0	Gymnomitrion concinnatum	22.0
Juncus trifidus	22.0	Polytrichastrum alpinum	22.0
Vaccinium vitis-idaea	22.0	Vahlodea atropurpurea	22.0
Viola biflora	22.0	Anastrophyllum minutum	17.0
Betula nana	17.0	Calamagrostis lapponica	17.0
Carex ferruginea	17.0	Carex lachenalii	17.0
Cetraria cucullata	17.0	Cetraria delisei	17.0
Cladonia bellidiflora	17.0	Cladonia borealis	17.0
Cladonia rangiferina	17.0	Cladonia uncialis	17.0
Comarum palustre	17.0	Huperzia selago	17.0
Kiaeria starkei	17.0	Luzula confusa	17.0

Nardus stricta	17.0	Polytrichum juniperinum	17.0
Ptilidium ciliare	17.0	Rumex acetosa	17.0
Sibbaldia procumbens	17.0	Trientalis europaea	17.0
Tritomaria quinquedentata	17.0	Alchemilla monticola	11.0
Alchemilla xanthochlora	11.0	Andreaea rupestris	11.0
Avenella flexuosa	11.0	Barbilophozia floerkei	11.0
Blepharostoma trichophyllum	11.0	Carex vaginata	11.0
Cetrariella delisei	11.0	Cirsium helenioides	11.0
Cladonia coccifera	11.0	Cladonia ecmocyna	11.0
Cladonia macrophylla	11.0	Cladonia pyxidata	11.0
Cladonia sulphurina	11.0	Conopodium majus	11.0
Dactylis glomerata	11.0	Diapensia obovata	11.0
Dicranum elongatum	11.0	Dicranum fuscescens	11.0
Drepanocladus uncinatus	11.0	Empetrum hermaphroditum	11.0
Epilobium anagallidifolium	11.0	Equisetum arvense	11.0
Equisetum sylvaticum	11.0	Eriophorum angustifolium	11.0
Festuca ovina	11.0	Festuca rubra	11.0
Festuca vivipara	11.0	Gnaphalium norvegicum	11.0
Gnaphalium supinum	11.0	Gymnomitrion corallioides	11.0
Heracleum sphondylium	11.0	Holcus lanatus	11.0
Juncus filiformis	11.0	Leontodon hispidus	11.0
Luzula multiflora	11.0	Lycopodium alpinum	11.0
Pertusaria dactylina	11.0	Phleum alpinum aggr.	11.0
Phyllodoce caerulea	11.0	Poa trivialis	11.0
Pohlia drummondii	11.0	Polytrichum hyperboreum	11.0
Ranunculus acris	11.0	Ranunculus nivalis	11.0
Rhinanthus minor	11.0	Salix glauca	11.0
Saussurea alpina	11.0	Sauteria alpina	11.0
Trifolium pratense	11.0	Trollius europaeus	11.0
Veronica chamaedrys	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Carex bigelowii	6.0	Cassiope hypnoides	6.0
Cassiope tetragona	6.0	Cerastium alpinum	6.0
Poa pratensis aggr.	6.0	Sphagnum girgensohnii	6.0
Viola biflora	6.0		

E4.3b - Temperate acidophilous alpine grassland

*Diagnostic species (phi coefficient * 100)*

Agrostis rupestris	50.9	Carex curvula	47.6
Festuca airoides	43.4	Juncus trifidus	42.0
Helictochloa versicolor	41.5	Oreochloa disticha	40.3
Phyteuma hemisphaericum	37.5	Campanula alpina	37.2
Trifolium alpinum	36.5	Leucanthemopsis alpina	34.9
Festuca eskia	34.0	Hieracium alpinum	32.6
Luzula spicata	32.4	Geum montanum	32.2

Euphrasia minima	30.6	Primula minima	29.7
Veronica bellidioides	29.6	Gentiana alpina	29.0
Homogyne alpina	27.6	Ranunculus pyrenaeus	27.6
Gnaphalium supinum	24.8	Scorzoneroides pyrenaica	24.5
Potentilla aurea	24.2	Scorzoneroides helvetica	24.0
Vaccinium uliginosum	23.9	Minuartia sedoides	23.8
Ligusticum mutellina	23.6	Festuca halleri	22.4
Cetraria islandica	22.0	Silene acaulis	21.4
Luzula alpinopilosa	21.3	Loiseleuria procumbens	21.2
Minuartia recurva	21.2	Androsace carnea	20.8
Luzula lutea	20.6	Sempervivum montanum	20.4
Thymus nervosus	20.3	Campanula scheuchzeri	19.5
Phyteuma confusum	19.4	Soldanella pusilla	19.2
Pedicularis pyrenaica	19.1	Jacobaea incana subsp. carniolica	18.8
Poa alpina	17.6	Phyteuma globulariifolium	16.9
Sibbaldia procumbens	16.9	Sedum alpestre	16.3
Antennaria carpatica	16.2	Luzula pediformis	15.9
Primula integrifolia	15.6	Salix herbacea	15.4
Sesleria comosa	15.4	Saxifraga bryoides	15.2
Cardamine resedifolia	15.1	Erigeron uniflorus	15.1
Poa media	15.1		

Constant species (occurrence frequencies)

Agrostis rupestris	39.0	Nardus stricta	34.0
Geum montanum	30.0	Poa alpina	29.0
Potentilla aurea	29.0	Anthoxanthum odoratum aggr.	27.0
Carex curvula	27.0	Helictochloa versicolor	27.0
Juncus trifidus	27.0	Trifolium alpinum	26.0
Campanula scheuchzeri	25.0	Homogyne alpina	24.0
Festuca airoides	23.0	Carex sempervirens	22.0
Euphrasia minima	22.0	Phyteuma hemisphaericum	22.0
Leucanthemopsis alpina	21.0	Ligusticum mutellina	21.0
Luzula spicata	21.0	Persicaria vivipara	21.0
Oreochloa disticha	20.0	Avenella flexuosa	19.0
Scorzoneroides pyrenaica	18.0	Silene acaulis	18.0
Campanula alpina	17.0	Cetraria islandica	17.0
Festuca eskia	17.0	Lotus corniculatus	17.0
Vaccinium myrtillus	17.0	Gnaphalium supinum	15.0
Primula minima	15.0	Luzula alpinopilosa	14.0
Hieracium alpinum	13.0	Minuartia sedoides	13.0
Pulsatilla alpina	13.0	Vaccinium uliginosum	13.0
Antennaria dioica	12.0	Festuca rubra	12.0
Scorzoneroides helvetica	12.0	Ranunculus pyrenaeus	11.0
Veronica bellidioides	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Carex curvula	14.0	Festuca eskia	12.0
Nardus stricta	12.0	Trifolium alpinum	9.0

Festuca airoides	7.0

E4.4a - Arctic-alpine calcareous grassland

*Diagnostic species (phi coefficient * 100)*

Carex firma	49.0	Gentiana clusii	40.3
Bellidiastrum michelii	36.9	Primula auricula	36.8
Saxifraga caesia	36.2	Campanula cochleariifolia	35.0
Dryas octopetala	32.9	Festuca versicolor	31.7
Carex mucronata	30.0	Trisetum alpestre	29.3
Galium anisophyllon	28.8	Sesleria coerulans	28.7
Saxifraga paniculata	28.2	Valeriana saxatilis	28.1
Pedicularis rostratocapitata	27.5	Helianthemum oelandicum	27.2
Hieracium villosum	27.1	Carex sempervirens	26.6
Achillea clavennae	25.7	Euphrasia salisburgensis	25.7
Crepis jacquinii	24.0	Rhodothamnus chamaecistus	23.6
Leontopodium nivale	23.1	Sesleria caerulea	22.9
Androsace chamaejasme	22.8	Globularia cordifolia	22.8
Athamanta cretensis	22.6	Pinguicula alpina	22.5
Bartsia alpina	21.9	Festuca quadriflora	21.9
Thymus pulcherrimus	20.7	Aster alpinus	20.5
Ranunculus alpestris	20.5	Scabiosa lucida	20.5
Draba aizoides	20.4	Kernera saxatilis	20.4
Rhododendron hirsutum	20.2	Festuca tatrae	20.0
Gypsophila repens	19.8	Potentilla clusiana	19.8
Dianthus nitidus	19.6	Salix alpina	19.0
Ranunculus hybridus	18.5	Androsace lactea	17.6
Biscutella laevigata	17.6	Potentilla caulescens	17.5
Primula clusiana	17.5	Sesleria sphaerocephala	17.3
Pedicularis verticillata	17.1	Persicaria vivipara	17.0
Phyteuma orbiculare	17.0	Carduus defloratus aggr.	16.9
Sesleria sadlerana subsp. tatrae	16.9	Asplenium viride	16.3
Chamorchis alpina	16.3	Minuartia langii	16.2
Oxytropis jacquinii	16.1	Silene acaulis	16.1
Tortella tortuosa	15.8	Carex ferruginea	15.2

Constant species (occurrence frequencies)

Carex sempervirens	45.0	Anthyllis vulneraria	42.0
Sesleria caerulea	39.0	Helianthemum nummularium	34.0
Helianthemum oelandicum	32.0	Bellidiastrum michelii	30.0
Galium anisophyllon	30.0	Phyteuma orbiculare	30.0
Lotus corniculatus	29.0	Sesleria coerulans	28.0
Carex firma	27.0	Persicaria vivipara	27.0
Poa alpina	24.0	Scabiosa lucida	24.0
Dryas octopetala	23.0	Gentiana clusii	22.0
Saxifraga paniculata	22.0	Carduus defloratus aggr.	21.0
Euphrasia salisburgensis	21.0	Globularia cordifolia	20.0

Gentiana verna	19.0	Bartsia alpina	18.0
Carlina acaulis	18.0	Primula auricula	18.0
Campanula cochleariifolia	17.0	Hieracium villosum	17.0
Silene acaulis	17.0	Tortella tortuosa	17.0
Aster alpinus	16.0	Biscutella laevigata	16.0
Hippocrepis comosa	16.0	Thesium alpinum	16.0
Festuca versicolor	15.0	Thymus praecox	15.0
Draba aizoides	14.0	Linum catharticum	14.0
Minuartia verna	14.0	Pulsatilla alpina	14.0
Saxifraga caesia	14.0	Festuca quadriflora	13.0
Clinopodium alpinum	11.0	Festuca rubra	11.0
Leontodon hispidus	11.0	Trifolium pratense	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Carex sempervirens	16.0	Carex firma	10.0
Sesleria coerulans	7.0	Sesleria caerulea	6.0

E4.4b - Alpine and subalpine calcareous grassland of the Balkan and Apennines

*Diagnostic species (phi coefficient * 100)*

Carex kitaibeliana	77.1	Edraianthus graminifolius	55.0
Trinia dalechampii	47.1	Sesleria juncifolia	44.6
Festuca violacea subsp. italica	41.4	Sabulina verna subsp. verna	41.4
Pedicularis elegans	38.8	Sesleria nitida	37.4
Globularia meridionalis	36.5	Armeria gracilis subsp. majellensis	32.7
Asperula aristata	32.1	Cerastium decalvans	30.2
Viola eugeniae	29.5	Helictochloa versicolor subsp. praetutiana	29.3
Daphne oleoides	29.2	Poa molinierii	29.2
Thymus ciliatopubescens	29.0	Onobrychis montana subsp. scardica	28.6
Koeleria splendens	28.4	Draba aizoides	28.3
Erigeron epiroticus	27.6	Asyneuma limonifolium	27.3
Festuca hercegovinica	27.3	Sedum atratum subsp. atratum	26.8
Draba scardica	26.3	Helianthemum oelandicum	25.6
Dianthus integer	25.3	Minuartia verna	25.2
Aster alpinus subsp. alpinus	24.8	Hieracium pannosum	24.7
Gentiana dinarica	24.5	Paronychia chionea	23.4
Helictochloa aetolica	22.8	Cerastium tomentosum	22.7
Dianthus sylvestris	22.5	Galium magellense	22.5
Ranunculus breyninus	22.3	Androsace villosa	22.2
Galium oreophilum	22.2	Anthyllis aurea	22.0
Sesleria korabensis	21.5	Ranunculus brevifolius	20.3
Festuca circummediterranea	20.1	Thesium parnassi	20.1
Carex macrolepis	19.4	Rhodax alpestris	19.4
Helictochloa cincinnata	19.3	Clinopodium alpinum	19.2
Cerastium thomasii	19.0	Scorzoneroides montana subsp. breviscapa	19.0
Leontopodium nivale	18.9	Gnaphalium hoppeanum	18.7

Sideritis scardica	18.5	Dianthus haematocalyx	18.3
Saxifraga sempervivum	18.3	Galium bernardii	18.0
Thymus longicaulis	18.0	Ranunculus pollinensis	17.9
Veronica austriaca subsp. vahlii	17.9	Achillea barrelieri subsp. barrelieri	17.7
Trifolium noricum	17.6	Carex rupestris	17.5
Achillea holosericea	17.3	Festuca hirtovaginata	17.3
Brachypodium genuense	17.2	Erysimum bonannianum	17.2
Saxifraga paniculata	17.2	Sesleria wettsteinii	17.2
Plantago atrata	17.0	Armeria canescens	16.9
Euphorbia myrsinites	16.8	Gentiana verna	16.8
Poa molinerii	16.7	Geranium cinereum	16.6
Potentilla apennina subsp. apennina	16.6	Saxifraga adscendens subsp. adscendens	16.4
Anthyllis montana	16.3	Anthyllis vulneraria	16.3
Centaurea parlatoris	16.3	Jovibarba heuffelii	15.9
Poa alpina	15.9	Crepis aurea subsp. glabrescens	15.8
Dianthus arrostii	15.8	Iberis sempervirens	15.7
Myosotis suaveolens	15.7	Ranunculus apenninus	15.7
Arabis collina	15.4	Iberis saxatilis subsp. saxatilis	15.2

Constant species (occurrence frequencies)

Carex kitaibeliana	70.0	Anthyllis vulneraria	55.0
Thymus praecox	37.0	Edraianthus graminifolius	36.0
Helianthemum oelandicum	34.0	Poa alpina	31.0
Minuartia verna	30.0	Sesleria juncifolia	28.0
Clinopodium alpinum	27.0	Trinia dalechampii	26.0
Asperula aristata	24.0	Gentiana verna	24.0
Dianthus sylvestris	23.0	Draba aizoides	23.0
Festuca violacea subsp. italica	21.0	Sabulina verna subsp. verna	21.0
Helianthemum nummularium	20.0	Koeleria splendens	20.0
Globularia meridionalis	19.0	Asperula cynanchica	18.0
Bromopsis erecta	18.0	Teucrium montanum	18.0
Thymus longicaulis	18.0	Helictochloa versicolor subsp. praetutiana	17.0
Sesleria nitida	17.0	Cerastium arvense	16.0
Lotus corniculatus	16.0	Pedicularis elegans	16.0
Ranunculus breyninus	16.0	Saxifraga paniculata	16.0
Silene acaulis	16.0	Androsace villosa	15.0
Armeria gracilis subsp. majellensis	15.0	Plantago atrata	15.0
Viola eugeniae	15.0	Anthyllis montana	14.0
Trifolium pratense	14.0	Euphrasia salisburgensis	13.0
Festuca circummediterranea	13.0	Galium lucidum	13.0
Hippocrepis comosa	13.0	Leontodon crispus	13.0
Pilosella officinarum	13.0	Pulsatilla alpina	13.0
Carex caryophyllea	12.0	Myosotis alpestris	12.0
Potentilla crantzii	12.0	Asyneuma limonifolium	11.0
Carlina acaulis	11.0	Cerastium decalvans	11.0
Daphne oleoides	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Carex kitaibeliana	19.0	Sesleria juncifolia	12.0
Sesleria nitida	9.0	Helianthemum oelandicum	5.0

E5.2a - Thermophilous woodland fringe of base-rich soils

*Diagnostic species (phi coefficient * 100)*

Geranium sanguineum	31.1	Polygonatum odoratum	23.6
Vincetoxicum hirundinaria	19.7	Astragalus glycyphyllos	17.6
Peucedanum cervaria	17.2	Trifolium medium	16.9
Clinopodium vulgare	16.5	Origanum vulgare	16.4
Melittis melissophyllum	16.3	Dictamnus albus	16.2
Origanum vulgare subsp. virens	16.0		

Constant species (occurrence frequencies)

Geranium sanguineum	42.0	Dactylis glomerata	36.0
Euphorbia cyparissias	33.0	Achillea millefolium	32.0
Origanum vulgare	32.0	Galium mollugo aggr.	31.0
Trifolium medium	31.0	Vincetoxicum hirundinaria	30.0
Brachypodium pinnatum	29.0	Clinopodium vulgare	27.0
Hypericum perforatum	27.0	Poa pratensis aggr.	27.0
Polygonatum odoratum	24.0	Arrhenatherum elatius	22.0
Galium verum	22.0	Teucrium chamaedrys	22.0
Fragaria vesca	21.0	Helianthemum nummularium	19.0
Lotus corniculatus	19.0	Peucedanum cervaria	18.0
Pimpinella saxifraga	18.0	Viola hirta	18.0
Centaurea scabiosa	17.0	Bupleurum falcatum	16.0
Festuca rubra	16.0	Stachys recta	16.0
Agrostis capillaris	15.0	Knautia arvensis	15.0
Sanguisorba minor	15.0	Astragalus glycyphyllos	14.0
Laserpitium latifolium	14.0	Lathyrus pratensis	14.0
Silene nutans	14.0	Tanacetum corymbosum	14.0
Veronica chamaedrys	14.0	Agrimonia eupatoria	13.0
Anthericum ramosum	13.0	Festuca ovina	13.0
Fragaria viridis	13.0	Stachys officinalis	13.0
Vicia cracca	13.0	Carex humilis	12.0
Plantago lanceolata	12.0	Primula veris	12.0
Securigera varia	12.0	Bromopsis erecta	11.0
Campanula persicifolia	11.0	Medicago falcata	11.0
Poa nemoralis	11.0	Salvia pratensis	11.0
Silene vulgaris	11.0	Solidago virgaurea	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Geranium sanguineum	23.0	Trifolium medium	18.0
Peucedanum cervaria	8.0	Vincetoxicum hirundinaria	6.0

E5.2b - Thermophilous woodland fringe of acidic soils

*Diagnostic species (phi coefficient * 100)*

Teucrium scorodonia	73.4	Lonicera periclymenum	55.6
Melampyrum pratense	47.8	Holcus mollis	33.3
Hedera helix	33.2	Stellaria holostea	31.7
Hypericum pulchrum	30.1	Linaria repens	29.9
Pulmonaria longifolia	28.8	Peucedanum gallicum	27.3
Digitalis purpurea	24.0	Hieracium lachenalii	24.0
Quercus petraea	23.1	Pteridium aquilinum	23.0
Viola riviniana	22.5	Lathyrus linifolius	21.8
Cytisus scoparius	20.8	Luzula forsteri	19.8
Castanea sativa	18.5	Solidago virgaurea	17.9
Polygonatum multiflorum	17.1	Ruscus aculeatus	16.4
Avenella flexuosa	16.2	Potentilla sterilis	15.9
Erica cinerea	15.7	Festuca heterophylla	15.4

Constant species (occurrence frequencies)

Teucrium scorodonia	85.0	Holcus mollis	57.0
Lonicera periclymenum	40.0	Melampyrum pratense	37.0
Agrostis capillaris	32.0	Avenella flexuosa	32.0
Dactylis glomerata	31.0	Pteridium aquilinum	29.0
Solidago virgaurea	29.0	Viola riviniana	29.0
Stellaria holostea	26.0	Anthoxanthum odoratum aggr.	25.0
Hedera helix	24.0	Hypericum pulchrum	24.0
Galium mollugo aggr.	23.0	Lathyrus linifolius	22.0
Potentilla erecta	21.0	Achillea millefolium	20.0
Cytisus scoparius	19.0	Fragaria vesca	18.0
Quercus petraea	18.0	Festuca ovina	17.0
Hypericum perforatum	17.0	Stachys officinalis	17.0
Centaurea nigra	16.0	Linaria repens	16.0
Campanula rotundifolia	15.0	Festuca rubra	15.0
Brachypodium pinnatum	14.0	Calluna vulgaris	14.0
Veronica chamaedrys	14.0	Digitalis purpurea	13.0
Rumex acetosa	13.0	Serratula tinctoria	13.0
Conopodium majus	12.0	Hieracium lachenalii	12.0
Holcus lanatus	12.0	Potentilla sterilis	12.0
Pseudoscleropodium purum	12.0	Silene nutans	12.0
Anemone nemorosa	11.0	Arrhenatherum elatius	11.0
Poa nemoralis	11.0	Pulmonaria longifolia	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Teucrium scorodonia	31.0	Melampyrum pratense	13.0
Holcus mollis	11.0		

E5.2c - Macaronesian thermophilous woodland fringe

*Diagnostic species (phi coefficient * 100)*

Ranunculus cortusifolius	61.6	Pimpinella dendrotragium	55.3
Pericallis lanata	55.2	Ageratina adenophora	55.1
Aeonium aizoon	47.9	Cistus symphytifolius	47.9
Crambe scaberrima	47.9	Festuca agustinii	47.9
Hypericum reflexum	47.9	Pericallis cruenta	47.9
Rumex maderensis	47.9	Carlina salicifolia	47.8
Phyllis nobla	47.8	Aeonium holochrysum	39.1
Drymochloa donax	39.1	Geranium palmatum	39.1
Geranium reuteri	39.1	Myosotis discolor subsp. canariensis	39.1
Oenanthe divaricata	39.1	Peucedanum lowei	39.1
Sonchus gummifer	39.1	Origanum vulgare subsp. virens	36.4
Carex divulsa	28.8	Aichryson divaricatum	27.6
Ammi huntii	27.6	Andryala pinnatifida subsp. teydensis	27.6
Angelica lignescens	27.6	Argyranthemum foeniculuceum	27.6
Argyranthemum webbii	27.6	Cardamine caldeirarum	27.6
Crambe strigosa	27.6	Cyclosorus pozoi	27.6
Cyrtomium falcatum	27.6	Dactylorhiza foliosa	27.6
Deschampsia argentea	27.6	Dryopteris intermedia subsp. azorica	27.6
Erysimum scoparium	27.6	Helianthemum broussonnetii	27.6
Morella faya	27.6	Pericallis aurita	27.6
Pericallis malvifolia	27.6	Polystichum falcinellum	27.6
Scrophularia glabrata	27.6	Selaginella kraussiana	27.6
Sibthorpia peregrina	27.6	Tinguarra cervariaefolia	27.6
Tolpis azorica	27.6	Woodwardia radicans	27.6
Festuca petraea	27.5	Rubus bollei	27.5
Teucrium francoi	27.5	Viola paradoxa	27.5
Viola stellata	27.5	Erysimum bicolor	27.4
Holcus rigidus	27.4	Micromeria hyssopifolia var. kuegleri	27.4
Salix canariensis	27.4	Tolpis macrorhiza	27.4
Adiantum capillus-veneris	27.2	Petroselinum crispum	26.9
Sibthorpia europaea	26.9	Ceratochloa cathartica	26.6
Selaginella denticulata	25.7	Agrostis castellana	22.3
Mentha spicata	22.1	Erica arborea	21.3
Clinopodium nepeta	19.8	Athyrium filix-femina	19.0
Samolus valerandi	18.6	Viola odorata	18.1
Brachypodium sylvaticum	15.6		

Constant species (occurrence frequencies)

Ranunculus cortusifolius	38.0	Ageratina adenophora	31.0
Pericallis lanata	31.0	Pimpinella dendrotragium	31.0
Aeonium aizoon	23.0	Carlina salicifolia	23.0
Cistus symphytifolius	23.0	Crambe scaberrima	23.0
Festuca agustinii	23.0	Hypericum reflexum	23.0
Pericallis cruenta	23.0	Phyllis nobla	23.0
Rumex maderensis	23.0	Succisa pratensis	23.0
Aeonium holochrysum	15.0	Agrostis castellana	15.0
Athyrium filix-femina	15.0	Brachypodium sylvaticum	15.0
Carex divulsa	15.0	Drymochloa donax	15.0

Geranium palmatum	15.0	Geranium reuteri	15.0
Juncus effusus	15.0	Myosotis discolor subsp. canariensis	15.0
Oenanthe divaricata	15.0	Origanum vulgare subsp. virens	15.0
Peucedanum lowei	15.0	Sonchus gummifer	15.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Pimpinella dendrotragium	23.0	Aeonium aizoon	15.0
Geranium palmatum	15.0	Geranium reuteri	15.0
Angelica lignescens	8.0	Athyrium filix-femina	8.0
Dactylorhiza foliosa	8.0	Deschampsia argentea	8.0
Oenanthe divaricata	8.0	Origanum vulgare subsp. virens	8.0
Pericallis malvifolia	8.0	Rumex maderensis	8.0
Salix canariensis	8.0	Teucrium francoi	8.0

E5.4 - Lowland moist or wet tall-herb and fern fringe

*Diagnostic species (phi coefficient * 100)*

Urtica dioica	29.2	Impatiens noli-tangere	24.1
Galium aparine	23.3	Petasites hybridus	22.5
Stachys sylvatica	20.8	Lamium maculatum	20.2
Schedonorus giganteus	19.7	Calystegia sepium	18.3
Stellaria nemorum	18.3	Impatiens glandulifera	18.2
Circaea lutetiana	18.1	Myosoton aquaticum	18.0
Petasites albus	16.1	Chrysosplenium alternifolium	15.6
Geranium robertianum	15.4	Alliaria petiolata	15.3
Epilobium hirsutum	15.0		

Constant species (occurrence frequencies)

Urtica dioica	68.0	Poa trivialis	40.0
Galium aparine	33.0	Ranunculus repens	29.0
Phalaroides arundinacea	27.0	Filipendula ulmaria	26.0
Dactylis glomerata	25.0	Aegopodium podagraria	22.0
Agrostis stolonifera	21.0	Cirsium arvense	21.0
Calystegia sepium	20.0	Elymus repens aggr.	20.0
Artemisia vulgaris	19.0	Heracleum sphondylium	19.0
Glechoma hederacea	18.0	Angelica sylvestris	17.0
Anthriscus sylvestris	17.0	Chaerophyllum hirsutum	17.0
Epilobium hirsutum	17.0	Rumex obtusifolius	17.0
Cirsium oleraceum	15.0	Caltha palustris	13.0
Lythrum salicaria	13.0	Taraxacum sect. Taraxacum	13.0
Deschampsia cespitosa	11.0	Eupatorium cannabinum	11.0
Geranium robertianum	11.0	Holcus lanatus	11.0
Impatiens noli-tangere	11.0	Lycopus europaeus	11.0
Lysimachia vulgaris	11.0	Mentha longifolia	11.0
Symphytum officinale	11.0		

Dominant species (percentage frequencies of occurrences with cover > 25%)

Urtica dioica	13.0	Petasites hybridus	8.0
Chaerophyllum hirsutum	5.0	Filipendula ulmaria	5.0

E5.5 - Subalpine moist or wet tall-herb and fern fringe

*Diagnostic species (phi coefficient * 100)*

Adenostyles alliariae	69.2	Peucedanum ostruthium	60.4
Rumex alpestris	52.0	Saxifraga rotundifolia	50.6
Rumex alpinus	48.4	Aconitum napellus	46.8
Epilobium alpestre	43.0	Lactuca alpina	42.5
Athyrium distentifolium	41.7	Viola biflora	34.1
Veratrum album	34.0	Ranunculus platanifolius	32.7
Geranium sylvaticum	32.3	Ranunculus aconitifolius	31.6
Stellaria nemorum	28.7	Aconitum lycoctonum subsp. neapolitanum	28.4
Aconitum lycoctonum subsp. vulparia	28.3	Silene dioica	27.8
Tozzia alpina	24.7	Chaerophyllum hirsutum	24.0
Streptopus amplexifolius	22.0	Polystichum lonchitis	21.9
Milium effusum	21.8	Thalictrum aquilegiifolium	20.8
Cirsium spinosissimum	20.7	Jacobaea alpina	20.6
Senecio nemorensis	20.6	Doronicum austriacum	20.1
Athyrium filix-femina	19.9	Luzula glabrata	19.2
Prenanthes purpurea	19.2	Rhodiola rosea	18.9
Myosotis sylvatica	18.6	Dryopteris filix-mas	18.4
Achillea macrophylla	18.1	Chaerophyllum villarsii	17.9
Arabis alpina	17.3	Festuca nitida	17.0
Carduus personata	16.6	Valeriana tripteris	16.6
Dryopteris villarii	16.4	Lactuca plumieri	15.8
Adenostyles alpina	15.7	Myrrhis odorata	15.6
Pedicularis recutita	15.6	Phleum alpinum aggr.	15.6
Poa hybrida	15.6	Veratrum lobelianum	15.4
Calamagrostis villosa	15.2	Doronicum grandiflorum	15.2
Rubus idaeus	15.1		

Constant species (occurrence frequencies)

Adenostyles alliariae	63.0	Rumex alpestris	59.0
Geranium sylvaticum	56.0	Peucedanum ostruthium	45.0
Chaerophyllum hirsutum	37.0	Veratrum album	36.0
Aconitum napellus	35.0	Deschampsia cespitosa	35.0
Rumex alpinus	34.0	Saxifraga rotundifolia	31.0
Silene dioica	31.0	Viola biflora	31.0
Epilobium alpestre	27.0	Stellaria nemorum	27.0
Alchemilla vulgaris aggr.	26.0	Urtica dioica	24.0
Lactuca alpina	23.0	Athyrium distentifolium	22.0
Hypericum maculatum	22.0	Heracleum sphondylium	21.0
Ranunculus aconitifolius	21.0	Bistorta officinalis	20.0
Phleum alpinum aggr.	20.0	Poa alpina	20.0
Senecio nemorensis	20.0	Ranunculus platanifolius	19.0

Silene vulgaris	19.0	Ligusticum mutellina	18.0
Trollius europaeus	18.0	Solidago virgaurea	16.0
Athyrium filix-femina	15.0	Myosotis sylvatica	15.0
Dactylis glomerata	14.0	Primula elatior	14.0
Rubus idaeus	14.0	Chaerophyllum villarsii	13.0
Thalictrum aquilegiifolium	13.0	Aconitum lycoctonum subsp. vulparia	12.0
Dryopteris filix-mas	12.0	Geum rivale	12.0
Myosotis alpestris	12.0	Cirsium spinosissimum	11.0
Milium effusum	11.0	Veratrum lobelianum	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Adenostyles alliariae	24.0	Rumex alpinus	18.0
Peucedanum ostruthium	10.0	Athyrium distentifolium	7.0

E6.1 - Mediterranean inland salt steppe

*Diagnostic species (phi coefficient * 100)*

Sphenopus divaricatus	48.8	Suaeda braun-blanquetii	47.5
Suaeda vera	40.5	Mesembryanthemum nodiflorum	40.2
Puccinellia caespitosa	37.7	Frankenia pulverulenta	37.6
Lygeum spartum	36.4	Parapholis incurva	35.6
Limonium delicatulum	35.2	Limonium supinum	32.1
Elytrigia curvifolia	31.9	Spergularia media	30.6
Arthrocnemum macrostachyum	30.4	Spergularia diandra	29.9
Hymenolobus procumbens	29.6	Hordeum marinum	29.5
Salicornia patula	28.7	Aeluropus littoralis	28.1
Puccinellia fasciculata	27.6	Sonchus crassifolius	26.9
Frankenia thymifolia	25.0	Limonium costae	24.5
Mesembryanthemum crystallinum	24.5	Limonium caesium	22.7
Bupleurum semicompositum	22.6	Artemisia herba-alba	22.3
Limonium cossonianum	21.9	Spergularia marina	20.3
Jacobaea auricula	20.0	Limonium dichotomum	19.8
Limonium angustibracteatum	19.1	Limonium viciosoi	18.6
Plantago coronopus	17.9	Suaeda spicata	17.9
Atriplex glauca	17.8	Puccinellia tenuifolia	17.0
Frankenia corymbosa	16.6	Lepidium cardamines	16.3
Limbarda crithmoides	16.2	Atriplex halimus	16.1
Cytisus proliferus	15.6	Aethionema froedinii	15.2
Hypericum atomarium	15.0	Juncus subulatus	15.0

Constant species (occurrence frequencies)

Sphenopus divaricatus	24.0	Suaeda braun-blanquetii	23.0
Plantago coronopus	21.0	Hordeum marinum	20.0
Mesembryanthemum nodiflorum	17.0	Parapholis incurva	17.0
Suaeda vera	17.0	Lygeum spartum	16.0
Spergularia media	16.0	Frankenia pulverulenta	15.0
Puccinellia caespitosa	14.0	Aeluropus littoralis	13.0

Limonium delicatulum	13.0	Spergularia marina	13.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Mesembryanthemum nodiflorum	9.0	Suaeda braun-blanquetii	9.0
Salicornia patula	6.0		

E6.2 - Continental inland salt steppe

*Diagnostic species (phi coefficient * 100)*

Limonium gmelinii	58.1	Artemisia santonicum	54.7
Podospermum canum	49.9	Camphorosma annua	40.7
Puccinellia distans	37.8	Plantago tenuiflora	33.2
Petrosimonia oppositifolia	31.5	Trifolium angulatum	30.4
Trifolium retusum	28.9	Plantago schwarzenbergiana	27.2
Camphorosma monspeliaca	27.1	Pholiurus pannonicus	26.3
Cerastium dubium	24.6	Eremopyrum triticeum	24.6
Lepidium cartilagineum	23.3	Petrosimonia brachiata	22.1
Festuca valesiaca	21.0	Bupleurum tenuissimum	19.4
Tripolium pannonicum	19.1	Ranunculus pedatus	19.0
Alhagi maurorum	18.9	Lepidium perfoliatum	18.8
Puccinellia tenuissima	18.6	Eremopyrum orientale	18.4
Taraxacum besarabicum	18.4	Limonium meyeri	18.2
Aeluropus pungens	17.6	Matricaria chamomilla	17.2
Lepidium ruderale	17.0	Atriplex tatarica	16.8
Bassia sedoides	15.9	Puccinellia festuciformis	15.7
Halimione verrucifera	15.3	Petrosimonia triandra	15.1

Constant species (occurrence frequencies)

Festuca valesiaca	48.0	Artemisia santonicum	41.0
Limonium gmelinii	40.0	Podospermum canum	36.0
Puccinellia distans	32.0	Bromus hordeaceus	18.0
Camphorosma annua	17.0	Plantago maritima	16.0
Tripolium pannonicum	16.0	Cynodon dactylon	15.0
Poa bulbosa	15.0	Plantago lanceolata	14.0
Cerastium dubium	13.0	Matricaria chamomilla	13.0
Petrosimonia oppositifolia	13.0	Trifolium retusum	13.0
Plantago tenuiflora	12.0	Trifolium angulatum	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Festuca valesiaca	23.0	Artemisia santonicum	9.0
Puccinellia distans	9.0		

E6.3 - Temperate inland salt marsh

*Diagnostic species (phi coefficient * 100)*

Salicornia perennans	61.0	Tripolium pannonicum	50.2

Puccinellia distans	46.1	Spergularia marina	41.6
Suaeda maritima	35.7	Puccinellia festuciformis	33.6
Halimione pedunculata	32.9	Atriplex prostrata	32.7
Suaeda prostrata	30.8	Suaeda acuminata	28.3
Limonium bellidifolium	27.1	Juncus gerardi	26.9
Halocnemum strobilaceum	24.4	Limonium meyeri	23.7
Spergularia media	23.5	Scorzonera parviflora	23.3
Salicornia europaea aggr.	22.3	Bolboschoenus maritimus	22.0
Puccinellia gigantea	21.7	Halimione verrucifera	21.6
Taraxacum besarabicum	20.7	Aeluropus littoralis	20.6
Crypsis aculeata	20.0	Triglochin maritima	19.9
Frankenia hirsuta	19.5	Salsola soda	19.4
Crypsis schoenoides	16.7	Salicornia europaea	16.0
Glaux maritima	15.3		

Constant species (occurrence frequencies)

Tripolium pannonicum	42.0	Salicornia perennans	40.0
Puccinellia distans	38.0	Juncus gerardi	29.0
Atriplex prostrata	27.0	Spergularia marina	25.0
Agrostis stolonifera	22.0	Bolboschoenus maritimus	22.0
Phragmites australis	17.0	Puccinellia festuciformis	16.0
Suaeda maritima	16.0	Plantago maritima	14.0
Halimione pedunculata	13.0	Triglochin maritima	13.0
Glaux maritima	12.0	Argentina anserina	11.0
Limonium meyeri	11.0	Lotus tenuis	11.0
Suaeda acuminata	11.0	Suaeda prostrata	11.0

Dominant species (percentage frequencies of occurrences with cover > 25%)

Salicornia perennans	13.0	Puccinellia distans	11.0
Juncus gerardi	6.0		

Appendix E: Descriptions of the revised EUNIS grassland habitat types

In the following, the proposed EUNIS Grassland habitat names are given in bold, followed by the new habitat description. Where the proposed code and/or name differ from an original EUNIS habitat code and/or name, the latter is/are provided in italics. Original habitat descriptions are also shown in italics.

The single habitat included in this report but omitted from the Red List is shown in green. Habitats included in the Red List and omitted from the report are shown in red.

B1.4 Coastal stable dune grassland (grey dunes)
Original EUNIS description: Fixed or semifixed dunes of the coasts of the boreal, nemoral, steppe, mediterranean and warm-temperate humid zones, with the perennial grasslands, chamaephyte-dotted grasslands, forblands, subshrub or succulent communities that stabilise them and the therophyte communities that may occupy the grassland.

B1.4a Atlantic and Baltic coastal stable dune grassland (grey dunes)

Grassland of stabilised sands of fixed dunes along the north-west European coast south to Portugal, thinly enriched with accumulating humus and sharply draining, typically with a more or less complete low cover of grasses, herbs, mosses and lichens, sometimes with low shrubs. The flora can vary with the regional climate, with the character of the substrate, varying from acid to highly calcareous, and with the local dune topography. Often grazed or mown in the past.

B1.4b Mediterranean and Macaronesian coastal stable dune grassland (grey dunes)

Grassland of stabilised sands of fixed dunes around the Mediterranean and Macaronesian coasts, inland from wind erosion and salt-deposition, with a more or less complete cover of graminoids and herbs, often with a contingent of colour-ful spring annuals capitalising on early rains. The flora varies according to regional climate and dune topography.

B1.4c Black Sea coastal dune grassland (grey dunes)

Grassland on stabilised or semi-stabilised coastal sands around the Black Sea, mostly on the western and north-western stretches. The flora varies with a shift from Mediterranean to Pontic moving northwards, with many regional endemic plant species among its grasses and herbs. Perennials predominate but there can be striking contingents of annuals on more mobile stretches of sand on the ridges, and mosses and lichens can be extensive on north-facing, less sunny slopes.

E1.1 Pioneer and open perennial grasslands of inland sands and rocky terrain (= Inland sand and rock with open vegetation)
Original EUNIS description: Open, thermophile vegetation of sands or rock debris in the nemoral zone and locally, in boreal or submediterranean lowland to montane areas of Europe. Included are open grasslands on strongly to slightly calcareous inland sands, and vegetation formed mostly by annuals and succulents or semisucculents on decomposed rock surfaces of edges, ledges or knolls, with calcareous or siliceous soils.

E1.1a Pannonian and Pontic sandy steppe

Rather open steppe grassland dominated by perennial tussock-grasses and herbs, with frequent spring annuals and cryptogams, typical of nutrient-poor, sandy soils on plains and dunes through the Pannonian, Pontic and southern Baltic regions. The climate is strongly continental with cold winters, often with long frosts and shallow snow, and hot, droughty summers. Traditionally used for extensive grazing by stock, particularly sheep, but now widely abandoned.

E1.1b Cryptogam- and annual-dominated vegetation on siliceous rock outcrops
Open pioneer grassland dominated by perennial succulents and annuals, with subordinate small tussock grasses, sometimes geophytes and often a prominent contingent of cryptogams. Typically forming small stands on very shallow and skeletal, impoverished, acid soils on siliceous rock outcrops, eroded slopes and disturbed or artificial habitats like soil heaps and wall tops, the habitat occurs throughout temperate and boreal Europe up to the sub-alpine level, in situations where the permeable soils dry quickly in summer, but where spring rains can permit a quick flush of growth by the annuals.

E1.1d. Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops

Open pioneer grassland with perennial succulents and spring annuals, subordinate small tussock grasses and herbs, and often with a very prominent and rich contingent of cryptogams. Typically found in small patches on very shallow and skeletal, impoverished, base-rich soils on a wide variety of base-rich and sometimes ultramafic bedrocks, and similar artificial habitats like quarry spoil and wall-tops. It is found from the hemiboreal to the submediterranean, occurring mainly at higher altitudes further south.

E1.1e Perennial rocky grassland of the Italian peninsula

Unique to base-rich bedrocks in the Italian peninsula (and maybe Sicily) and best developed within the submediterranean bioclimatic zone, this grassland is variously dominated by perennial grasses and herbs, or mat formers and sub-shrubs on steeper, rockier ground. Generally species-rich, and sometimes with contingents of annuals and, in disturbed places, geophytes, the habitat sometimes hosts endemic plants. Developed through clearance of broadleaved

and mixed woodland it is maintained by traditional grazing in a distinctive cultural landscape.

E1.1f Continental dry rocky steppic grasslands and dwarf scrub on chalk outcrops

Original EMERALD description: Communities of chamaeophytes on cretaceous outcrops in the steppe and southern forest-steppe zones in the Don and (probably) Volga basins. A mix of continental steppes is typical. The community is usually open, and plant cover varies from 30-70%, with several threatened plant species.

Usually open vegetation dominated by perennial mat-forming Continental steppe plants on free-draining base-rich soils of rocky chalk outcrops in the Don and (probably) Volga basins.

1.1g Perennial rocky grassland of Central Europe and the Carpathians

Open grassland generally dominated by perennial grasses with rich mixtures of associated rosette herbs, mat-formers and geophytes, and towards southern Europe especially, annuals. It occurs on shallow, impoverished soils over both calcareous and siliceous bedrocks, through the lowlands and submontane zone of central and southern Europe, best developed on steeper ground uncongenial for agriculture, but extended where woodland clearance and grazing, particularly by goats, have been part of traditional farming.

E1.1h Heavy metal dry grassland of the Balkans

Grassland confined to droughty, nutrient-poor soils rich in heavy metals derived from ultramafic rocks in the mountains of the Balkans and Cyprus with an open cover of grasses and forbs, including many endemics.

E1.1i Perennial rocky calcareous grassland of subatlantic-submediterranean Europe

Open grasslands, dominated by perennials and especially rich in mat-formers, typical of rudimentary, shallow, nutrient-poor, base-rich soils over sloping, rubbly limestone terrain through the lowland to sub-montane levels in subatlantic and submediterranean Europe where traditionally maintained by extensive grazing.

E1.1j Dry steppic, submediterranean pasture of South-Eastern Europe

Dry steppic pasture typical of sharply-draining, base-rich soils developed over valley sides, dolines and sink-holes around the Adriatic coasts where the submediterranean climate is characterised by late autumn and spring rains and summer drought. Dominated by often rich mixtures of graminoids, forbs and mat-formers, the habitat is dependent on extensive grazing and now often survives patchily among mosaics of scrub and woodland.

E1.2 - Perennial calcareous grassland and basic steppes
Original EUNIS description: Perennial grasslands, often nutrient-poor and species-rich, on calcareous and other basic soils of the nemoral and steppe zones and of adjacent parts of the subboreal and submediterranean zones. Includes the calcareous grasslands of central and western Europe, alvar grasslands of the Baltic region, and basic grasslands of the steppe zone

E1.2a Semi-dry perennial calcareous grassland

Semi-natural grassland on deeper and not so drought-prone, nutrient-poor, base-rich soils over limestones throughout the lowlands and sub-montane levels of submediterranean to hemiboreal Europe. Generally closed and dominated by mixtures of graminoids and forbs, often extremely species rich, with many rare plants and sometimes striking contingents of orchids and varying much across the large range with different sets of continental or sub-mediterranean companions. Dependent on extensive grazing, usually with sheep, or on an annual mowing, and often developed over centuries of traditional pastoralism, contributing to some striking cultural landscapes.

E1.2b Continental dry steppe

Steppe and steppe-like grassland on mostly base-rich soils over limestones, of varying depth and stoniness, occurring through the Continental lowlands to sub-montane belts of Europe. Dominated by plants adapted to long periods of summer drought, mostly tall tussock grasses and perennial forbs, it shows wide variation in species composition and particular topographic location across the substantial range. In more extreme situations, the grasslands are natural, but they often sustain extensive grazing.

E1.3 Mediterranean xeric grassland
Original EUNIS description: Meso- and thermo-Mediterranean xerophile, mostly open, short-grass perennial grasslands rich in therophytes; therophyte communities of oligotrophic soils on base-rich, often calcareous substrates.

E1.3a Mediterranean closely-grazed dry grassland

Heavily-grazed pasture of the Mediterranean basin, mostly on silt and clay soils in the lowlands, dominated by rosette plants and small grasses tolerant of intensive herbivory and trampling. The soils are dry in summer which helps exclude nitrophilous plants that might be encouraged by dunging but, refreshed by autumn rains, the herbage remains green and productive through the winter, providing valuable forage. Companion plants vary widely across the large range.

E1.3b Mediterranean tall perennial dry grassland

Grassland of impoverished, base-rich soils over various calcareous bedrocks through the Mediterranean region, where grazing and trampling sustain open or closed swards generally dominated by tall, dense tussock grasses that lend

a steppe-like character. Summer drought and disturbance help prevent reversion to woodland but can encourage the invasion of aliens.

E1.3c Mediterranean annual-rich dry grassland

Usually ephemeral vegetation related to the yearly cycle of spring rains and summer drought through the Mediterranean zone where a high diversity of small annual plants make a brief colourful appearance on bare patches of mainly base-rich soils. The species composition varies greatly, according to the particular regional terrain and climate and the impact of traditional pastoralism.

E1.5 Mediterranean montane grassland

Original EUNIS description: Open perennial grasslands, often rich in chamaephytes, most characteristic of the thermophilous oak level of Iberia, southern France, southern Italy, Greece and the Balkans. Some of the largest remaining expanses of unbroken grasslands in Europe, of evident importance as faunal habitats, belong to this division.

E1.5a Iberian oromediterranean siliceous dry grassland

Grassland of base-poor soils over siliceous bedrocks on the slopes and crests of high mountains in the Iberian Peninsula with a short growing season and harsh winters with strong winds which blow the ground free of snow and leave the surface subject to deep cold and the development of freeze-thaw features. The vegetation cover, moderately open to closed, is dominated by prostrate or dwarf grasses and forbs, and includes many endemics.

E1.5b Iberian oromediterranean basiphilous dry grassland

Grassland of base-rich soils over calcareous bedrocks on the slopes and crests of high mountains in the Iberian Peninsula and France, with a short growing season and harsh winters when strong winds blow the ground free of snow and leave the surface subject to deep cold which encourages the development of freeze-thaw features. The vegetation cover, moderately open to closed, is dominated by prostrate or dwarf grasses and forbs, and includes many endemics.

E1.5c Cyrno-Sardean oromediterranean siliceous dry grassland

Grassland of base-poor soils over siliceous bedrocks on the slopes and crests of high mountains in Corsica and (probably) Sardinia, with a short growing season and harsh winters when strong winds blow the ground free of snow and leave the surface subject to deep cold which encourages the development of freeze-thaw features. The cover of vegetation is intermediate to complete, dominated by prostrate herbs, cushion plants and dwarf shrubs, and includes many endemics.

E1.5d Greek and Anatolian oromediterranean siliceous dry grassland

Closed grassland of deeper acid soils occurring over various bedrocks above the tree-line on high mountain slopes and hollows in Greece and Anatolia where snow accumulates and provides springtime irrigation with melt-water. The vegetation is species-rich but the dominants and associates vary from place to place. It provides valuable summer grazing for traditional pastoralism.

E1.5e Madeirean oromediterranean siliceous dry grassland

Highly distinctive tussocky grassland, rich in endemics, restricted to high mountains in Madeira, where it occurs in crevices and on ledges in silicate volcanics where the soils are kept permanently moist by the very humid climate. Typically occurring in mosaics with heaths and woodlands, the decline of domestic goat grazing has favoured its extension into what were once more accessible situations.

E1.7a Lowland to submontane, dry to mesic Nardus grassland

E1.7 Non-Mediterranean dry acid and neutral closed grassland
Original EUNIS description: Closed, dry or mesophile, perennial grasslands occupying acid soils in Atlantic or sub-Atlantic lowland to montane regions of northern Europe, middle Europe and western Iberia, with Nardus stricta, Festuca filiformis (Festuca tenuifolia), Festuca ovina, Festuca rubra, Agrostis capillaris, Danthonia decumbens, Anthoxanthum odoratum, Deschampsia flexuosa, Poa angustifolia, Galium saxatile, Polygala vulgaris, Viola canina, Meum athamanticum, Arnica montana, Centaurea nigra, Dianthus deltoides, Gentianella campestris, Chamaespartium sagittale, Jasione laevis, Potentilla erecta, Carex pilulifera. Any of the grasses listed can dominate or codominate distinctive facies; Calamagrostis epigejos or Carex arenaria also can invade and dominate some formations.

Usually dominated by the tightly tussocky *Nardus stricta,* this grassland is characteristic of nutrient-poor, acidic soils, sometimes seasonally wet, on siliceous substrates through the entire lowlands and sub-montane zone of temperate Europe, though optimally developed in the cooler and rainier climate of the Atlantic zone. Other grasses may share dominance but the associated flora is generally rather species-poor and related to the type and intensity of grazing.

E1.8 Open Iberian supramediterranean dry acid and neutral grassland

E1.8 Mediterranean dry acid and neutral closed grassland
Original EUNIS description: Perennial grasslands on acid soils of the supra-Mediterranean zone, dominated by e.g. Festuca elegans or Nardus stricta. Mediterranean annual-rich siliceous grassland of siliceous gravelly, sandy or silty, usually shallow, soils that remain cohesive during the dry season.

Dominated by small tussock grasses, forbs and mat-formers, including many endemics, this grassland occurs on shallow skeletal soils, nutrient-poor and

drought-prone, developed over outcrops of siliceous and ultramafic bedrocks at moderate to high altitudes in the western Iberian Peninsula. Traditionally part of pastoral landscapes, grazed mostly by sheep.

E1.9 Non-Mediterranean dry acid and neutral open grassland, including inland dune grassland
Original EUNIS description: Open grassland, often with therophytes, of the nemoral, boreonemoral and submediterranean zones, developed on raw non-calcareous soils, especially on inland dunes and fixed sands.This group of Koelerio-Corynephoeretea alliances replicates the first block of alliances within E1.1 (and E1.7)

E1.9a Oceanic to subcontinental inland sand grassland on dry acid and neutral soils

Moderately open to closed grassland on nutrient-poor sandy soils, mostly acid to neutral though sometimes calcareous, on plains, river terraces and cliffs through the lowlands and sub-montane belts of temperate Europe. Narrow-leaved, tussocky graminoids dominate, associated herbs can be very numerous and more open swards can have rich annual and cryptogam floras. Across the wide range, there is considerable variety among the dominants and companions and the extreme topoclimate can provide a western outpost for steppe elements.

E1.9b Inland sanddrift and dune with siliceous grasslands

Usually sparse grasslands on sand drifts among inland dunes and other open landscapes, mainly in the north central European lowlands, where the nutrient-poor and highly acidic surface is prone to wind erosion and hot droughty summers, forming a highly distinctive 'Atlantic desert' landscape. Soil development is very slow, pioneer moss vegetation succeeded by an open cover of small tussocky grasses, often with rich contingents of lichens on the compacted surface. Military training zones and abandoned lignite areas provide new situations.

E1.A Mediterranean to Atlantic open, dry, acid and neutral grassland

E1.A Mediterranean dry acid and neutral open grassland
Original EUNIS-3 description: Sandy open ground with vernal therophytes, not necessarily grasses, in the Mediterranean region. Open perennial grasslands and pastures on siliceous, usually skeletal, soils of the supra-Mediterranean zone.

Usually ephemeral vegetation related to the yearly cycle of spring rains and summer drought through the western Mediterranean and more fragmentarily into the Atlantic and Continental zones where a high diversity of small annual plants make a brief colourful appearance on bare patches of nutrient-poor, acidic soils. Typically, the habitat occurs as small patches in intimate mosaics with heath and scrub and has provided a valuable supplementary resource for sheep at lambing time.

E1.B Heavy-metal grassland in Western and Central Europe
E1.B Heavy metal grassland
Original EUNIS description: Dry, short grasslands, often rich in lichens and mosses, colonizing western and central European soils with a high content in hea y metals such as zinc and lead, and comprising uniquely adapted species, ecotypes or populations mostly related to, or derived from, otherwise montane, boreomontane or steppic species; heavy metal grasslands of distinctly alpine affinities, though spanning an altitudinal range that extends from the montane level and lowland dealpine stations to the subalpine and alpine levels, are included.

Short open sward with a distinctive metallophyte component, occurring on shallow, skeletal soils over natural rock exposures with heavy metals in Western and Central Europe, on mine spoil or ground contaminated by dust and waters from such sources. Typically occurs locally in other landscapes, colonising slowly and sustained by the extreme environment, though also sometimes dependent on grazing by wild herbivores for maintaining early successional stages which are richer in cryptogams.

E1.F Azorean open dry, acid to neutral grassland

Ungrazed grassland, with mixtures of grasses, herbs and mat-formers, including many endemics which may dominate, confined to the Azores where it is characteristic of exposed or unstable rocky slopes, ledges and landslips with nutrient-poor acid soils. The species composition varies according to the altitude and climate, rock type and stability of the terrain.

E2.1a Mesic permanent pasture of lowlands and mountains
E2.1 Permanent mesotrophic pastures and aftermath-grazed meadows

Original EUNIS description: Regularly grazed mesotrophic pastures of Europe, fertilised and on well-drained soils, with Lolium perenne, Cynosurus cristatus, Poa spp., Festuca spp., Trifolium repens, Leontodon autumnalis, Bellis perennis, Ranunculus repens, Ranunculus acris, Cardamine pratensis; they are most characteristic of the nemoral and boreonemoral zones Europe, but extend to the Cordillera Central, the Apennines and the supra-Mediterranean zone of the Balkan peninsula and Greece.

The most common and widespread kind of traditionally managed pasture on deeper, well-drained mesic soils throughout temperate Europe, with many local types related to regional climate, terrain and pastoral traditions. Typically dominated by mixtures of productive grasses and herbs, it can be species-rich with distinctive scarce and rare plants where low input grazing and dunging are maintained. Often once part of wider pastoral landscapes with distinctive associated meadows, it is now widely transformed by intensive grazing and transitions are commonplace.

E2.2 Low and medium altitude hay meadow
E2.2 Low and medium altitude hay meadows

Original EUNIS description: Mesotrophic hay meadows of low altitudes of Europe, fertilised and well-drained, with Arrhenatherum elatius, Trisetum flavescens, Anthriscus sylvestris, Heracleum sphondylium, Daucus carota, Crepis biennis, Knautia arvensis, Leucanthemum vulgare, Pimpinella major, Trifolium dubium, Geranium pratense; they are most characteristic of the nemoral and boreonemoral zones of Europe, but extend to the Cordillera Central, the Apennines and the supra-Mediterranean zone of the Balkan peninsula and Greece.

The most common and widespread kind of traditionally managed meadow in deeper, well-drained mesic soils throughout the lowlands and foothills of temperate Europe, with many local types differing according to regional climate, terrain and mowing traditions. Typically dominated by mixtures of productive grasses and herbs, it can be very species-rich with distinctive scarce and rare plants where traditional regimes of mowing, grazing and dunging are maintained. Often once part of wider agricultural landscapes with distinctive associated pastures, it is now widely transformed by shifts to silage production and transitions to intensive silage grasslands are commonplace.

E2.3 Mountain hay meadow

E2.3 Mountain hay meadows

Original EUNIS description: Often species-rich hay meadows of the montane and subalpine levels of higher mountains of the nemoral and southern boreal zones.

The typical kind of traditionally-managed meadow on deep, well-drained, mesic soils throughout the mountains of northern and central Europe where there is a short cool growing season. There are many local types differing according to regional climate, terrain and farming traditions but the vegetation is typically dominated by mixtures of productive grasses and herbs, and can be species-rich with distinctive scarce and rare plants where traditional regimes of mowing, grazing and dunging are maintained. Often once part of wider agricultural landscapes with distinctive associated pastures, good examples of the habitat now often survive more fragmentarily and transitions to improved silage grassland are widespread.

E2.4 Iberian summer pasture (vallicares)

E2.4 Iberian summer pastures (vallicares)

Original EUNIS description: Summer pastures of the Iberian peninsula, subject to poor drainage, brief flooding and rapid desiccation with the first heat, composed of perennial and annual grasses, most commonly by Agrostis castellana, Agrostis pourretii (Agrostis salmantica), Gaudinia fragilis, Festuca ampla, Periballia involucrata, Vulpia ciliata, Vulpia myuros, Vulpia bromoides, Holcus setiglumis, Molineriella minuta, Anthoxanthum aristatum, Anthoxanthum ovatum and often with Juncus capitatus and clovers such as Trifolium campestre.

Highly distinctive tall grass pasture and meadow associated with traditional cattle rearing in the lowlands and foothills of western Iberia where a mediterranean or submediterranean climate and the long-established grazing

and occasional mowing regimes sustain a striking contingent of regional plants and association with dehesa. The substrate is sandy or clayey, often subject to temporary flooding with rapid dessication, conditions which affect the pattern of grass dominance.

E3.1 Mediterranean tall humid grassland

Original EUNIS-3 description: Mediterranean humid grasslands of tall grasses and rushes with Scirpus holoschoenus (Holoschoenus vulgaris), Agrostis stolonifera, Agrostis reuteri, Calamagrostis epigejos, Galium debile, Molinia caerulea, Briza minor, Melica cupanii, Cyperus longus, Linum tenue, Trifolium resupinatum, Schoenus nigricans, Peucedanum hispanicum, Carex mairii, Juncus maritimus, Juncus acutus, Asteriscus aquaticus, Hypericum tomentosum, Hypericum tetrapterum, Inula viscosa, Oenanthe pimpinelloides, Oenanthe lachenalii, Eupatorium cannabinum, Prunella vulgaris, Pulicaria dysenterica, Tetragonolobus maritimus, Orchis laxiflora, Dactylorhiza elata, Succisa pratensis, Sonchus maritimus ssp. aquatilis, Silaum silaus, Sanguisorba officinalis, Serratula tinctoria, Genista tinctoria, Cirsium monspessulanum, Cirsium pyrenaicum, Senecio doria, Dorycnium rectum, Erica terminalis, Euphorbia pubescens, Lysimachia ephemerum, widespread in the entire Mediterranean basin, extending, along the coasts of the Black Sea, in particular in dune systems, north to the Dobrogea and the Danube Delta, and, in valleys of the Balkan peninsula, north to the Banat.

E3.1a Mediterranean tall humid inland grassland

Rush- and tall grass-dominated vegetation of seasonally waterlogged soils, mostly acidic, occurring in depressions throughout the Mediterranean basin. Though not dependent on grazing, it can be a valuable source of fodder for cattle and sheep in traditional pastoral systems during summer when other pastures are dried up.

E3.2 Mediterranean short humid grassland

Original EUNIS description: Very short grasslands of impermeable compact soils or marls, wet for a large part of the year, and desiccated in summer, characteristic of the Mediterranean basin, with irradiations north to the Illyrian zone of the northwestern Balkan peninsula, with Deschampsia media, Centaurium pulchellum, Lotus tenuis, Trifolium lappaceum, Prunella hyssopifolia, Plantago maritima ssp. serpentina, Centaurea timbali.

E3.2a Mediterranean short moist grassland of lowlands

Short species-rich grassy sward, traditionally sustained by heavy grazing, on clay soils through the Mediterranean region where there is winter waterlogging and distinctive surface cracking in the droughty summer.

E3.2b Mediterranean short moist grassland of mountains

Closed tussocky grassland of moist ground at high altitudes in the west Mediterranean which, remaining green through the summer, provide valuable grazing for transhumant cattle and sheep.

E3.3 Submediterranean moist meadows

E3.3 Submediterranean humid meadows

Original EUNIS description: Humid meadows rich in clover (Trifolium spp.) of sub- and supramediterranean regions remote from Atlantic influence, in particular, of the Balkan peninsula, of the Apennines and of Mediterranean Anatolia, mostly developed above the lowlands but below the montane level.

Moist meadows of sandy to clayey, mesotrophic to eutrophic soils on riverside terraces and gentle slopes, mainly within the lowlands and sub-montane zone of south-eastern Europe, extending westwards to Central Italy. Winter and spring flooding is common but later in the season the ground may dry up and become locally saline. The species composition reflects regional differences in temperature and rainfall but patterns of mowing and grazing can also affect the species composition.

E3.4 Moist or wet eutrophic and mesotrophic grassland

Original EUNIS description: Wet eutrophic and mesotrophic grasslands and flood meadows of the boreal and nemoral zones, dominated by grasses Poaceae, rushes Juncus spp. or club-rush Scirpus sylvaticus.

E3.4a Moist or wet mesotrophic to eutrophic hay meadow

Meadows of moist, sometimes seasonally flooded, nutrient-rich soils on floodplains and in brook-valleys throughout lowland and submontane Europe. Traditionally cut for hay, though sometimes also light grazed in late summer and autumn, the vegetation is often species-rich with a diverse associated invertebrate fauna attracted by the abundance of flowers. Often once part of wider agricultural landscapes with distinctive associated pastures, good examples of the habitat now often survive more fragmentarily and transitions to improved silage grassland on flood-protected land are widespread.

E3.4b Moist or wet mesotrophic to eutrophic pasture

Pastures of moist to wet, mesotrophic to eutrophic soils, generally inundated during winter and spring, on floodplains, lake shores and ditchsides throughout temperate Europe, sometimes with a brackish influence. Grazing is mostly by cattle which can strongly affect the nutrient status and compaction of the soil and plants tolerant of inundation and trampling dominate here with a paucity of attractive flowers and a poor associated invertebrate fauna.

E3.5 Temperate and boreal moist or wet oligotrophic grassland

E3.5 Moist or wet oligotrophic grassland

Original EUNIS description: Grasslands on wet, nutrient-poor, often peaty soils, of the boreal, nemoral and steppe zones. Includes coarse acid grassland dominated by Molinia caerulea and shorter wet heathy grasslands with Juncus squarrosus, Nardus stricta and Scirpus cespitosus.

Meadows and pastures of less nutrient-rich soils, wet for much of the year, though not inundated by flood-waters and drying out in summer, especially in more Continental regions. The soils may be somewhat acidic to base-rich, sometimes peaty above, and through the lowlands and sub-montane zones of Europe, they have been part of wider landscapes among fens and drier grasslands. Less productive than flood meadows, they are mown just once a year, and towards the west of the range, often just lightly grazed, but they can be species-rich with some characteristic and striking species.

E4.1 Vegetated snow patch
Original EUNIS-3 description: Vegetated areas that retain late-lying snow. Dominants may be mosses, liverworts, macrolichens, graminoids, ferns and small herbs. Snow patches are well developed in boreal and arctic mountains and in subarctic lowlands; they are well represented, though of much smaller extent, above the tree limit in the Alps, Pyrenees, Carpathians and Caucasus. They are found very locally in the Paeonian mountains, Sierra Nevada, Cordillera Central, Monti Sibillini, Abruzzi, Scottish Highlands and Sudeten.

Vegetation on skeletal, sometimes humic, soils developed beneath late-lying snow patches in boreal and arctic mountains and the subarctic lowlands of Europe. Dominated by grasses, sedges, herbs and cryptogams, the species composition depends on regional climate, altitude, bedrock and soil type, and sometimes includes endemics, particular on high south European peaks.

E4.3 Acid alpine and subalpine grassland
EUNIS-3 description: Alpine and subalpine grasslands developed over crystalline rocks and other lime-deficient substrates or on decalcified soils of mountains. On boreal mountains, Carex bigelowii and Juncus trifidus often dominate. The acid alpine grasslands of central Europe are more mixed, with Armeria alpina, Armeria alliacea (Armeria montana), Euphrasia minima, Gentiana alpina, Geum montanum, Juncus trifidus, Lychnis alpina, Pedicularis pyrenaica, Phyteuma hemisphaericum, Pulsatilla alpina ssp. sulphurea, Ranunculus pyrenaeus, Sempervivum montanum, Botrychium lunaria.

E4.3a Boreal and arctic acidophilous alpine grassland

Boreal and arctic acidophilous alpine grasslands, dominated by low graminoids and herbs, characteristic of shallow mostly base-poor soils with thick late snow-lie, occurring through the high mountains of Fennoscandia, Iceland and Scotland.

E4.3b Temperate acidophilous alpine grassland

Grassland and dwarf chamaephyte vegetation on skeletal and shallow soils over predominantly siliceous bedrocks in the alpine belt throughout the temperate mountains of Europe, typical of the highest summits and ridges, often very exposed to strong winds and largely blown clear of snow in the winter.

E4.4 Calcareous alpine and subalpine grassland

Original EUNIS description: Alpine and subalpine grasslands of base-rich soils of the high mountains of the nemoral, submediterranean and supramediterranean zones. Characteristic species of the Alps include Dryas octopetala, Gentiana nivalis, Gentiana campestris, Alchemilla hoppeana, Alchemilla conjuncta, Alchemilla flabellata, Anthyllis vulneraria, Astragalus alpinus, Aster alpinus, Draba aizoides, Globularia nudicaulis, Helianthemum nummularium ssp. grandiflorum, Helianthemum oelandicum ssp. alpestre, Pulsatilla alpina ssp. alpina, Phyteuma orbiculare, Astrantia major and Polygala alpestris.

E4.4a Arctic-alpine calcareous grassland

Grasslands on shallow, highly calcareous soils on limestone or dolomite slopes and ridges in the alpine or subalpine belts of the high mountains of the nemoral zone, being best developed in the Alps, but occurring also in the Carpathians and Pyrenees, with small fragmentary stands also in the Sudetes and in Scotland. Grasses and sedges dominate, along with numerous small herbs, the cover varying from sparse to complete according to the soil depth.

E4.4b Alpine and subalpine calcareous grassland of the Balkans and Apennines

Grass-dominated vegetation of base-rich soilsd in the high mountains in the Balkans and Appenines including both primary vegetation above the tree-line but also secondary grasslands maintained by grazing at lower altitudes.

E5.2 Thermophile woodland fringes
Original EUNIS-3 description: Woodland edge (seam) vegetation of the nemoral, boreo-nemoral and submediterranean zones, composed of warmth-requiring drought-resistant herbaceous perennials and shrubs, which form a belt between dry or mesophile grasslands and the shrubby forest mantle, on the sunny side, where the nutrient supply is limited, or, sometimes, pioneering the woodland colonization into the grasslands.

E5.2a Thermophilous woodland fringe of base-rich soils

Fringe communities on neutral to base-rich, only moderately nutrient-rich, soils in the transition zone between forests and open habitats or in similar situations alongside cliffs and on roadsides, occuring across large parts of lowland north-west Europe, but also extending into more continental regions where they fringe more open thermophilous forests, and into cooler montane levels to the south and south-east. Typically comprising half-shade plants, other species of neighbouring habitats can also find a place and, in calcareous landscapes, the vegetation can be more species rich, harbouring a lot of rare and/or endangered species. vegetation. Dependent on grazing and/or mowing for preventing succession.

E5.2b Thermophilous woodland fringe of acidic soils

Fringe vegetation of semi-shaded forest margins and similar situations on acidic, nutrient-poor soils in the cooler Atlantic and Subatlantic regions of Europe, becoming rare and more species-poor further east. It is generally dominated by bulky grasses and tall herbs, rather species-poor, and ultimately dependent on extensive grazing or occasional mowing to prevent encroachment by shrubs and trees that threaten denser shade.

E5.2c Macaronesian thermophilous woodland fringes

Perennial herbaceous communities of the warm half-shade of woodland fringes and clearings of Macaronesian laurel-forests in the Canary Islands, Azores and Madeira. It is found as sunnier micro-sites in or along humid woodland edges but is dependent on forest litterfall producing somewhat mesotrophic conditions.

E5.3 Pteridium aquilinum stand
E5.3 Pteridium aquilinum fields
Original EUNIS description: Atlantic, sub-Atlantic, sub-Mediterranean and Macaronesian communities dominated by the large fern Pteridium aquilinum, extensive and often closed.
Dense species-poor stands of Pteridium, naturally a lowland European forest fern which, when not held in check by dense shade and lacking the traditional management of cutting and trampling by cattle, readily establishes itself as a dominant, spreading vigorously by rhizome extension and producing deep litter, a feature now of many pastoral landscapes less traditionally managed than before.

E5.4 Moist or wet tall-herb and fern fringe of the lowlands
E5.4 Moist or wet tall-herb and fern fringes and meadows
EUNIS-3 description: Tall-herb and fern vegetation of the nemoral and boreal zones, including stands of tall herbs on hills and mountains below the montane level. Tall herbs are often dominant along watercourses, in wet meadows and in shade at the edge of woodlands.

Tall-herb and fern-dominated communities of moist, sometimes flooded, nutrient-rich soils in the lowlands and lower mountain areas of Europe, up to the subalpine zone, through the nemoral, boreal and submediterranean regions. The relatively species-rich vegetation may be found in river floodplains, along smaller watercourses, in the shade at the edge of woodlands, often as narrow strips, and, as secondary vegetation after the abandonment of pastures and especially meadows. The species composition is quite diverse, depending on the altitude, geographic distribution and location in the landscape.

E5.5 Subalpine moist or wet tall-herb and fern fringe
E5.5 Subalpine moist or wet tall-herb and fern stands
Original EUNIS description: Luxuriant tall herb formations of deep, humid soils in the montane to alpine, but mostly subalpine, levels of the higher mountains, with Cicerbita alpina, Cicerbita alpina plumieri, Cirsium helenioides, Cirsium spinosissimum, Cirsium flavispina, Geranium sylvaticum,

Polygonatum verticillatum, Ranunculus platanifolius, Aconitum vulparia, Aconitum napellus, Aconitum nevadense, Adenostyles alliariae, Senecio elodes, Veratrum album, Trollius europaeus, Peucedanum ostruthium, Doronicum austriacum, Pedicularis foliosa, Eryngium alpinum, Leuzea rhapontica (Centaurea rhapontica), Valeriana pyrenaica, Tozzia alpina.

Tall forb and fern vegetation of moist, fertile soils in relatively cool and humid situations through high levels of the mountain ranges of Europe, having its optimum in the subalpine zone but also occurring in the arctic lowlands of Scandinavia. Typically found as strips along streams and on the edges of forests, in the shelter of large rocks, on mountain ledges and under scrub, sometimes also fringing snowbeds where it benefits from protection from winter frosts. The vegetation is often very rich in species and hosts many local and regional endemics, as well as widespread montane plants. Vulnerable to grazing by wild herbivores and stock, but often protected by its remoteness.

E6.1 Mediterranean inland salt steppe

E6.1 Mediterranean inland salt steppes
Original EUNIS description: Vegetated saline land of Mediterranean coastal regions and of the fringes of semiarid salt basins that lack drainage to the sea; often dominated by perennial, rosette-forming Limonium spp. or esparto grass, Lygeum spartum. The soils are temporarily permeated (though not inundated) by saline water and subject to extreme summer drying, with formation of salt efflorescences.

Halophyte vegetation of inland situations in the Mediterranean region where the soils of flats or gentle hollows are permeated by waters laden with soluble salts from underlying substrates, and are then subject to extreme summer drought, with surface efflorescence of crystalline deposits. The vegetation can be rich in endemics, but the particular species composition depends on the regional climate and local soil conditions and there is often a distinctive seasonal pattern of growth and zonation around the hollows. In some regions, the vegetation has provided valuable grazing for sheep and goats in summer drought.

E6.2 Continental inland salt steppe

E6.2 Continental inland salt steppes
Original EUNIS description: Salt steppes and their associated salt-tolerant herbaceous communities outside the Mediterranean zone. In Europe they are found in the substeppe and steppe zones eastwards from the Hungarian Plain.

Salt steppe of the Pannonian biogeographic region, characteristic of solonetz soils, saturated, even shallow flooded, by soluble carbonates in spring, then drying in summer with surface cracking. According to variations in salinity, slope and erosion by spring floods, the vegetation is a complex mosaic of grasslands and more halophytic herb communities, rich in endemic species and plant communities. Traditionally part of the pastoral landscape of older breeds of cattle.

E6.3 Temperate inland saltmarsh

D6.1 Inland salt-marshes
Original EUNIS description: Salt meadows and swards of Salicornia and other Chenopodiaceae of inland salt basins of the nemoral zone. Inland saltmarshes of middle Europe are remarkable, extremely threatened communities occurring in a few isolated stations of Saxony and Lower Saxony, Schleswig-Holstein, Thuringia, Hesse, Lorraine, Auvergne, the Midlands and southeastern Poland (lower Nida valley).

Inland salt marsh and meadow of temperate and continental regions, characteristic of situations where fossil salt lies close to the surface or where relict sea water is present, resulting in brackish or saline ground and surface water. In more continental regions inland salt pans are more common, where the habitat is found in depressions within a matrix of salt steppes and as sub-halophytic meadows. Elsewhere in Europe, the habitat can be found in association with a variety of salty bedrocks and also on abandoned salt workings. The species composition is very varied according the regional climate and particular site conditions.

E7.1 Temperate wooded pasture and meadow
E7.1 Atlantic parkland
Original EUNIS description: Extensive surfaces of Atlantic regions of nemoral Europe occupied by grassland dotted with widely planted trees, characteristic of the British Isles, where they are usually enclosed, used for cattle or deer grazing.

A very diverse landscape-scale habitat occurring across the nemoral zone of Europe where different traditions of grazing, mowing and silviculture have together created distinctive associations of trees growing among pastures and meadows. Such wood-pastures, wooded steppes, park meadows, grazed orchards, parklands and open hunting forests, variously managed for stock rearing, hay production, coppice and timber products, represent highly distinctive social and economic histories and can express great cultural traditions. Species-rich types occur, including contingents of epiphytic plants growing on veteran trees but, even where the components are more commonplace, the combinations of floristic and structural elements are striking.

E7.2 Hemiboreal and boreal wooded pasture and meadow
E7.2 Sub-continental parkland
Original EUNIS description: Grassland dotted with widely planted trees, to the east of the Atlantic zone of nemoral Europe.

Open wooded landscapes of the lowlands, foothills and mountains of the boreal zone, traditionally managed for grazing, hay-making and woodland products, mainly by pollarding. Diverse very open canopies of broadleaved and coniferous trees, including veterans sometimes with rich epiphytic cryptogam floras, often with few or no associated shrubs, occur scattered over pasture and meadow vegetation. Long traditions of complex interactions and cultural associations make these landscapes both dynamic and distinctive.

E7.3 Mediterranean wooded pasture and meadow

E7.3 Dehesa

Original EUNIS description: A characteristic landscape of the southwestern quadrant of the Iberian peninsula in which crops, pasture land or Mediterranean scrub, in juxtaposition or rotation, are shaded by a fairly closed to very open canopy of native oaks, Quercus suber, Quercus rotundifolia, Quercus pyrenaica, Quercus faginea. It is an important habitat of raptors, including the threatened Iberian endemic eagle Aquila adalberti, of the crane Grus grus, of large insects and their predators and of the endangered Iberian lynx Lynx pardinus.

Open wooded landscapes created and maintained through combinations of traditional grazing, hay-making and tree management in the Mediterranean region. Variations in the local climate, topography and interventions, and the accumulation of long cultural traditions of use have resulted in a variety of highly distinctive types such as the dehesas of Spain and montados of Portugal. Typically the tree canopy is of evergreen broadleaved trees, variously with veterans, pollards or coppice, often with elements of sclerophyllous scrub beneath, and perennial and annual grasses and herbs in the field layer. In some traditions, there can even be small arable areas.

The Habitat descriptions from the European Red List of Habitats which were used as the basis of these EUNIS Habitat descriptions were written/edited by Capelo, J., Čarni, A., Chytrý, M., Dimopoulos, P., Fotiadis, G., Janssen, J., Loidi, J., Mäkelä, K., Molnar, Z., Rodwell, J., Schaminée, J.H.J., Šibik, J., Tsonev, R., Varga, A. and Vrahnakis, M.

Appendix F: List of data providers

Country/Region	Custodian	Deputy custodian	Database GIVD
Albania	Michele De Sanctis	Giuliano Fanelli	Vegetation Database of Albania
Austria	Wolfgang Willner		Austrian Vegetation Database
Balkan	Kiril Vassilev		Balkan Dry Grasslands Database
	Kiril Vassilev	Hristo Pedashenko	Balkan Vegetation Database
Baltic region	Jürgen Dengler	Łukasz Kozub	Nordic-Baltic Grassland Vegetation Database (NBGVD)
Basque Country	Idoia Biurrun	Itziar García-Mijangos	Vegetation-Plot Database of the University of the Basque Country (BIOVEG)
Belarus	Flavia Landucci		WetVegEurope
Belgium	Els De Bie		INBOVEG
	Els De Bie		INBOVEG
Bulgaria	Iva Apostolova	Desislava Sopotlieva	Bulgarian Vegetation Database
Caucasus	Veronika Kalníková	Helmut Kudrnovsky	
	Vladimir Onipchenko	Alexei Egorov	
Croatia	Zvjezdana Stančić		Phytosociological Database of Non-Forest Vegetation in Croatia
	Željko Škvorc	Daniel Krstonošić	Croatian Vegetation Database
Czech Republic	Milan Chytrý	Dana Michalcová	Czech National Phytosociological Database
Denmark	Jesper Erenskjold Moeslund	Rasmus Ejrnæs	National Vegetation Database of Denmark
Estonia	Flavia Landucci		WetVegEurope
Europe	Corrado Marcenò	Borja Jiménez-Alfaro	Mediterranean Ammophiletea database
	Risto Virtanen		Vegetation Database of Eurasian Tundra
	John Janssen		European Coastal Vegetation Database
	Tomáš Peterka	Martin Jiroušek	European Mire Vegetation Database
	Tomáš	Martin	European Mire Vegetation

	Peterka	Jiroušek	Database
	Veronika Kalníková	Helmut Kudrnovsky	
	Andraž Čarni		SE Europe forest database
	Flavia Landucci		WetVegEurope
France	Jean-Claude Gegout	Ingrid Seynave	
	Henry Brisse	Patrice de Ruffray	SOPHY
Germany	Ute Jandt		
	Ute Jandt	Gunnar Seidler	German Vegetation Reference Database (GVRD)
	Jörg Ewald	Martin Kleikamp	VegetWeb Germany
	Florian Jansen	Christian Berg	VegMV
Greece	Panayotis Dimopoulos	Ioannis Tsiripidis	Hellenic Natura 2000 Vegetation Database (HelNatVeg)
	Erwin Bergmeier		KRITI
Hungary	János Csiky	Zoltán Botta-Dukát	CoenoDat Hungarian Phytosociological Database
Ireland	Úna FitzPatrick	Lynda Weekes	Irish Vegetation Database
Italy	Laura Casella	Pierangela Angelini	Italian National Vegetation Database (BVN/ISPRA)
	Roberto Venanzoni	Flavia Landucci	VegItaly
	Angela Stanisci	Alberto Evangelista	VIOLA
	Emiliano Agrillo	Fabio Attorre	Vegetation Plot Database – Sapienza
Latvia	Solvita Rūsiņa		Semi-natural Grassland Vegetation Database of Latvia
Lithuania	Valerius Rašomavičius	Domas Uogintas	Lithuanian vegetation Database
Macedonia	Renata Ćušterevska		Vegetation Database of the Republic of Macedonia
Netherlands	Joop H.J. Schaminée	Stephan Hennekens	Dutch National Vegetation Database
Poland	Zygmunt Kącki	Grzegorz Swacha	Polish Vegetation Database
Portugal	Jan Jansen		
Romania	Eszter Ruprecht	Kiril Vassilev	Romanian Grassland Database
	Adrian Indreica	Pavel Dan Turtureanu	Romanian Forest Database
	Flavia		WetVegEurope

	Landucci		
Russia	Sergey Yamalov	Mariya Lebedeva	Database of South Ural Order Arrhenatheretalia (merged with 00-RU-006)
	Thomas Becker		
	Tatiana Lysenko		Vegetation Database of the Volga and the Ural Rivers Basins
	Valentin Golub	Viktoria Bondareva	Lower Volga Valley Phytosociological Database
Scandinavia	Jonathan Lenoir	Jens-Christian Svenning	The Nordic Vegetation Database
	Jonathan Lenoir	Jens-Christian Svenning	The Nordic Vegetation Database
Serbia	Svetlana Aćić	Zora Dajić Stevanović	Vegetation Database Grassland Vegetation of Serbia
	Mirjana Krstivojević Ćuk		Database of Forest Vegetation in Republic of Serbia
	Flavia Landucci		WetVegEurope
Slovakia	Milan Valachovič	Jozef Šibík	Slovak Vegetation Database
Slovenia	Urban Šilc		Vegetation Database of Slovenia
Spain	Xavier Font		Iberian and Macaronesian Vegetation Information System (SIVIM)
	Xavier Font		Iberian and Macaronesian Vegetation Information System (SIVIM)
	Xavier Font		Iberian and Macaronesian Vegetation Information System (SIVIM)
	Rosario G Gavilán	Xavier Font	Iberian and Macaronesian Vegetation Information System (SIVIM)
	Maria Pilar Rodríguez-Rojo	Xavier Font	Iberian and Macaronesian Vegetation Information System (SIVIM)
	Borja Jiménez-Alfaro	Xavier Font	Iberian and Macaronesian Vegetation Information System (SIVIM)
	Rosario G Gavilán	Xavier Font	Iberian and Macaronesian Vegetation Information System (SIVIM)
	Aaron Pérez-Haase	Xavier Font	Iberian and Macaronesian Vegetation Information System (SIVIM)

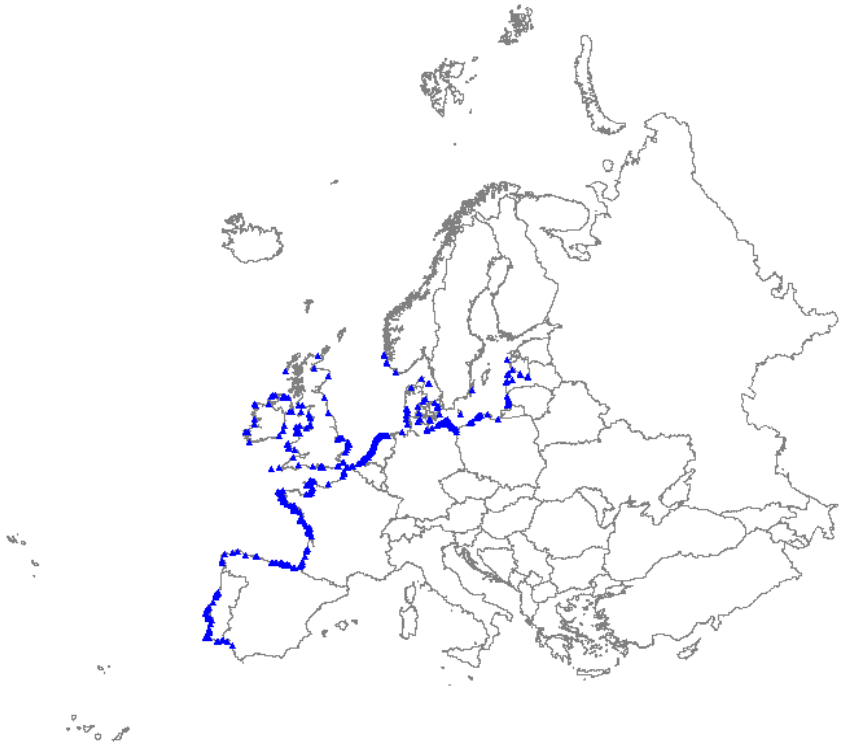
Switzerland	Thomas Wohlgemuth		Swiss Forest Vegetation Database
Tatarstan	Vadim Prokhorov		Vegetation Database of Tatarstan
Turkey	Deniz Işık Gürsoy	Didem Ambarlı	Vegetation Database of the Grassland Communities in Anatolia
	Emin Uğurlu		Vegetation Database of Oak Communities in Turkey
Ukraine	Viktor Onyshchenko	Vitaliy Kolomiychuk	Vegetation Database of Ukraine and Adjacent Parts of Russia
	Anna Kuzemko	Yulia Vashenyak	Ukrainian Grassland Database
	Tetiana Dziuba	Dmytro Dubyna	Halophytic and coastal vegetation database of Ukraine
	Milan Chytrý Flavia Landucci		WetVegEurope
	Flavia Landucci		WetVegEurope
United Kingdom	John S. Rodwell		UK National Vegetation Classification Database
	Irina Tatarenko		

Appendix G: Maps of distribution of phytosociological relevés of the revised EUNIS grassland habitat types

Code	Name	# of plots
B1.4a	Atlantic and Baltic coastal dune grassland (grey dune)	3550
B1.4b	Mediterranean and Macaronesian coastal dune grassland (grey dune)	5241
B1.4c	Black Sea coastal dune grassland (grey dune)	547
E1.1a	Pannonian and Pontic sandy steppe	790
E1.1b	Cryptogam- and annual-dominated vegetation on siliceous rock outcrops	1180
E1.1d	Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops	1922
E1.1e	Perennial rocky grassland of the Italian Peninsula	422
E1.1f	Continental dry rocky steppic grassland and dwarf scrub on chalk outcrops	169
E1.1g	Perennial rocky grassland of Central Europe and the Carpathians	1623
E1.1h	Heavy-metal dry grassland of the Balkans	86
E1.1i	Perennial rocky calcareous grassland of subatlantic-submediterranean Europe	2179
E1.1j	Dry steppic, submediterranean pasture of South-Eastern Europe	337
E1.2a	Semi-dry perennial calcareous grassland	41008
E1.2b	Continental dry steppe	5107
E1.3a	Mediterranean closely grazed dry grassland	522
E1.3b	Mediterranean tall perennial dry grassland	1000
E1.3c	Mediterranean annual-rich dry grassland	930
E1.5a	Iberian oromediterranean siliceous dry grassland	676
E1.5b	berian oromediterranean basiphilous dry grassland	902
E1.5c	Cyrno-Sardean-oromediterranean siliceous dry grassland	22
E1.5d	Greek and Anatolian oromediterranean siliceous dry grassland	106
E1.5e	Madeiran oromediterranean siliceous dry grassland	10
E1.7	Lowland to submontane, dry to mesic Nardus grassland	2014
E1.8	Open Iberian supra-mediterranean dry acid and neutral grassland	245
E1.9a	Oceanic to subcontinental inland sand grassland on dry acid and neutral soils	4346
E1.9b	Inland sanddrift and dune with siliceous grassland	2286
E1.A	Mediterranean to Atlantic open, dry, acid and neutral grassland	2066
E1.B	Heavy-metal grassland in Western and Central Europe	133

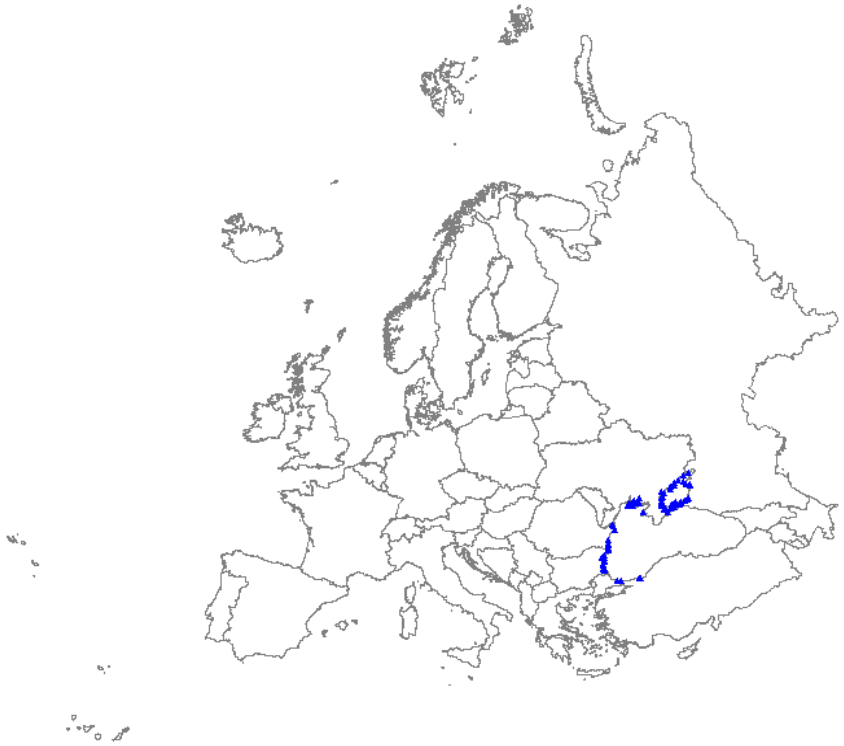
E1.F	Azorean open dry, acid to neutral grassland	4
E2.1	Mesic permanent pasture of lowlands and mountains	30390
E2.2	Low and medium altitude hay meadow	60857
E2.3	Mountain hay meadow	2146
E2.4	Iberian summer pasture (vallicar)	46
E3.1a	Mediterranean tall humid inland grassland	713
E3.2a	Mediterranean short moist grassland of lowlands	144
E3.2b	Mediterranean short moist grassland of mountains	1152
E3.3	Submediterranean moist meadow	1096
E3.4a	Moist or wet mesotrophic to eutrophic hay meadow	22215
E3.4b	Moist or wet mesotrophic to eutrophic pasture	11179
E3.5	Temperate and boreal moist or wet oligotrophic grassland	7401
E4.1	Vegetated snow-patch	1339
E4.3a	Boreal and arctic acidophilous alpine grassland	18
E4.3b	Temperate acidophilous alpine grassland	8422
E4.4a	Arctic-alpine calcareous grassland	3329
E4.4b	Alpine and subalpine calcareous grassland of the Balkan and Apennines	531
E5.2a	Thermophilous woodland fringe of base-rich soils	845
E5.2b	Thermophilous woodland fringe of acidic soils	134
E5.2c	Macaronesian thermophilous woodland fringe	10
E5.4	Lowland moist or wet tall-herb and fern fringe	11159
E5.5	Subalpine moist or wet tall-herb and fern fringe	788
E6.1	Mediterranean inland salt steppe	640
E6.2	Continental inland salt steppe	1242
E6.3	Temperate inland salt marsh	982

B1.4a - Atlantic and Baltic coastal dune grassland (grey dune)

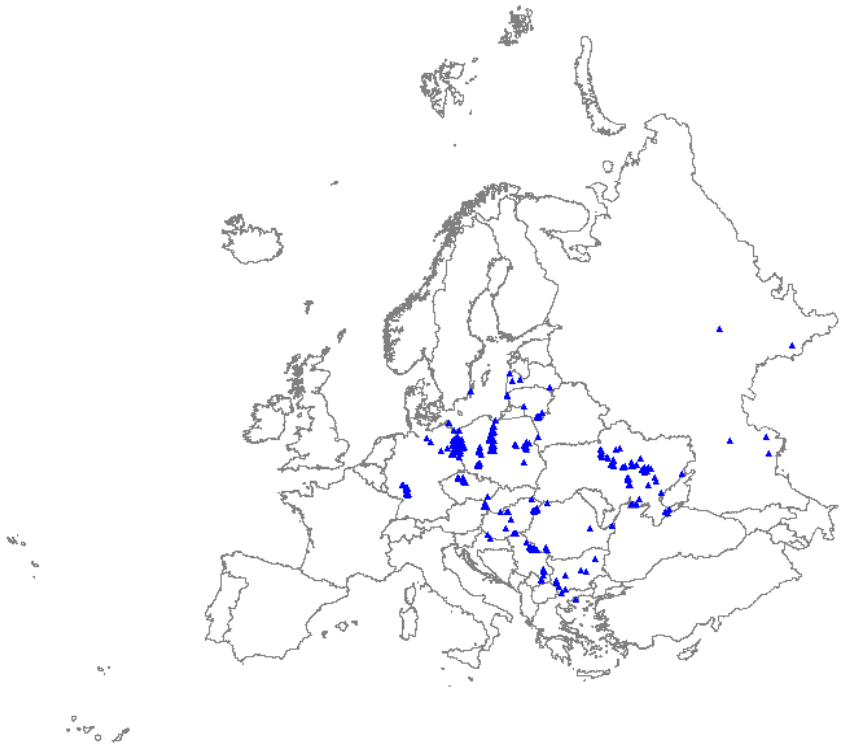


B1.4b - Mediterranean and Macaronesian coastal dune grassland (grey dune)

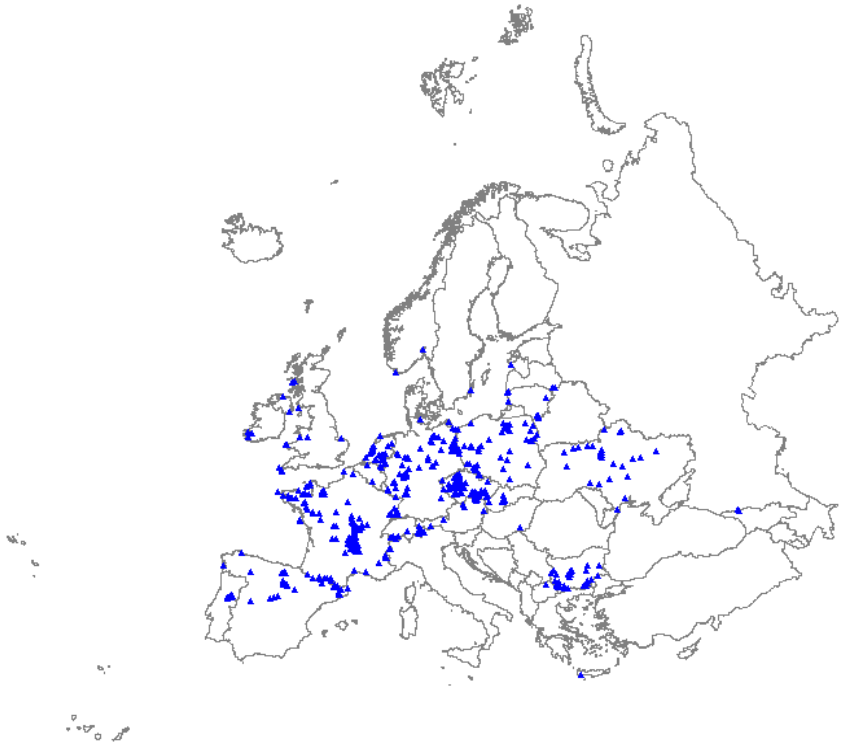
B1.4c - Black Sea coastal dune grassland (grey dune)



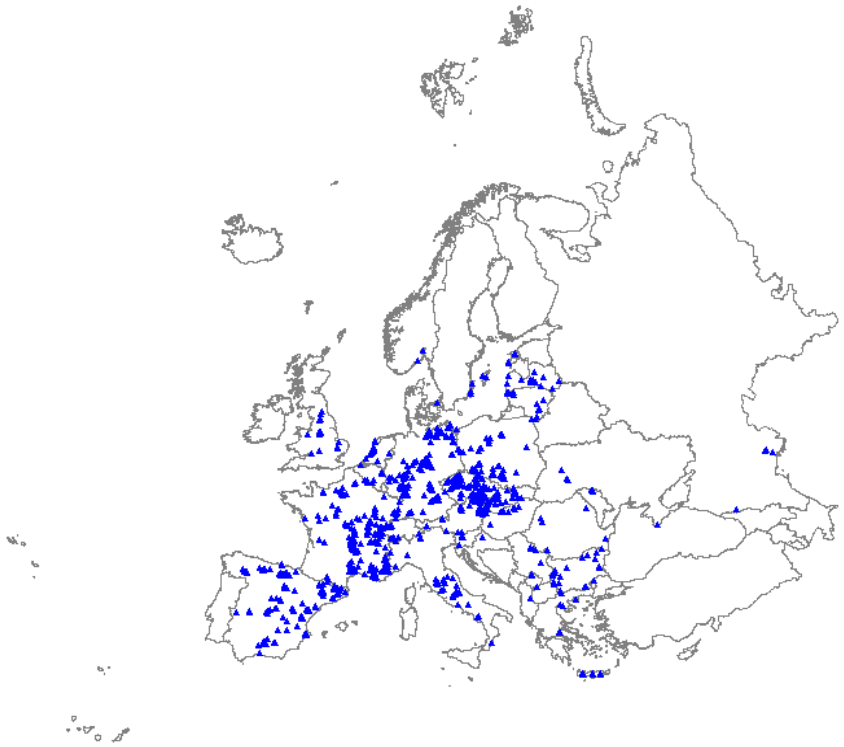
E1.1a - Pannonian and Pontic sandy steppe



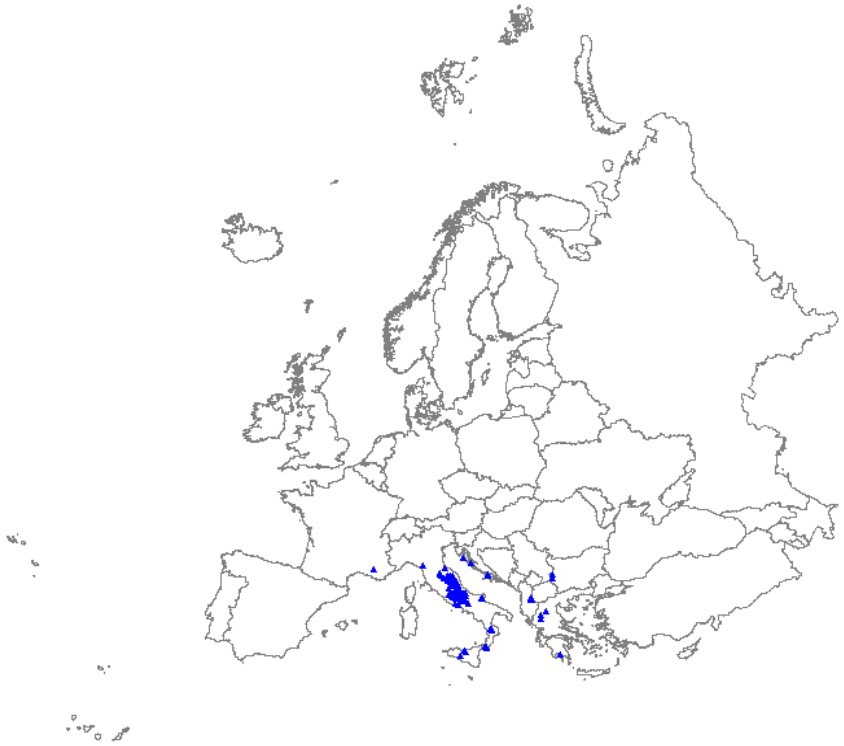
E1.1b - Cryptogam- and annual-dominated vegetation on siliceous rock outcrops



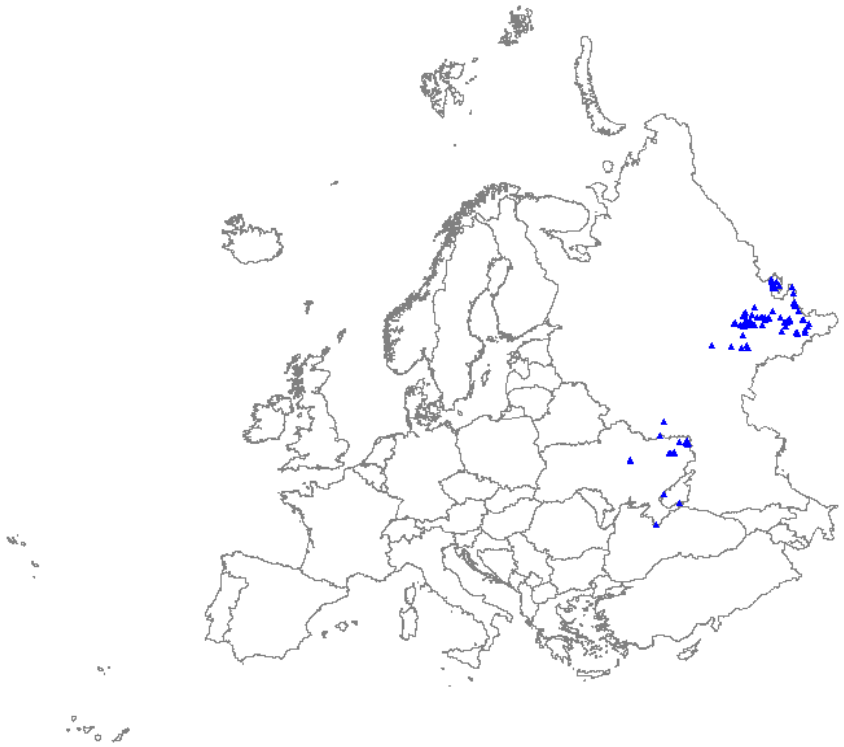
E1.1d - Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops



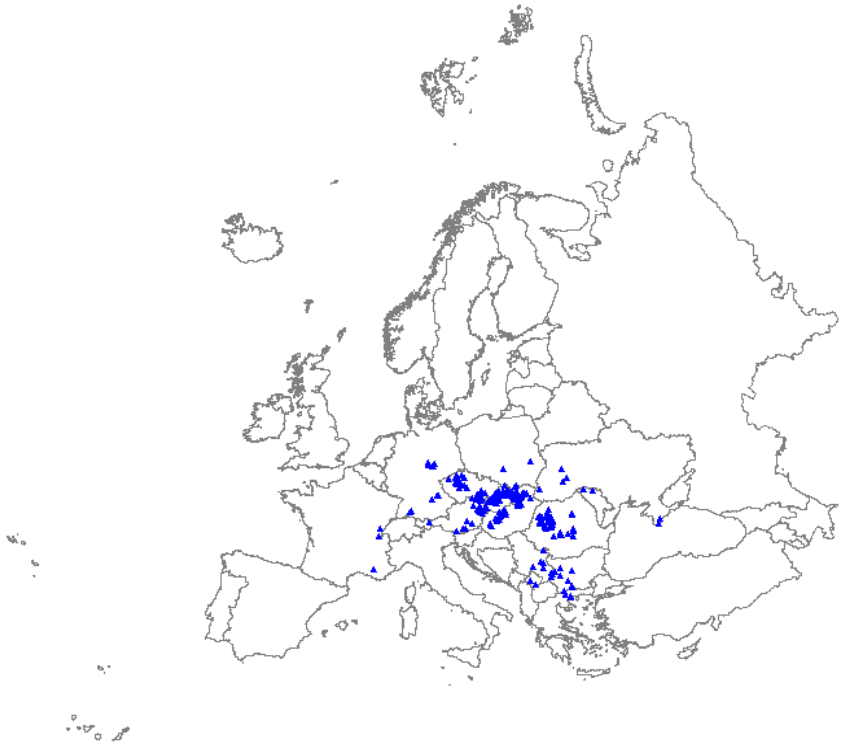
E1.1e - Perennial rocky grassland of the Italian Peninsula



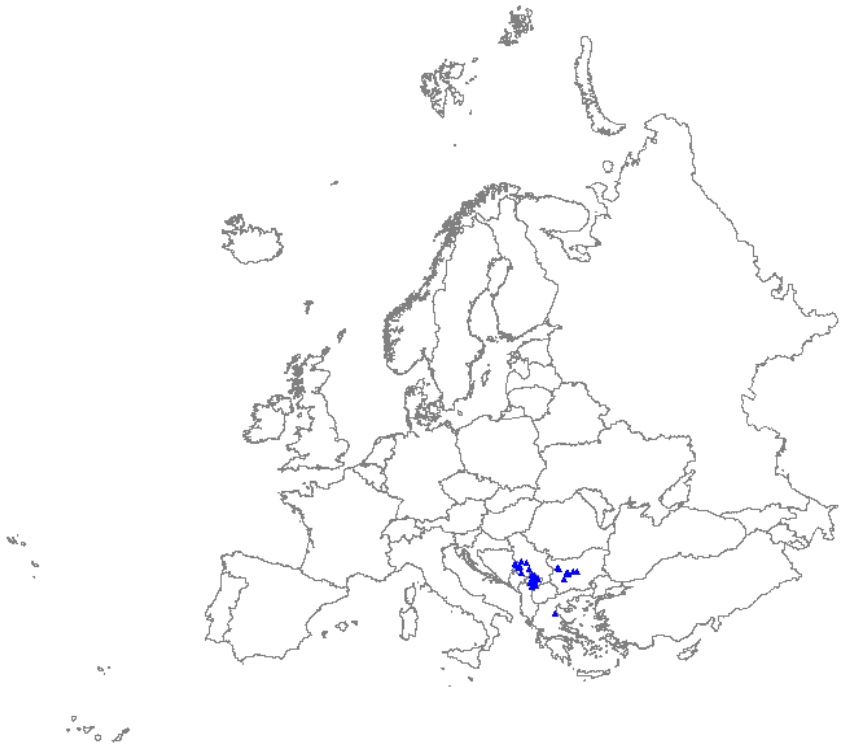
E1.1f - Continental dry rocky steppic grassland and dwarf scrub on chalk outcrops



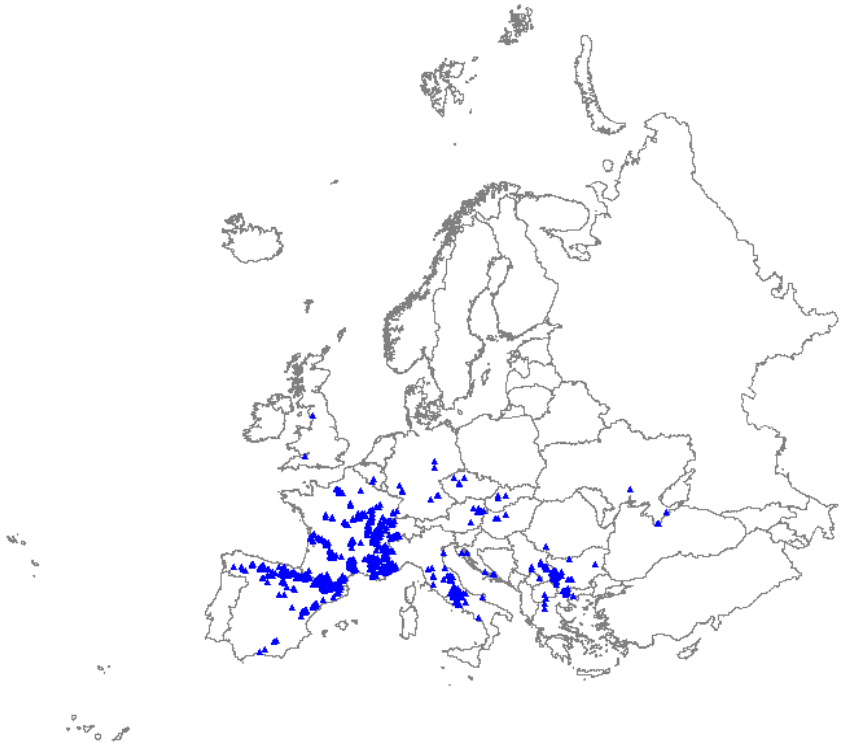
E1.1g - Perennial rocky grassland of Central Europe and the Carpathians



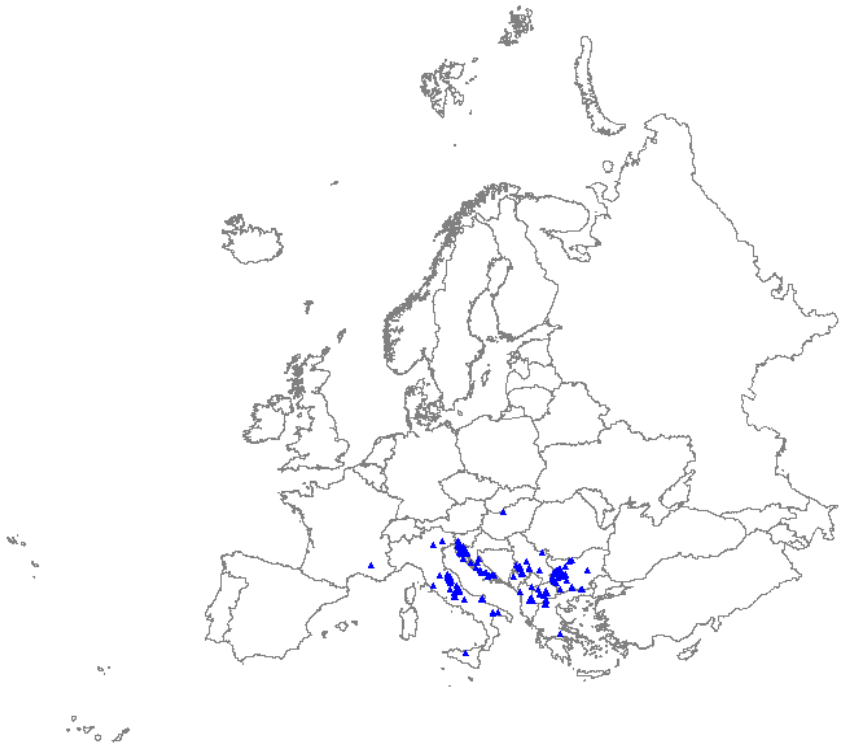
E1.1h - Heavy-metal dry grassland of the Balkans



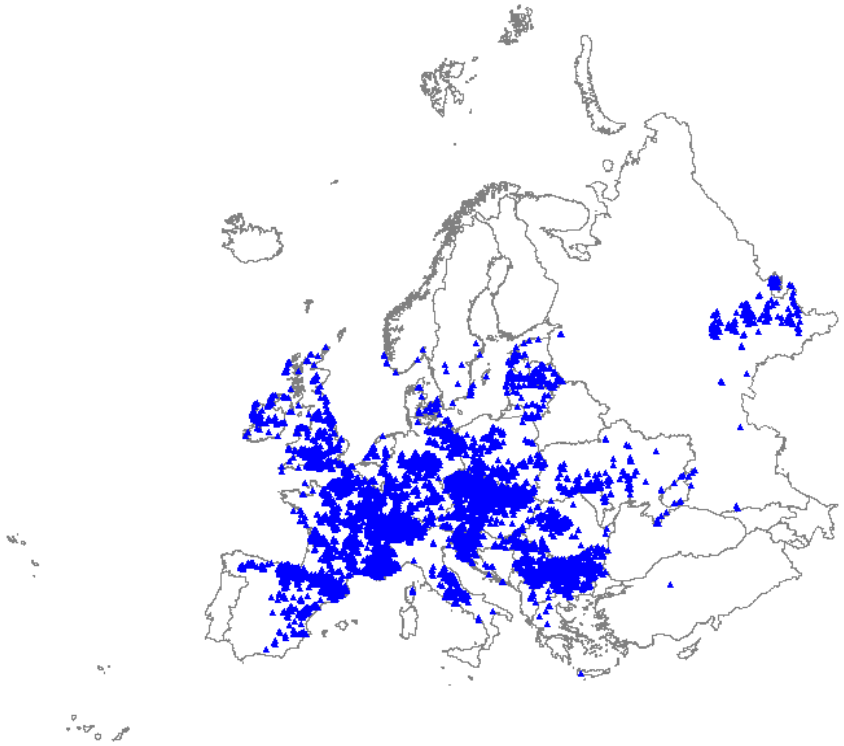
E1.1i - Perennial rocky calcareous grassland of subatlantic-submediterranean Europe



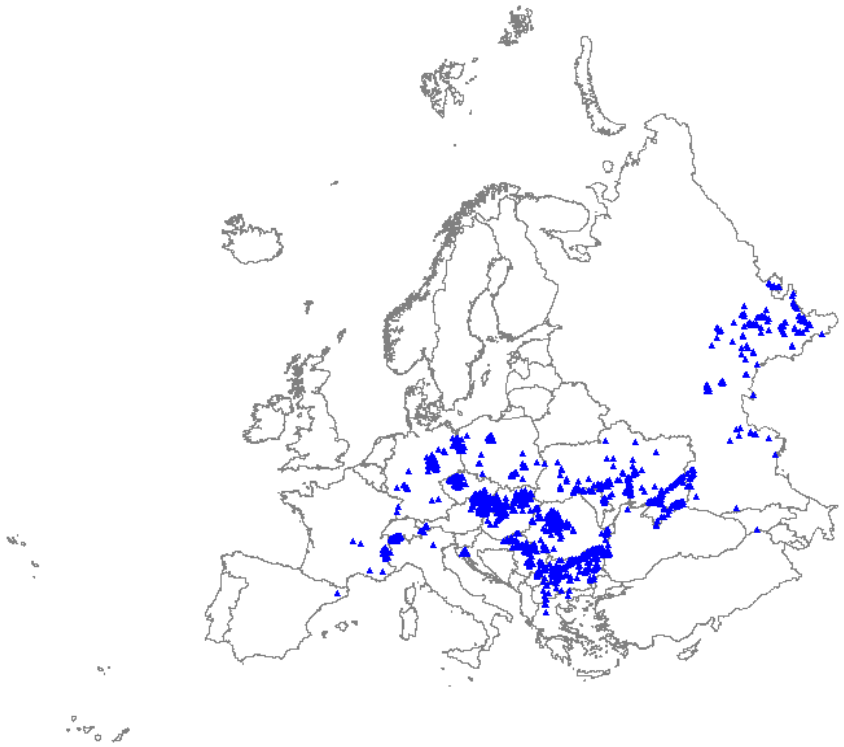
E1.1j - Dry steppic, submediterranean pasture of South-Eastern Europe



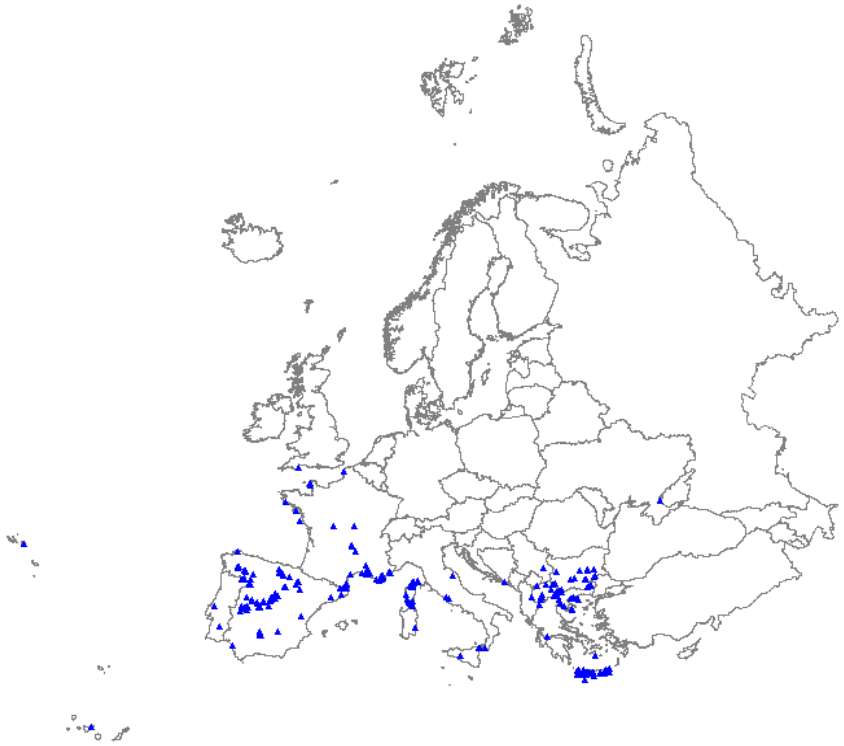
E1.2a - Semi-dry perennial calcareous grassland



E1.2b - Continental dry steppe

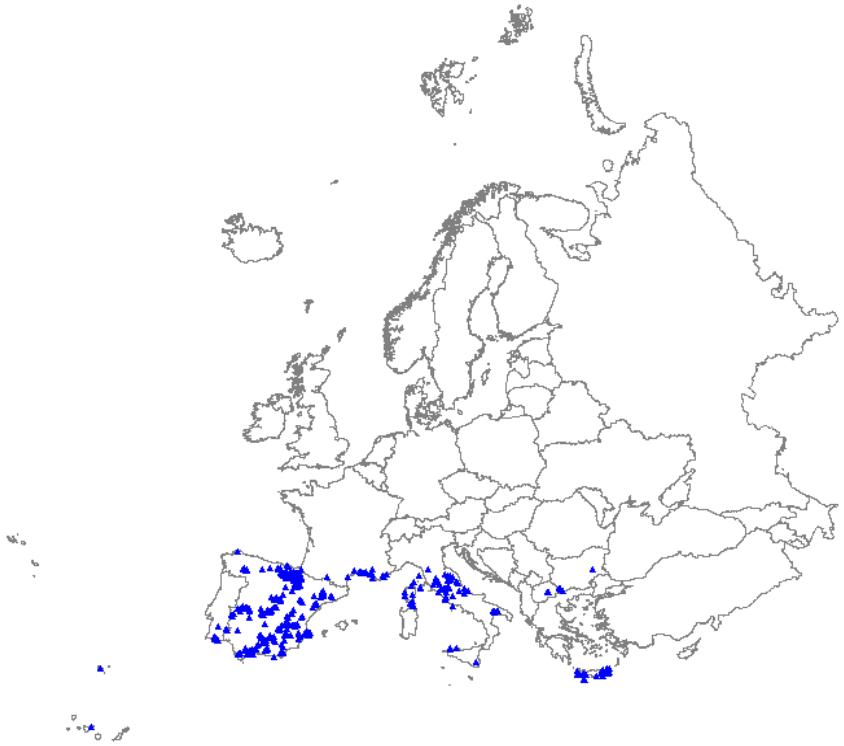


E1.3a - Mediterranean closely grazed dry grassland

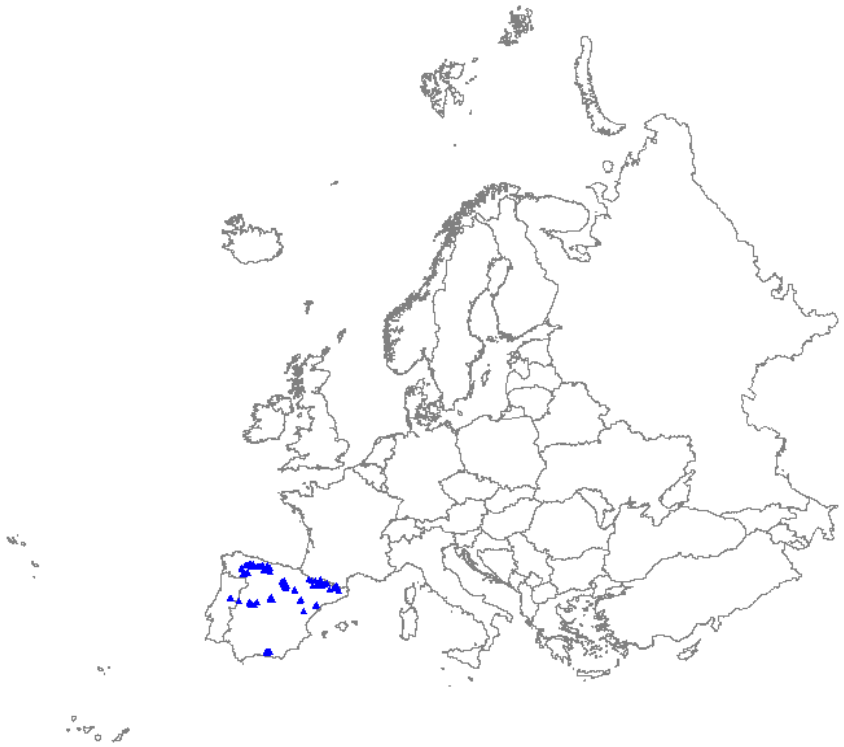


E1.3b - Mediterranean tall perennial dry grassland

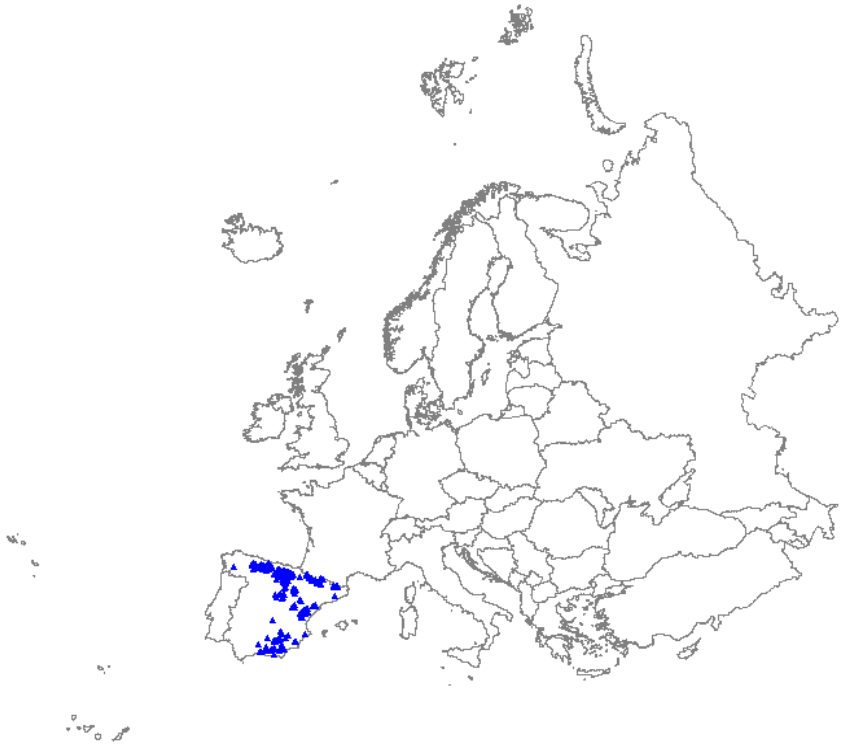
E1.3c - Mediterranean annual-rich dry grassland



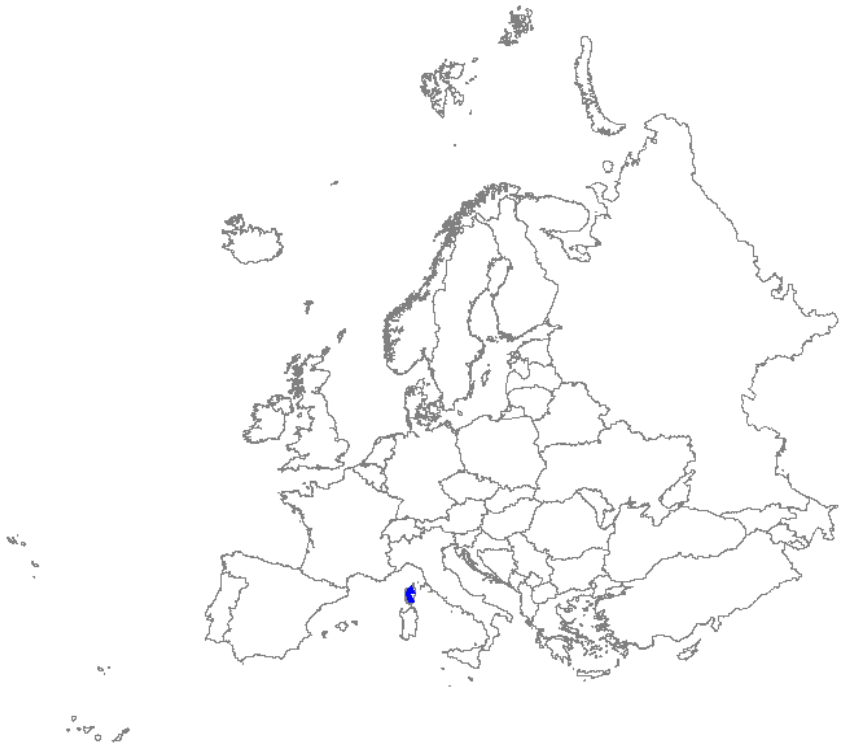
E1.5a - Iberian oromediterranean siliceous dry grassland



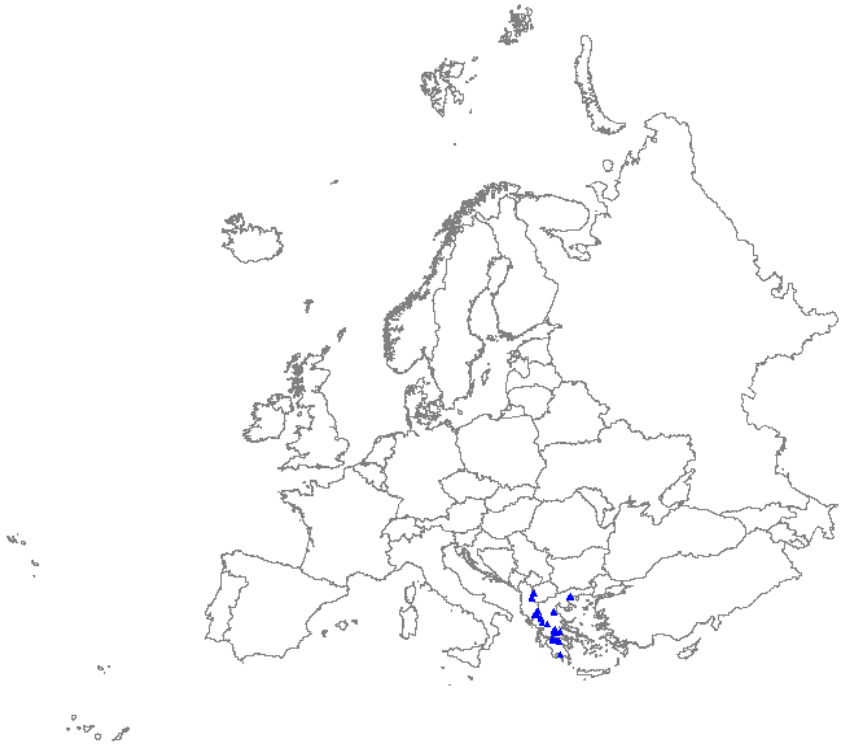
E1.5b - Iberian oromediterranean basiphilous dry grassland



E1.5c - Cyrno-Sardean-oromediterranean siliceous dry grassland

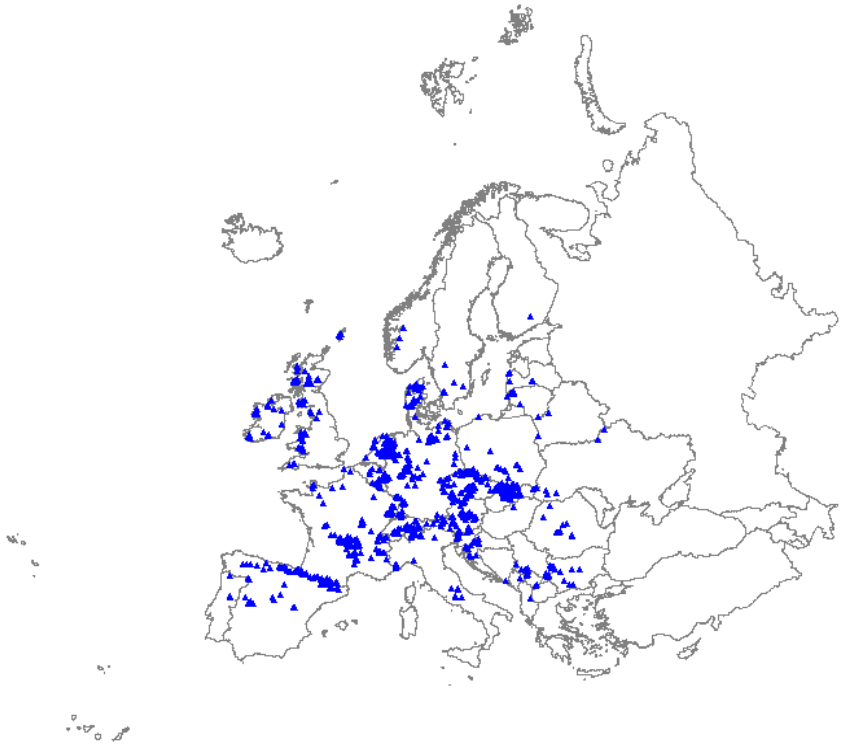


E1.5d - Greek and Anatolian oromediterranean siliceous dry grassland

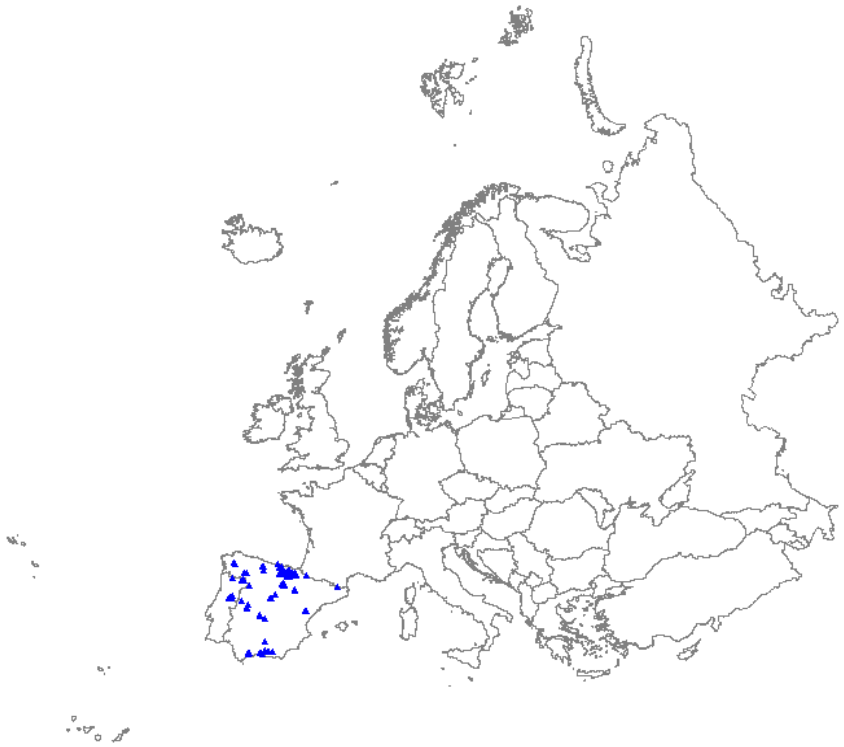


E1.5e - Madeiran oromediterranean siliceous dry grassland

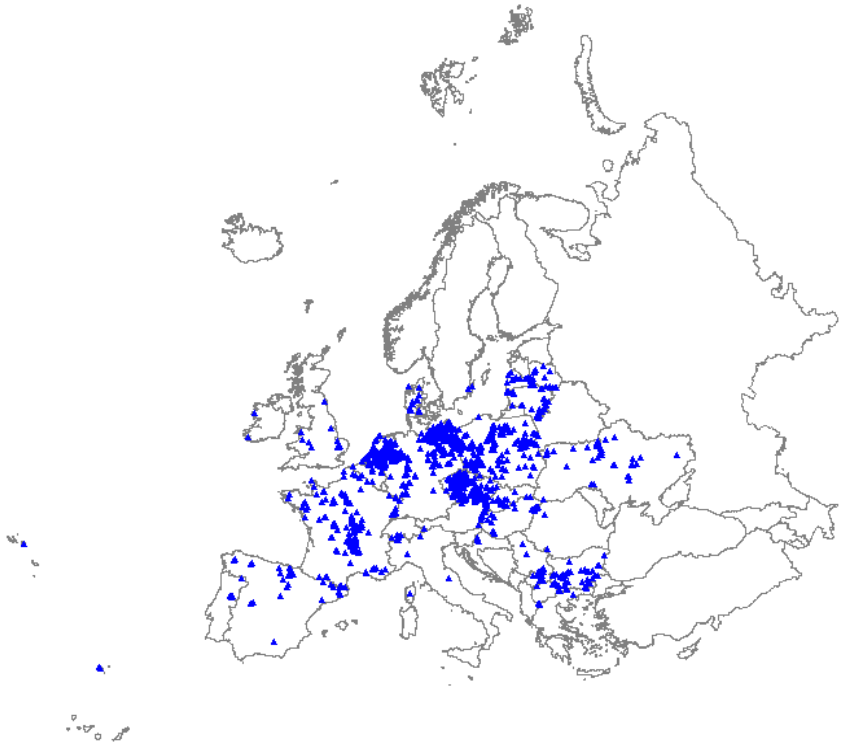
E1.7 - Lowland to submontane, dry to mesic Nardus grassland



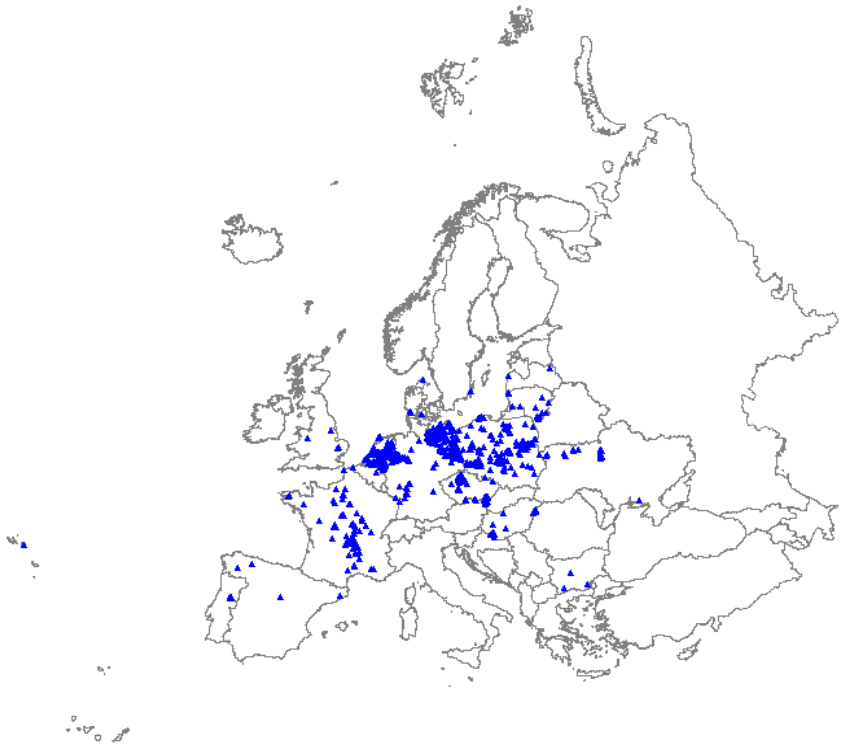
E1.8 - Open Iberian supra-mediterranean dry acid and neutral grassland



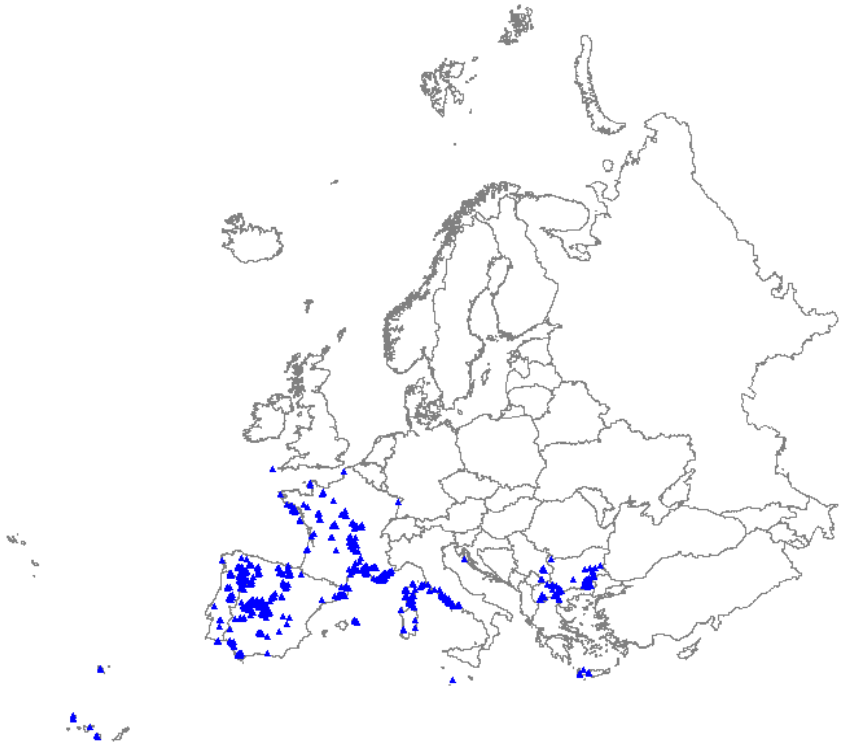
E1.9a - Oceanic to subcontinental inland sand grassland on dry acid and neutral soils



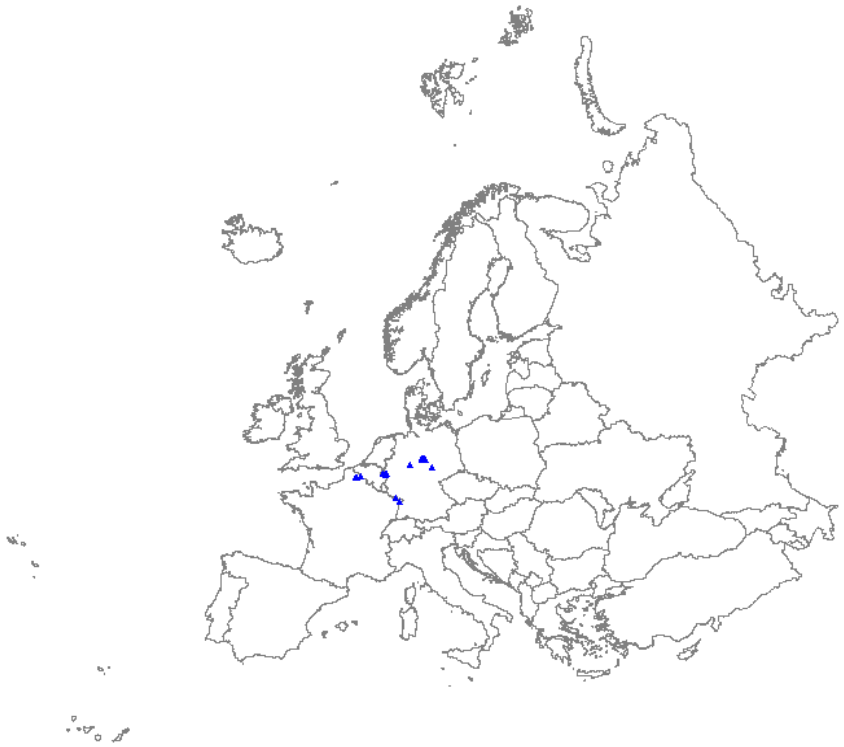
E1.9b - Inland sanddrift and dune with siliceous grassland



E1.A - Mediterranean to Atlantic open, dry, acid and neutral grassland

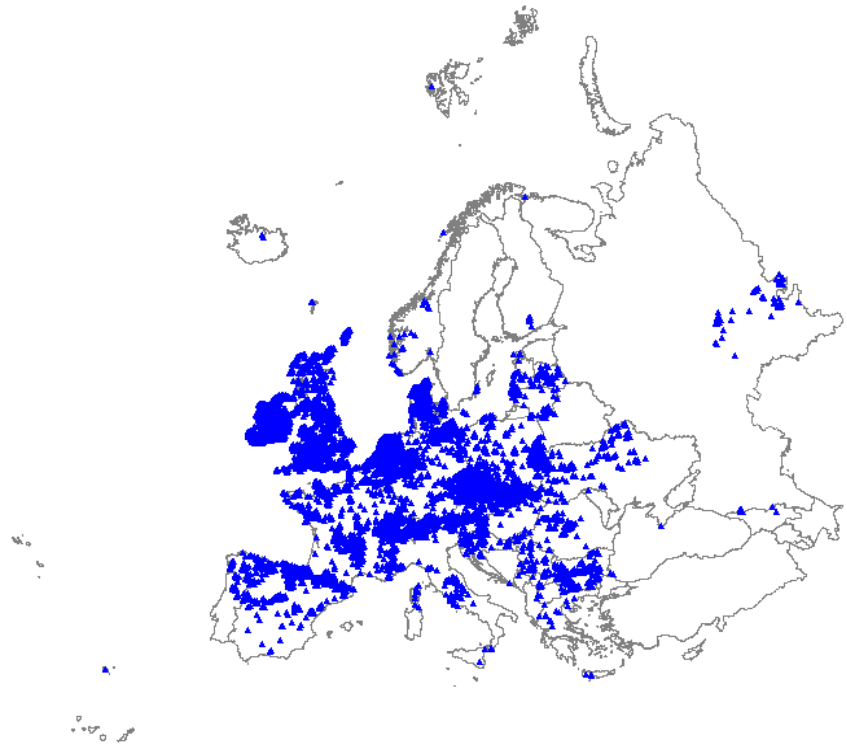


E1.B - Heavy-metal grassland in Western and Central Europe

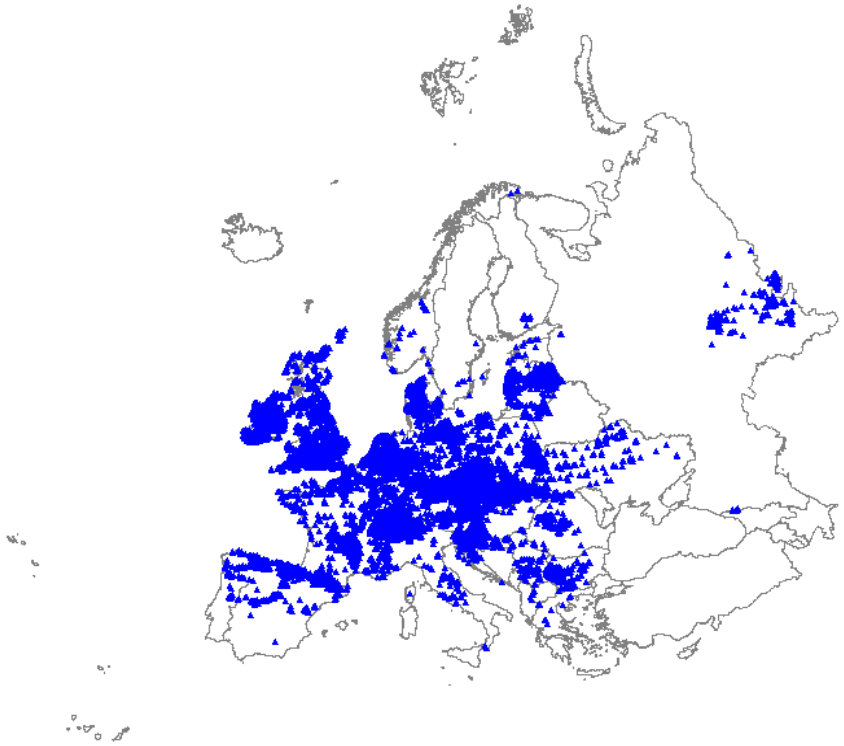


E1.F - Azorean open dry, acid to neutral grassland

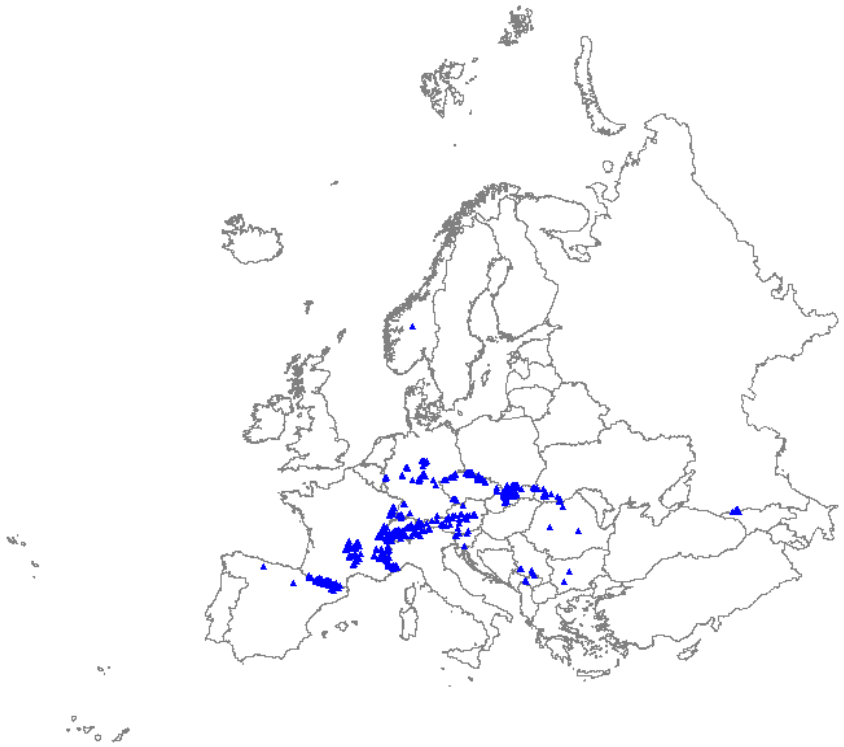
E2.1 - Mesic permanent pasture of lowlands and mountains



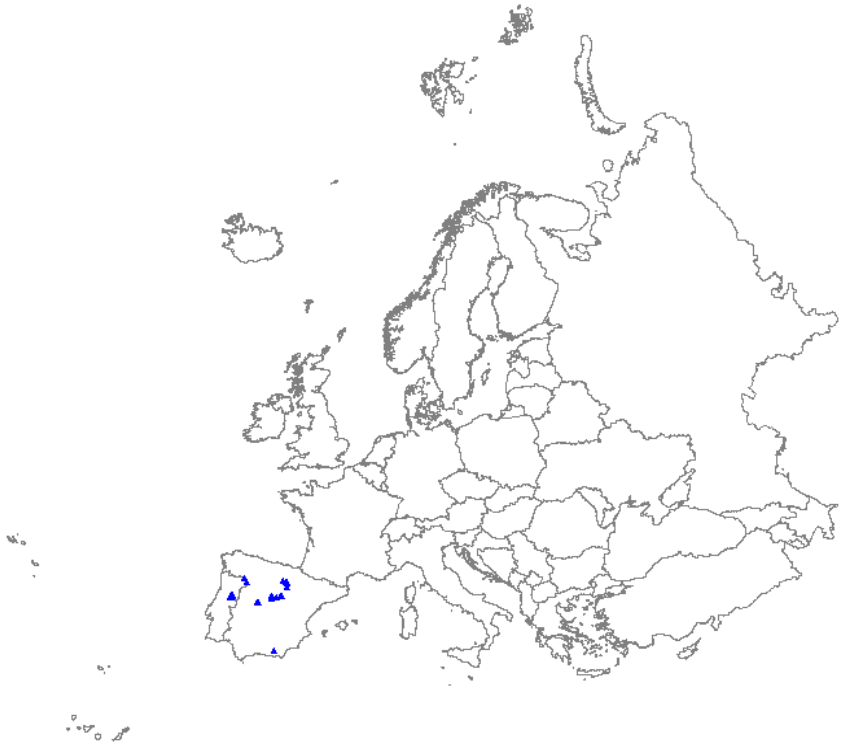
E2.2 - Low and medium altitude hay meadow



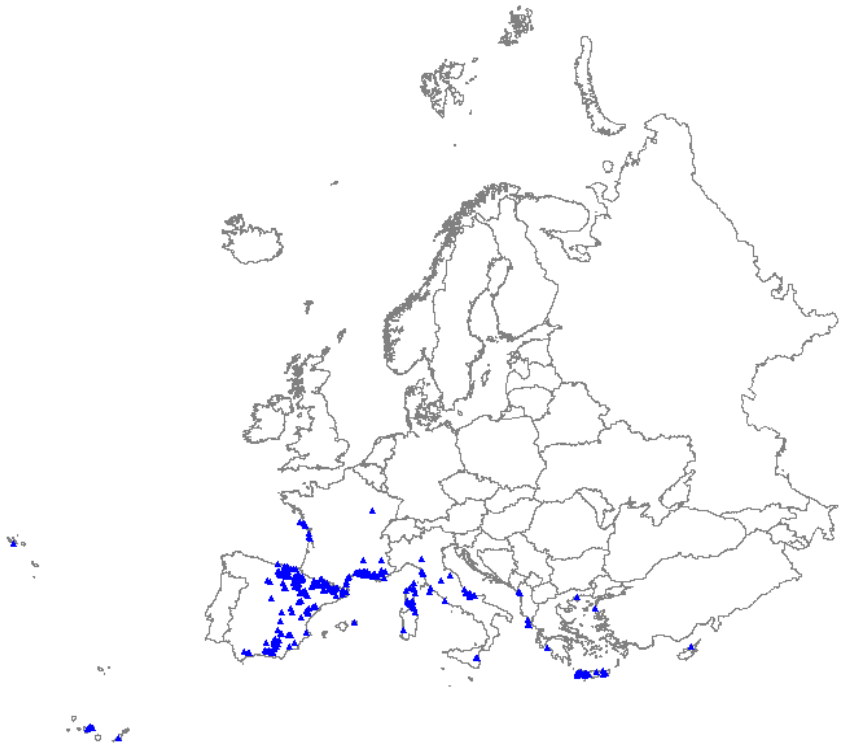
E2.3 - Mountain hay meadow



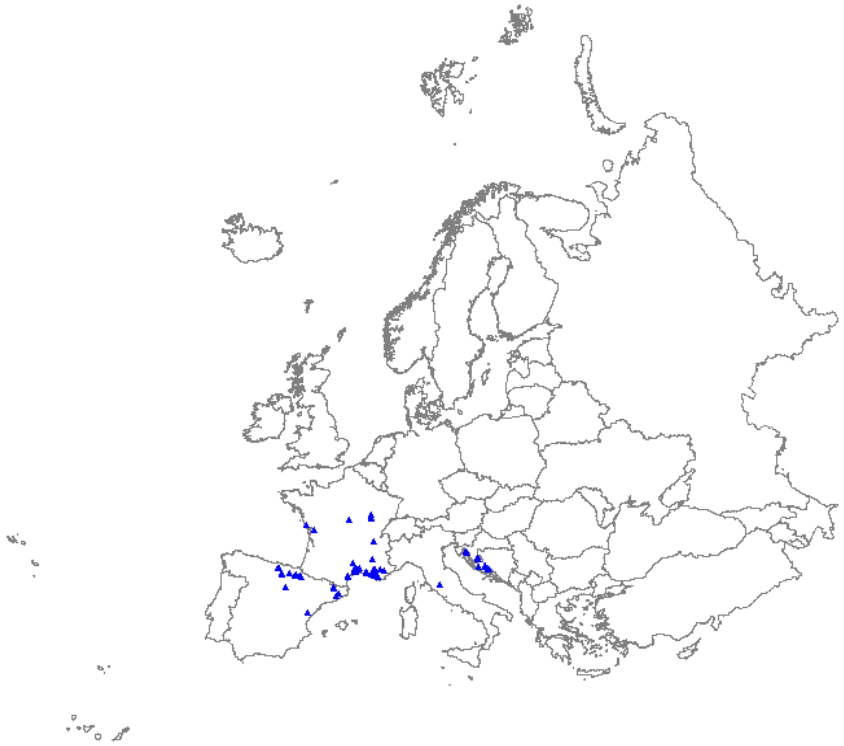
E2.4 - Iberian summer pasture (vallicar)



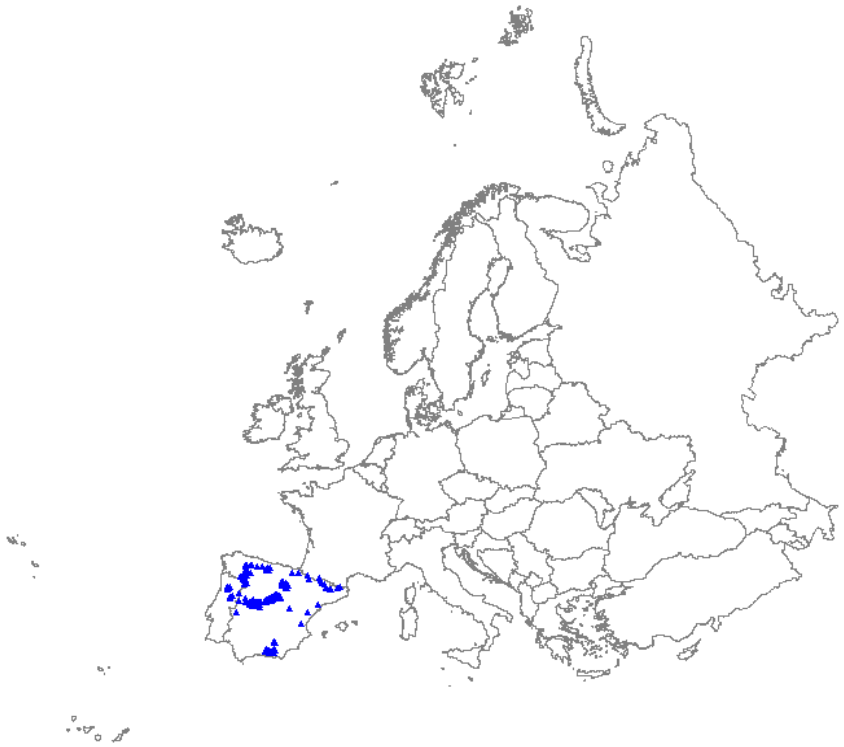
E3.1a - Mediterranean tall humid inland grassland



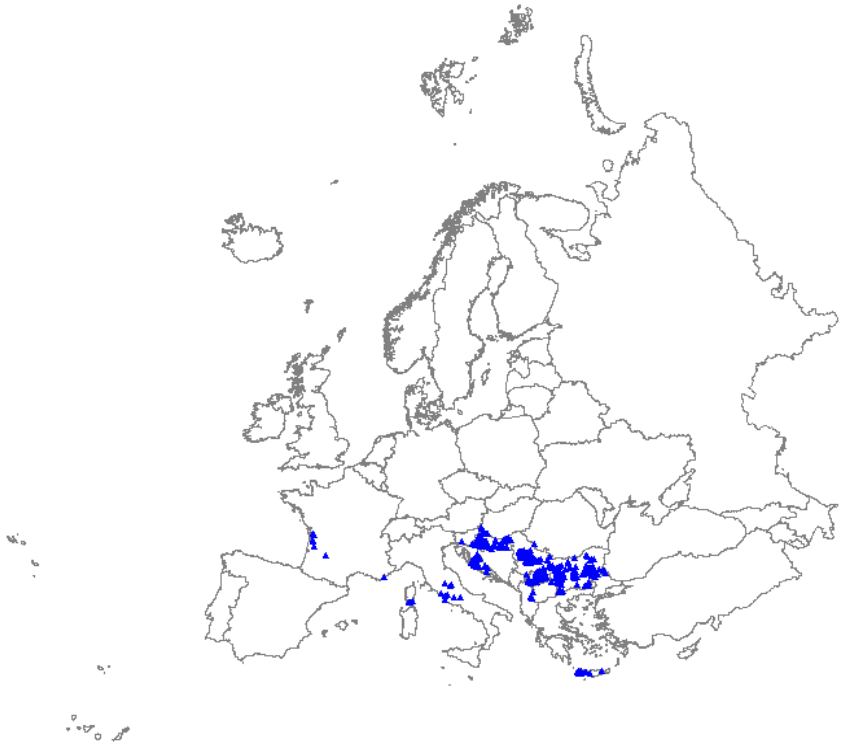
E3.2a - Mediterranean short moist grassland of lowlands



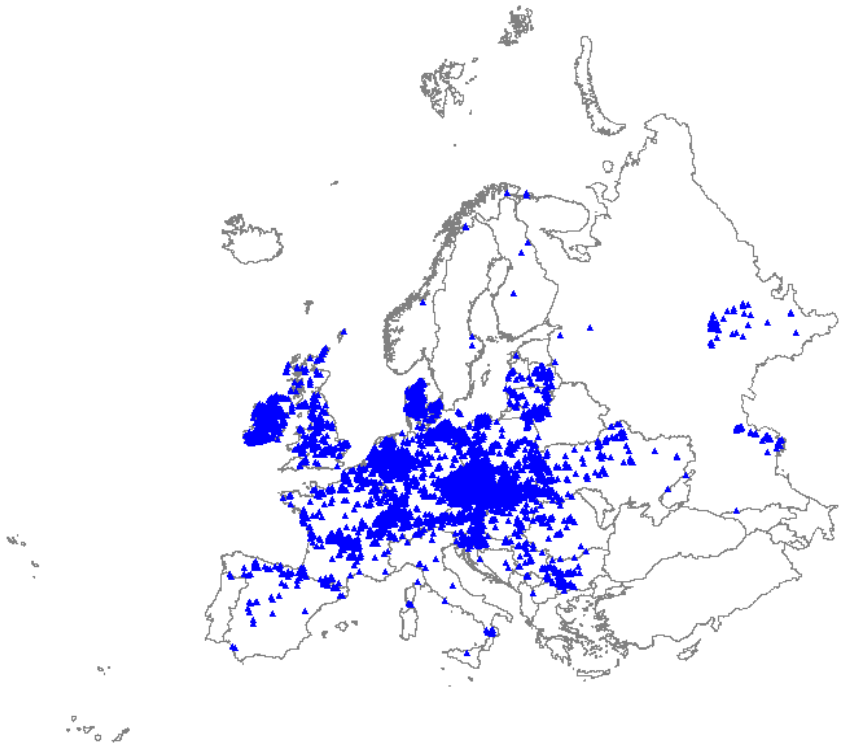
E3.2b - Mediterranean short moist grassland of mountains



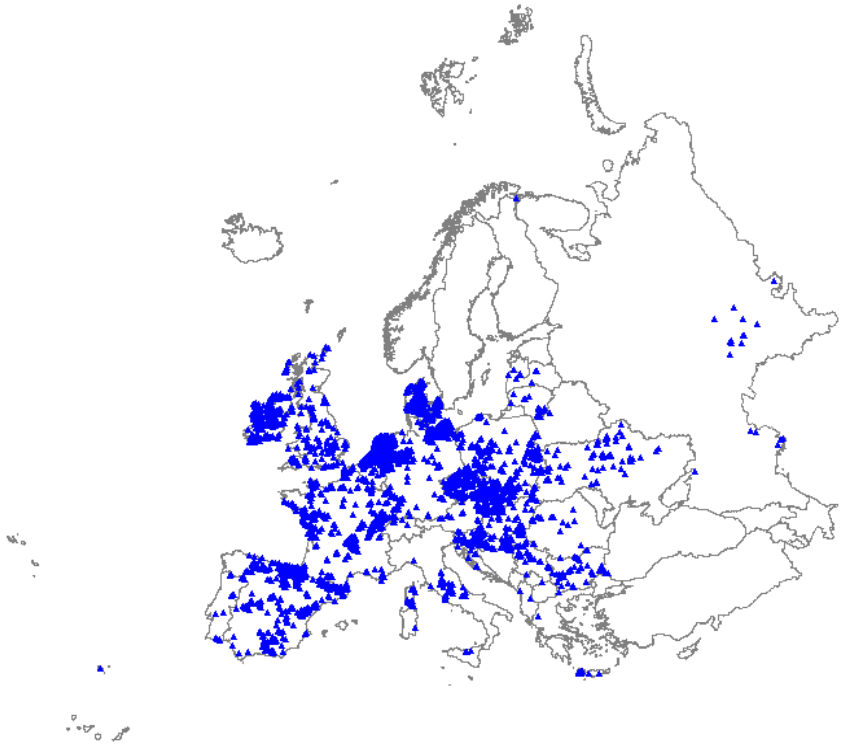
E3.3 - Submediterranean moist meadow



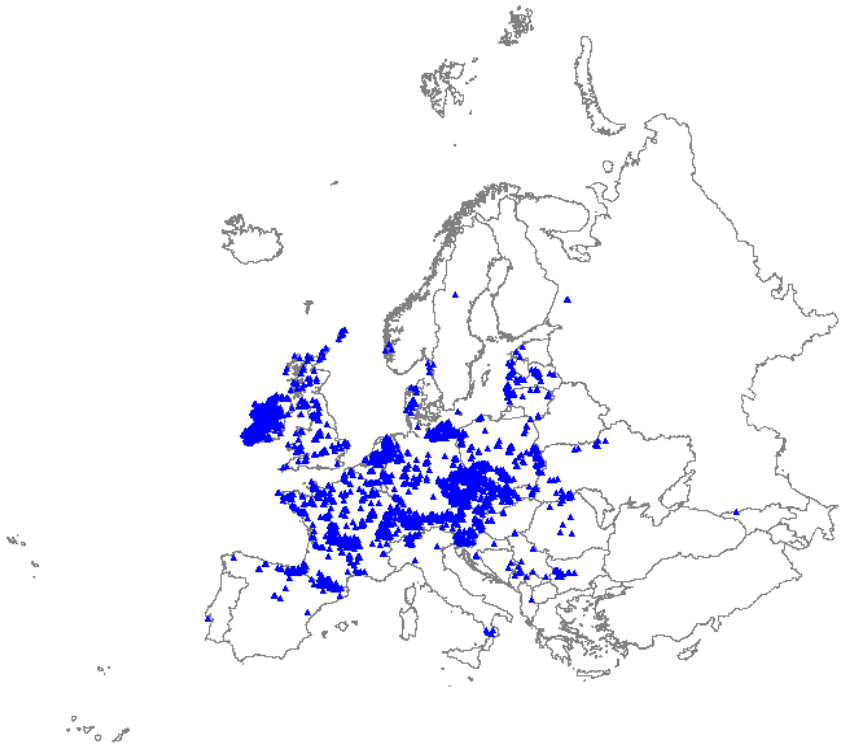
E3.4a - Moist or wet mesotrophic to eutrophic hay meadow



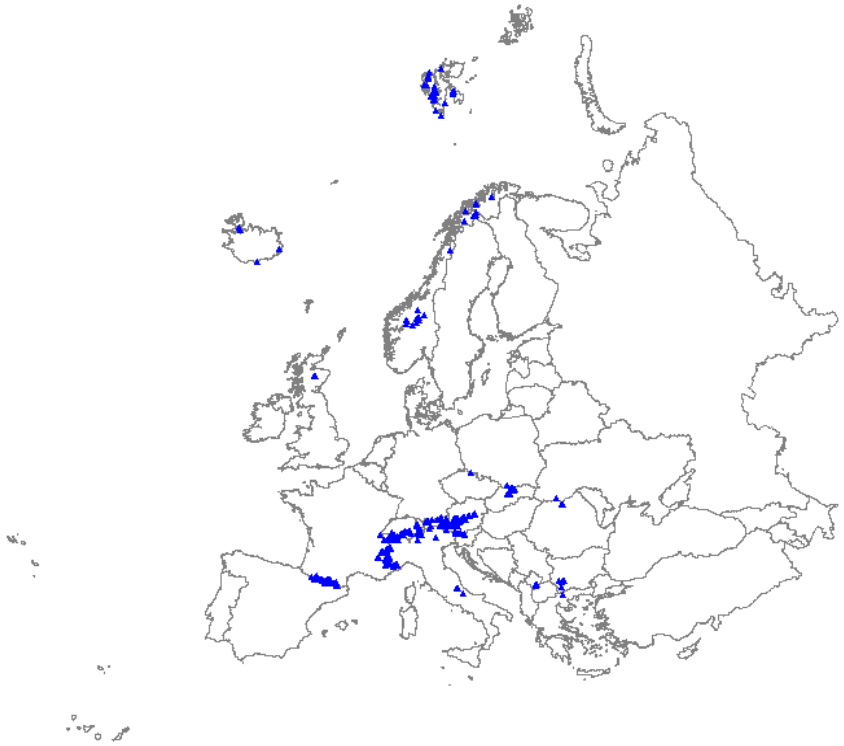
E3.4b - Moist or wet mesotrophic to eutrophic pasture



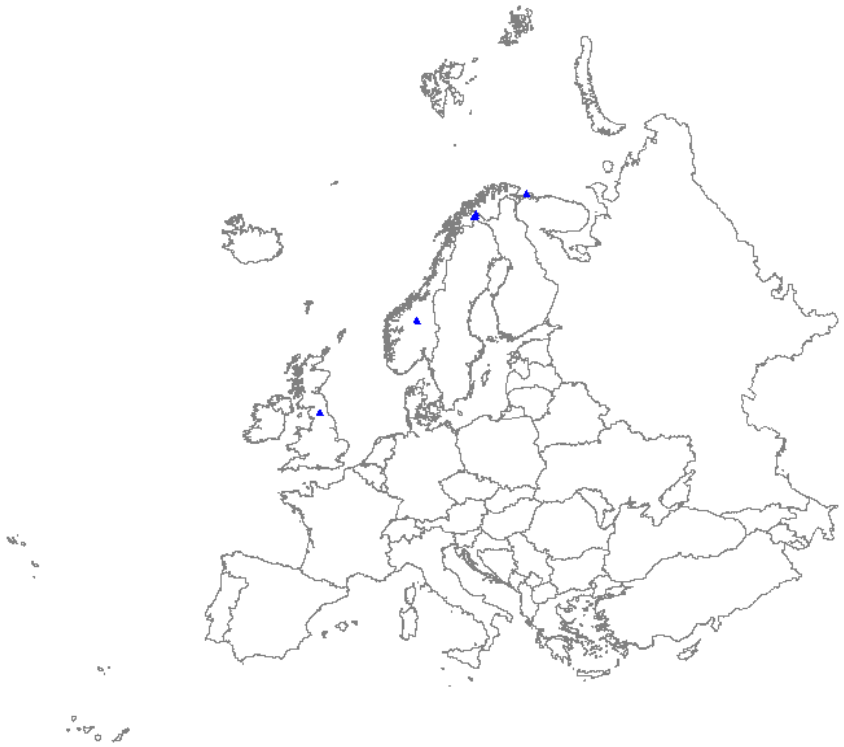
E3.5 - Temperate and boreal moist or wet oligotrophic grassland



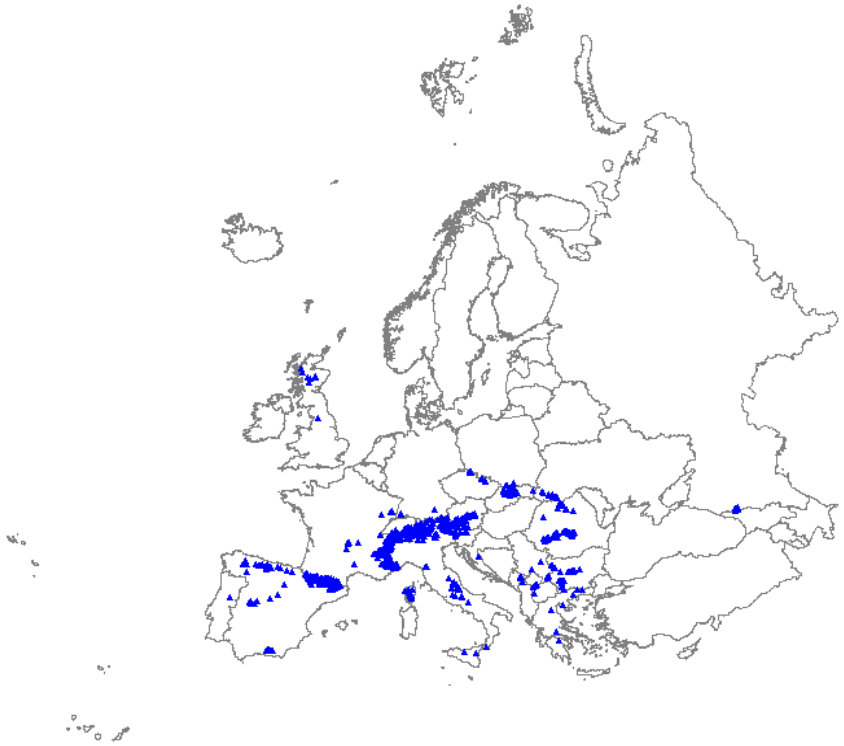
E4.1 - Vegetated snow-patch



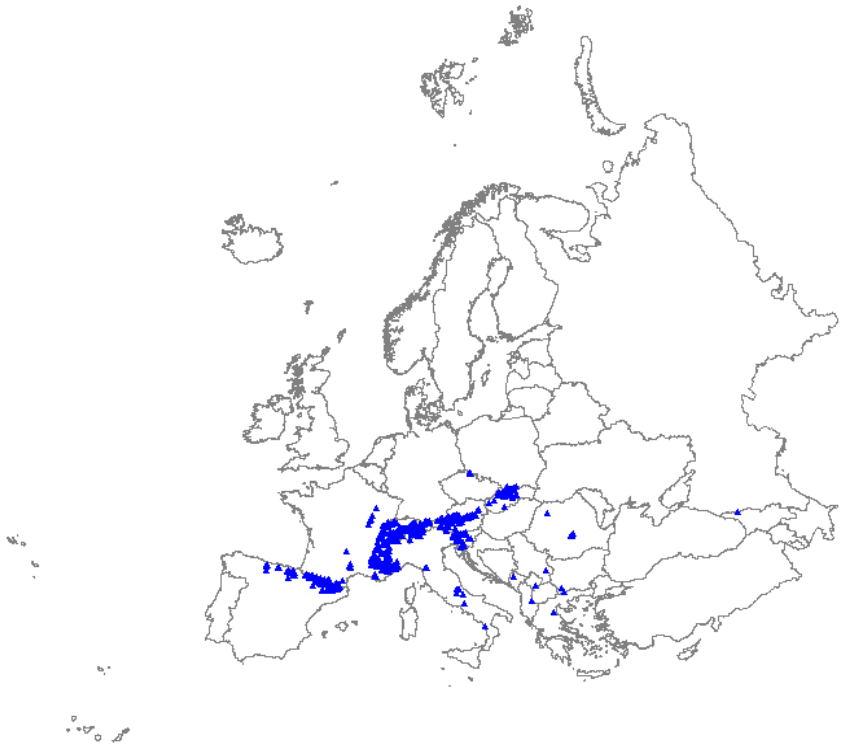
E4.3a - Boreal and arctic acidophilous alpine grassland



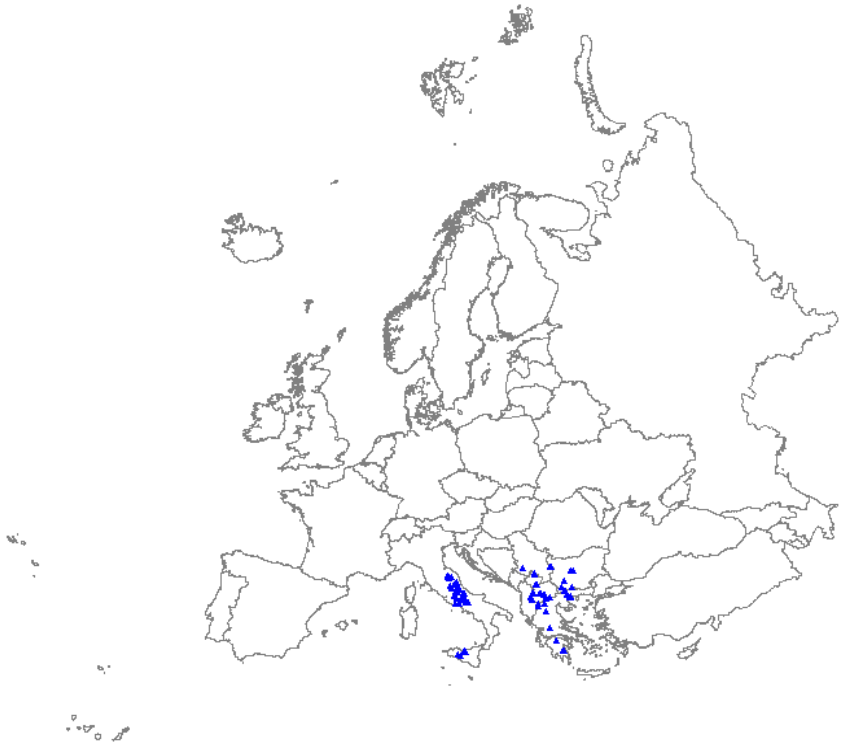
E4.3b - Temperate acidophilous alpine grassland



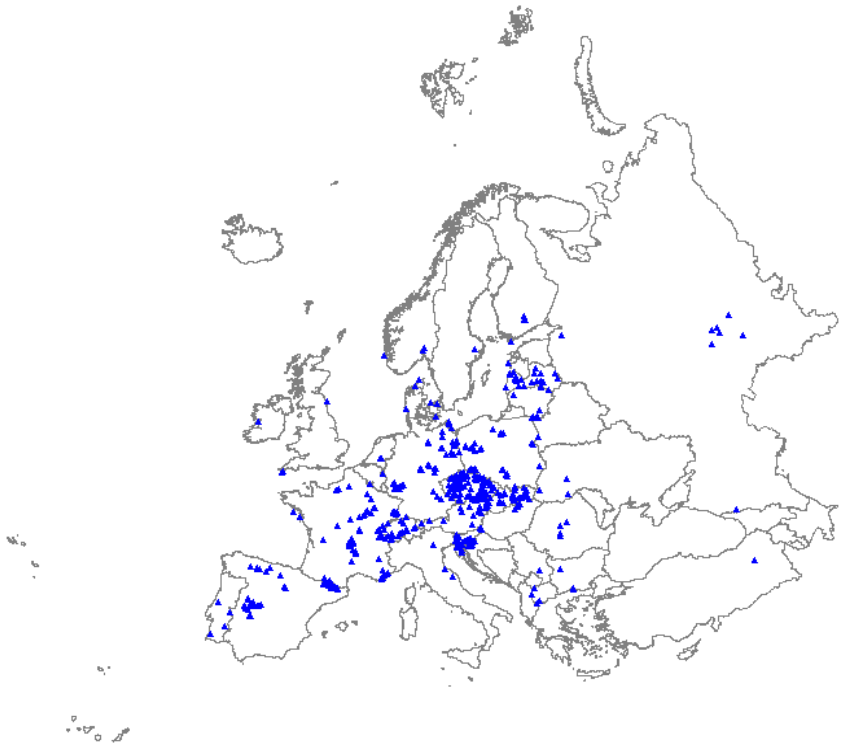
E4.4a - Arctic-alpine calcareous grassland



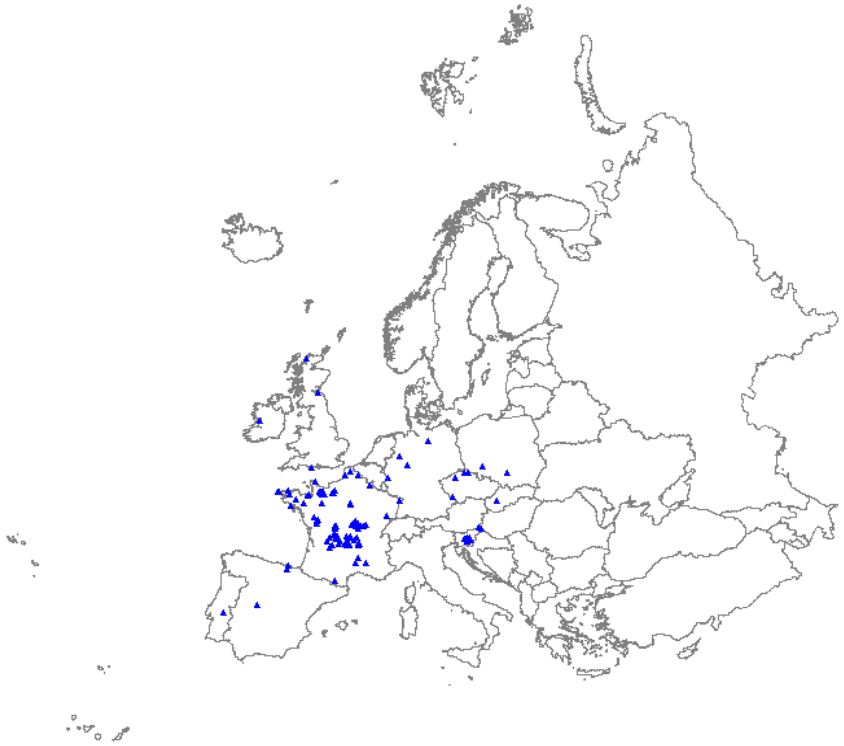
E4.4b - Alpine and subalpine calcareous grassland of the Balkan and Apennines



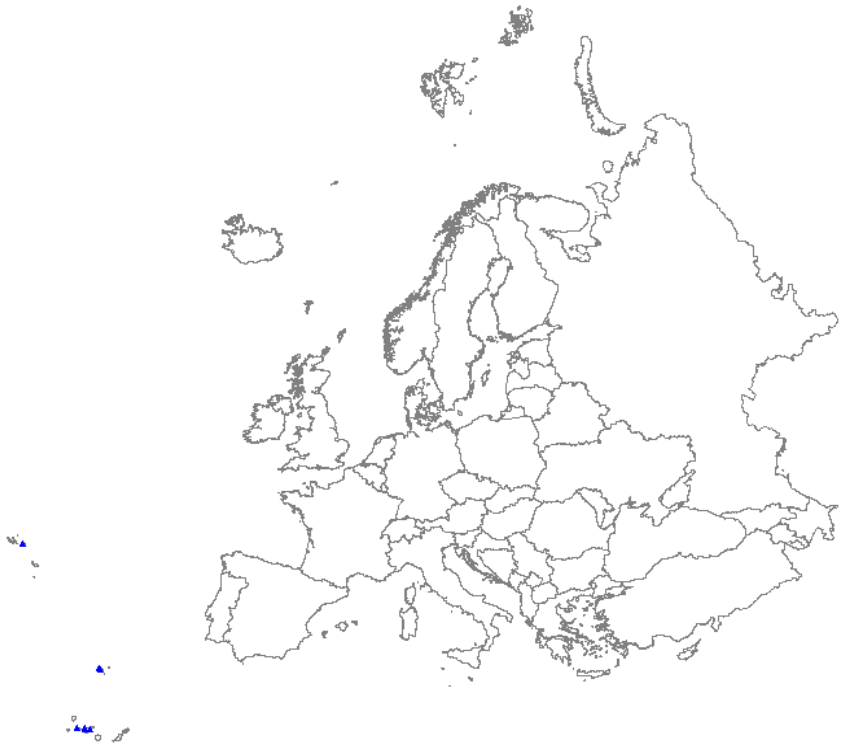
E5.2a - Thermophilous woodland fringe of base-rich soils



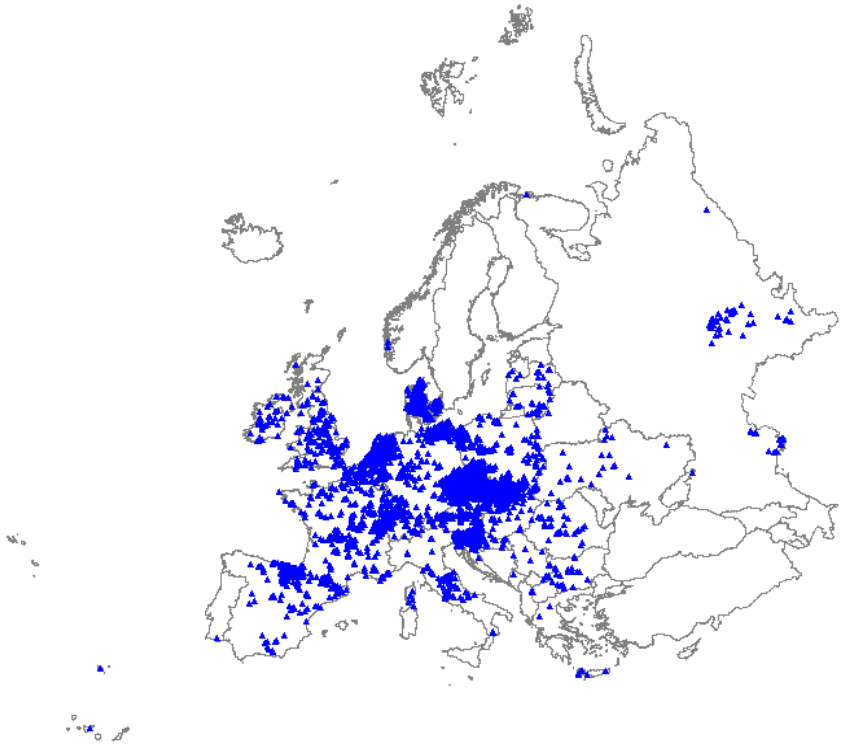
E5.2b - Thermophilous woodland fringe of acidic soils



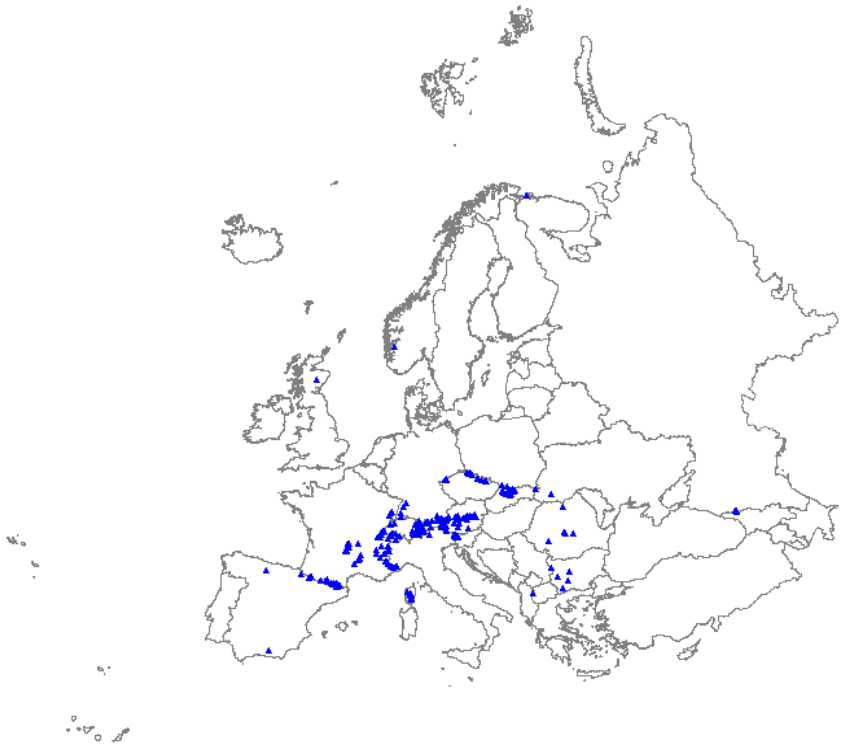
E5.2c - Macaronesian thermophilous woodland fringe



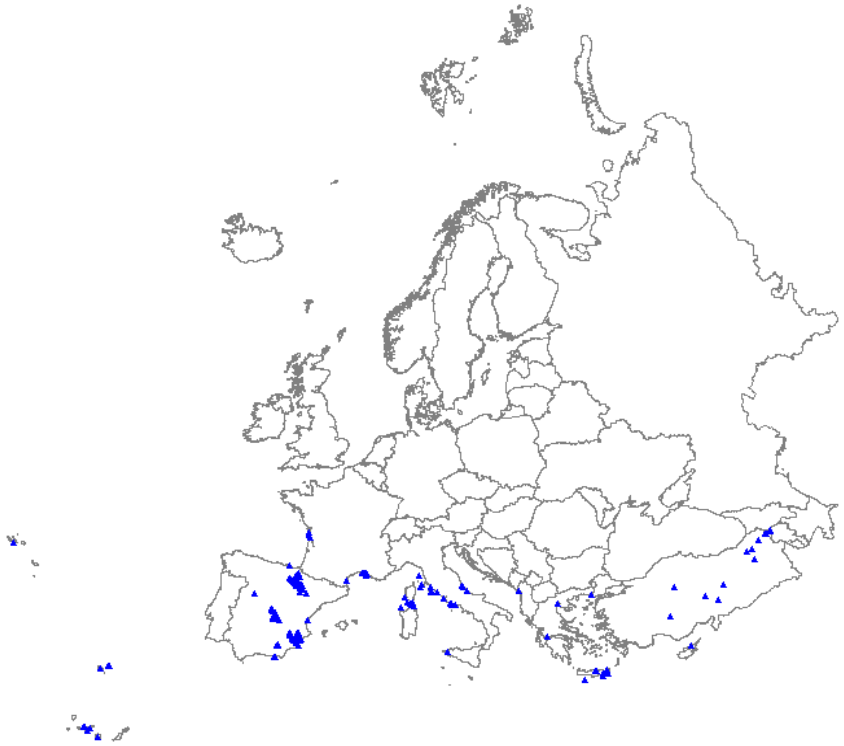
E5.4 - Lowland moist or wet tall-herb and fern fringe



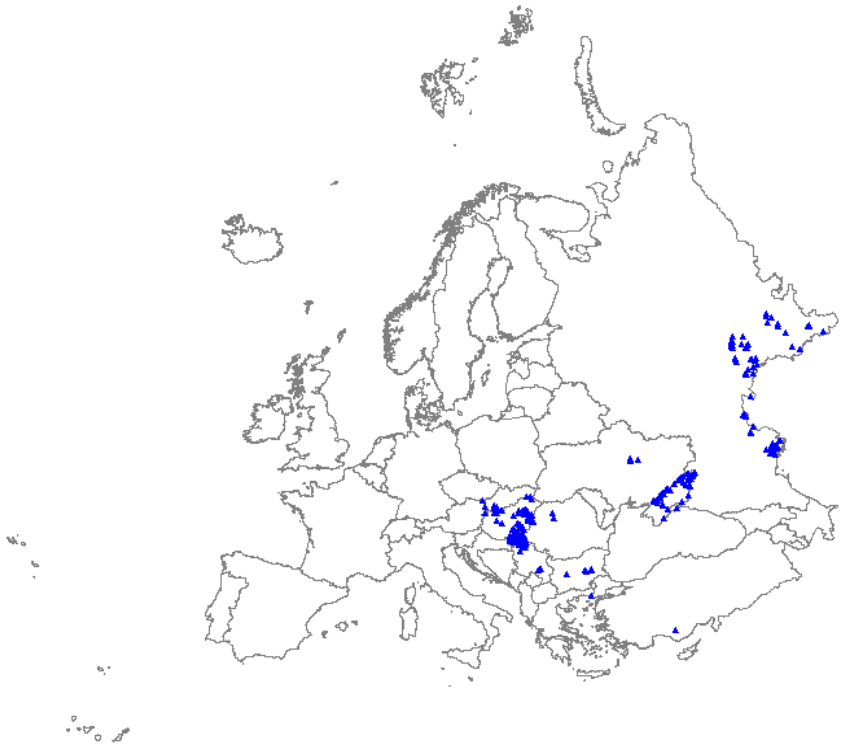
E5.5 - Subalpine moist or wet tall-herb and fern fringe



E6.1 - Mediterranean inland salt steppe



E6.2 - Continental inland salt steppe



E6.3 - Temperate inland salt marsh