EBONE

European Biodiversity Observation Network:

Design of a plan for an integrated biodiversity observing system in space and time

D 4.2: Rule based system for Annex I habitats

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Content

Abbreviations

General Habitat codes

URB	Urban
CUL	Cultivated
SEA	Sea
TID	Tidal (exposed marine substrates)
AQU	Aquatic (fresh/brackish water)
TER	Terrestrial (bare substrates inland)
ICE	Ice and Snow (glaciers and snow fields)
HER	Herbaceous
SHY	Submerged Hydrophytes (submerged aquatics)
EHY	Emergent Hydrophytes (emergent aquatics)
HEL	Helophytes (marsh plants)
LHE	Leafy Hemicryptophytes (herbs/ forbs)
CHE	Caespitose Hemicryptophytes (grasses and sedges)
THE	Therophytes (annuals)
SUC	Succulents (succulents)
GEO	Geophytes (bulbs, rhizomes)
HCH	Chamaephytes (cushion plants)
CRY	Cryptogams (mosses, lichens)
DCH	Dwarf Chamaephytes
SCH	Shrubby Chamaephytes
LPH	Low Phanerophytes
MPH	Mid Phanerophytes
TPH	Tall Phanerophytes
FPH	Forest Phanerophytes
DEC	Deciduous
EVR	Evergreen
CON	Coniferous
NLE	Non-leafy Evergreen

Environmental Zones

ALN	Alpine North
BOR	Boreal
NEM	Nemoral
ATN	Atlantic Central
ALS	Alpine South
CON	Continental
ATC	Atlantic Central
PAN	Pannonian
LUS	Lusitanian
MDM	Mediterranean Mountains
MDN	Mediterranean North
MDS	Mediterranean South
MAC	Macaronesia

Others

CLC	Corine Land Cover

The present document creates a hierarchical structure within which the Annex I habitats can be identified. Neither the original CORINE biotopes classification nor Annex I are strongly structured except that almost 60% are based on phytosociological syntaxa. The current concept of an expert system emerged during an ECOLAND forum meeting in Almeria south-eastern Spain. Subsequently the concept that was developed, used the General Habitat Categories as described in the BioHab Field Handbook, to provide a means of restricting the range of options for any given habitat after which expert rules are provided. These can later be elaborated from other data sources and by consultation with local experts.

The rule based system for Annex I habitats will promote consistent identification between Member States. A direct key is not possible because of the way the habitats have been produced over the years as well as the need for application of expert judgement

The system has been tested in the field in Spain, Portugal and Italy. There has been consultation with the European Topic Centre on Biological Diversity (ETC-BD) in Paris with modifications being made to the system following these meetings

The structure of the system is first to identify Annex I habitats that are landscape units or habitat complexes and then to use the General Habitat Categories of the EBONE Field Handbook as a framework to identify other habitats. All Annex I habitats have been descried and are characterised by indicator species.

The system is being prepared for input into a field computer to enable ready access and encourage consistency. Rules for mapping have been produced in the BioHab Field Handbook. It is essential that these rules for data recording are followed in the mapping, so that the relevant information can be fed directly into the system.

Apart from the short descriptions given in the report, the full information for the Annex I habitats given in the Interpretation Manual of EU27, together with additional information from the ETC-BD will be available on the Field Computer.

1 Introduction

1.1 The Habitats Directive and Annex I

The two most important legal documents of the EU related to biodiversity and conservation are the Birds Directive of 1979 (Council Directive (79/409/EEC)) and the Habitats Directive of 1992 (Council Directive (92/43/EEC)). The 1992 European Union Directive on the conservation of natural habitats and of wild fauna and flora (Commission of the European Communities 2003) requires member states of the European Union to establish a network of Special Areas for Conservation to protect species and habitats considered to be of 'Community Interest' and listed in annexes to the directive. The directive defines habitats of Community Interest as those that (i) are in danger of disappearance in their natural range; or (ii) have a small natural range following their regression or by reason of their intrinsically restricted area; or (iii) present outstanding examples of typical characteristics of one or more of the nine following biogeographical regions: Alpine, Atlantic, Black Sea, Boreal, Continental, Macaronesian, Mediterranean, Pannonian and Steppic (Article 1c, as modified in 1995, 2004 and 2007).

The Habitats Directive covers the protection of endangered and endemic species protecting 450 animal and 500 plant species and 231 rare and important habitats. The Habitats Directive requires the designation of Special Areas of Conservation (SAC), in order to protect the natural habitats of Community importance listed in Annex I and the animal and plant species of Community importance as listed in Annex II.

The implementation of the Natura 2000 Network, within the framework of the Habitats Directive, includes marine and coastal sites. In 2003, an EC working group of marine experts was established to address the difficulties in implementing the Habitats and Birds Directives in the marine environment which published guidelines in 2007. Implementation of the Habitats Directive for marine habitats and species has been very slow and is still far from complete (Evans *et al*, in press). Within this report only attention will be given to coastal marine habitats.

There are no Community regulations concerning the management of the Natura 2000 Network although the European Commission has provided some guidance and the directive recommends the use of management plans. Use and development is permitted if it does not damage the habitats and species of community interest and many of the habitats are dependent on appropriate agricultural management, for example many of the Annex I grasslands (Ostermann, 1998; Halada et al, in prep). The system intends to secure the survival of habitats and species primarily by providing assistance, rather than imposing prohibitions.

For designation and determination of area, status and trends it is important to recognise habitats consistently. This is not always easy as the Annex I has been developed as a living document, starting from CORINE biotopes in the period of Europe of 12 Member States to expansion to 15 Member States, to 25 and now 27 Member States. With each expansion of the EU, additional habitats have been added and the description of existing habitats modified.

The basis of the 1992 Annex I was the CORINE Biotope classification that was developed in the 1980s by a committee of experts from the several countries of the European Union (then only 12 members). The classification was further developed into the Palaearctic classification and the associated Physis database (Devillers & Devillers-Terschuren, 1996) and later into the

EUNIS habitat classification (http://eunis.eea.europa.eu/). EUNIS was developed in cooperation with the marine conventions such as Helcom and Ospar.

However the recognition of Annex I habitats in the field is not always straightforward. Although the Interpretation Manual (Commission of the European Communities, 2007) gives more detail than the list of habitat names in the annex itself, there are still many problems when trying to identify habitat types in the field, and in both selecting sites and assessing the national lists of proposed sites. Some of these problems arise from poorly defined, sometimes overlapping, habitat types, whereas others arise from errors within the Palaearctic classification or its associated PHYSIS database (Evans 2006; in press). This has led to differences in interpretation between countries and sometimes between regions in the same country.

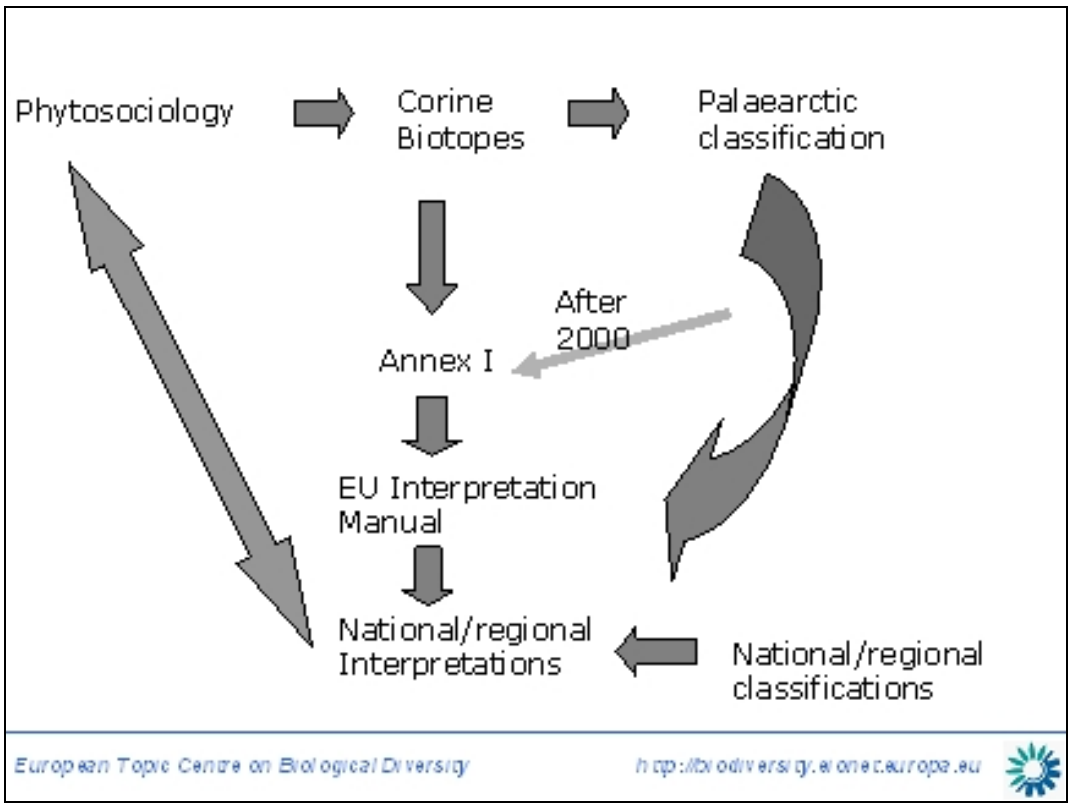

Figure 1. Development of Annex 1 from 1992 until 2007.

This means that when identifying habitats in the field and interpreting its status and trends there are often problems in identification and interpretation. Therefore it is needed to develop a consistent expert system for recognition of Annex I habitats that prevents at least the most obvious errors and introduces consistency. Already during the work carried out in the Ecoland Forum meeting in Cabo del Gata Natural Park near Almeria in Spain it became clear that an expert system was required for identification of European Annex I habitats.

1.2 Scope and objectives of the report

Development of a reliable monitoring system for Europe requires recognition of Annex I habitats as these are the core of European Biodiversity Conservation policy. It has therefore been included in the EBONE project as an important deliverable. This report covers the

following objective as stated in the EBONE Description of Work: *D4.4: to develop a rule based system for linking habitat data with Annex I of the Habitats Directive.*

A simple rule based system was not possible for the following reasons:

1. The Annex I habitats have been determined over the last twenty years by a series of committee meetings and there is no structure to the classes.
2. Many of the descriptions rely heavily upon expert judgement and the experience within the member states. For example consultations with local experts in Almeria made clear that for some habitats one species alone was enough to identify a specific habitat, but this was not apparent from the interpretation manual.
3. The Annex I habitats include landscape units, habitat complexes and the more usually recognisable types of habitats and vegetation units. Only an expert system could deal with these multiple levels.
4. Although the present document includes as much experience as possible it is inevitably a live document in which further expert knowledge must be added progressively during the EBONE project.
5. The early work in Almeria also showed that it was very difficult to obtain consistent information on the Annex I habitats and the present system is designed to improve the situation and to make common standards available throughout EU 27.

The report describes the way the expert system has been constructed. Currently the structure provided below is being converted into a suitable format for the field computer. This will be completed initially in early 2010 for field testing near Wageningen and for practical use in the EBONE field training course at the end of February and March. It is essential that the rules for data recording given in the BioHab Field Handbook are followed, so that the relevant information can be fed directly into the system.

The objective of the rule based system is to enable any observer within a landscape element to assign it to an Annex I habitat if applicable. In order to do this, there have to be rules about what constitutes a landscape element in the field. In the present document it is assumed that the Field Handbook, That has been developed in 2005 in the BioHab project and is elaborated further in the EBONE project, is used to determine boundaries between patches. This original Field Handbook (Bunce et al, 2005) is in the final stages of being updated and will to include deserts and other habitats outside Europe. Within the Field Handbook a procedure is described to record Annex I habitats. In some cases dual recording is necessary. For example an Estuary (1130) may also contain other Annex I habitats such as sandbanks (1110), mudflats (1140) or Salicornia beds (1310) as well as other habitats which are not in Annex I.

2 The approach

The rule based system is to be used to direct the user into an appropriate Annex I class where appropriate. The short description in the rule based system needs to be checked according to other criteria, e.g. local bio-indicators, succession status or age. Finally the distribution patterns of the available data from the ETC-BD can be used as a check where it is likely to exist. It is also important to remember that many habitats can exist outside the areas suggested by their name, for example Mediterranean temporary ponds (3170) can occur outside the Mediterranean biogeographical region. The overviews of the divisions are to be consulted before using the system.

The rule based system is the first part of four sections and is designed to lead the surveyor to a probable class, which then needs to be checked with further information. Some habitats may appear in more than one place in the system, as they have complex structures, e.g. Limestone Pavement (8240) may be over 70% bare (when it would appear as "unvegetated rock") or 30-70% bare (when it would appear as the appropriate vegetation cover). Other widely recognized habitats such as Machair (21A0) are actually complexes of other habitats such as sand dunes, grazed grasslands and even salt marsh. Many of these issues are discussed by Evans (2006) and the rule based system recognizes these contrasting scales and uses the rules described by Bunce et al (2008) to provide pathways to the habitats. There are also difficulties where the habitat is a complex of life forms, e.g. blanket bogs where secondary labels will be needed in the field to identify the habitat as well as consultation with experts. Blanket bogs (7130) form a good example, as to become a priority habitat they need to be "active" but no definition of this term is provided. The local expert in Northern Ireland, Alan Cooper of the University of Ulster, Coleraine, has suggested that the indicator should be at least 30% of Sphagnum cover, which has now been added to the system. The following broad ways of defining habitats are used in the list given below.

1. Landscape units e.g. Estuaries (1130);
2. Geomorphology e.g. Turloughs (3180);
3. Environmental descriptors only e.g. Mediterranean rivers (3250);
4. Individual plant communities consisting of one life form e.g. Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix* (4020);
5. Many vegetation associations but usually one life form e.g. Alpine and Boreal heath (4060);
6. Habitats dominated by endemic species with very restricted distribution e.g. Palm groves of Phoenix (9370);
7. Regionally defined habitats defined by vegetation structure and usually dominated by >30% of one life form e.g. Dehesas (6310).

The first step is to determine if there is a complex of landscape elements which constitute either a landscape class or a habitat complex class. In the present document any unit which contains more than three GHC's fall within this definition. It is recognised that this makes the rule based system more complicated, but is inevitable because of the composition of the Annex I habitats. In the description of the landscape classes and habitat complexes only the main GHC's are given, others might well occur. The structure of the rule based system is given in Figure 2.

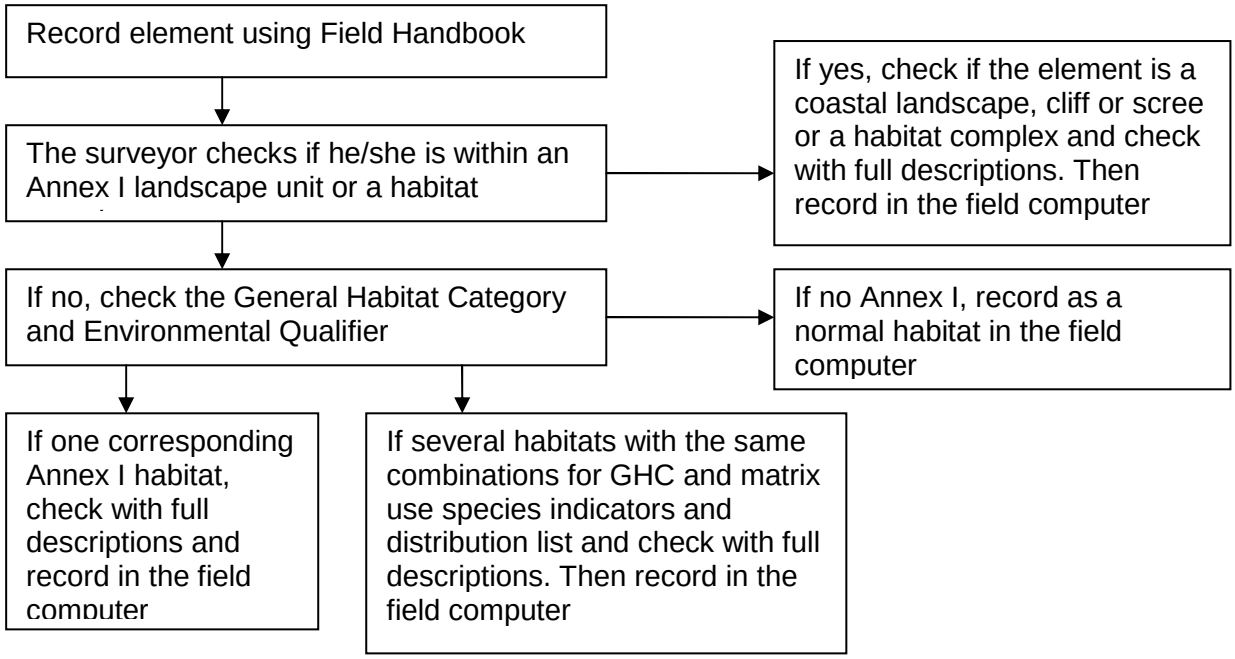

Figure 2. Diagram of the procedure to be followed when using the rule based system to check if the recorded habitat is an Annex I habitat.

It is important to note that the Field Handbook protocol does not map landscape elements under 400 m^2. Many of the Annex I habitats will have small areas of many different GHC's; in the habitat mapping system they might have to be recorded as points. Again patches of other habitats may also be present, e.g. in pre-desert scrub (5330) there are likely to be patches of bare ground. A procedure is described in the Field Handbook to enable these to be recorded. It should be noted that some Annex I habitats, for example Petrifying springs with tufa formation (Cratoneurion) (7220), normally occur as small patches, much less than 400 m^2.

If the unit is not a landscape class or habitat complex, the rule based system follows the structure of the General Habitat Categories. The highest level of this rule based system are those of widely accepted habitat classifications, i.e. (1) urban, (2) crops, (3) sparsely vegetated, (4) herbaceous and (5) trees/scrub. The first two categories have no Annex I habitats. The next level is based on the General Habitat Categories, which are derived from plant life form categories. Any user should become familiar with these categories, before attempting to use the rule based system .

Within each of the GHC's the matrix of environmental qualifiers is used to structure the rule based system further. Note, that the environmental qualifiers are not used in the landscape classes and habitat complexes.

Inevitably in many cases there will not be a complete coverage of the matrix. For example for helophytes (HEL in GHC terminology) there are only two classes included in Annex I, 3.1 (seasonally wet/eutrophic, 6430) and 2.1 (waterlogged, acid, 7150). In such a case the class is not mentioned in the rule based system because there is no Annex I habitat. Then the definition of the habitat is according to the normal habitat mapping system of GHC's and Environmental Qualifier. In much of lowland Europe experience has shown that Annex I habitats are relatively rare and elsewhere are very localised, hence the concept of biodiversity hot spots. If there is no information on the acidity level, then it is assumed to be neutral in the table. All these data need to be checked.

Table 1. Matrix and unique coding of Environmental Qualifiers. In general, acid is below pH 4.8; neutral is between pH 4.8 and 6.0; basic is over pH 6.0.

	Ellenberg values	Aquatic	Water logged	Seasonally wet	Wet	Mesic	Dry	Very Dry	Xeric	Semi desert	Desert
Eutrophic	F > 7	1.1	2.1	3.1	4.1	5.1	6.1	7.1	8.1	9.1	10.1
Acid		1.2	2.2	3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2
Neutral		1.3	2.3	3.3	4.3	5.3	6.3	7.3	8.3	9.3	10.3
Basic		1.4	2.4	3.4	4.4	5.4	6.4	7.4	8.4	9.4	10.4
Saline low		1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5
Saline medium		1.6	2.6	3.6	4.6	5.6	6.6	7.6	8.6	9.6	10.6
Saline high		1.7	2.7	3.7	4.7	5.7	6.7	7.7	8.7	9.7	10.7

It is essential to note that the moisture and nutrient levels used in the rule based system are at a European scale. Thus a dry sand dune in Belgium would be considered to be moist at a European scale. In situations where sufficient information is not provided in the Annex I descriptions the likely moisture level is taken from experience of the location in Europe. For instance, many soils in the Western Pannonian are termed xeric, but on a European scale they are very dry. If there is insufficient information on the acidity the class is assumed to be neutral. If the element does not fit any of the classes, then it is not an Annex I habitat.

When carrying out a mapping project there will be many elements that correspond to no Annex I habitat. Many intensively farmed lowland landscapes will have no Annex I habitats at all. In contrast many upland landscapes will often be dominated by Annex I habitats because of the emphasis on semi-natural vegetation in Annex I. Elsewhere Annex I habitats will often be clustered e.g. on coastal strips and in limestone landscapes.

In the identification of Annex I habitats in the field the biogeographical position of the habitat is important as well as the altitude where the survey is being carried out. For field observations a more or less exact location is needed. Therefore the European Environmental stratification (Figure 3) is being applied in the identification system (Chapter 4) as this is more accurate for monitoring than the administrative divisions in official Biogeographical zones (Jongman et al 2006).

There are the following combinations when identifying which habitat or combination of habitats the element is:

1) The element corresponds to the description of the Annex I habitat only, e.g. 4060 Alpine and Boreal heaths.
2) The element answer the description of the Annex I habitat, but also forms part of a landscape class or habitat complex – therefore having a dual code, e.g. 1310 *Salicornia* beds within 1130 Estuaries.
3) The element does not fulfil the description of Annex I in itself, but forms part of a landscape class or habitat complex, which does belong to Annex I, e.g. grasslands (CHE) dominated by *Agrostis repens* within 1130 Estuaries.
4) The element is not in Annex I and does not form part of a habitat complex, e.g. a *Pinus sylvestris* plantation (FPH/CON) in southern England.
5) The element according to the GHC rules is made up of a matrix of an Annex I habitat within which there are point features of another Annex I habitat, e.g. Atlantic wet heaths (4020) may contain point features of *Rhynchospora alba vegetation* (7150).

Database management can be used to convert these data into relevant areal estimates, bearing in mind that there will be inevitably some double entries which will therefore add up to over 100%.

Usually there are relatively few alternatives within each grouping of Annex I habitats. It is therefore not difficult to compare them however in some cases there are up to 13 habitats and in these cases it is important to note that the rule based system presents the habitats in the numerical order given in the manual of the Directive. This provides a convenient structure for finding the relative position of a given habitat.

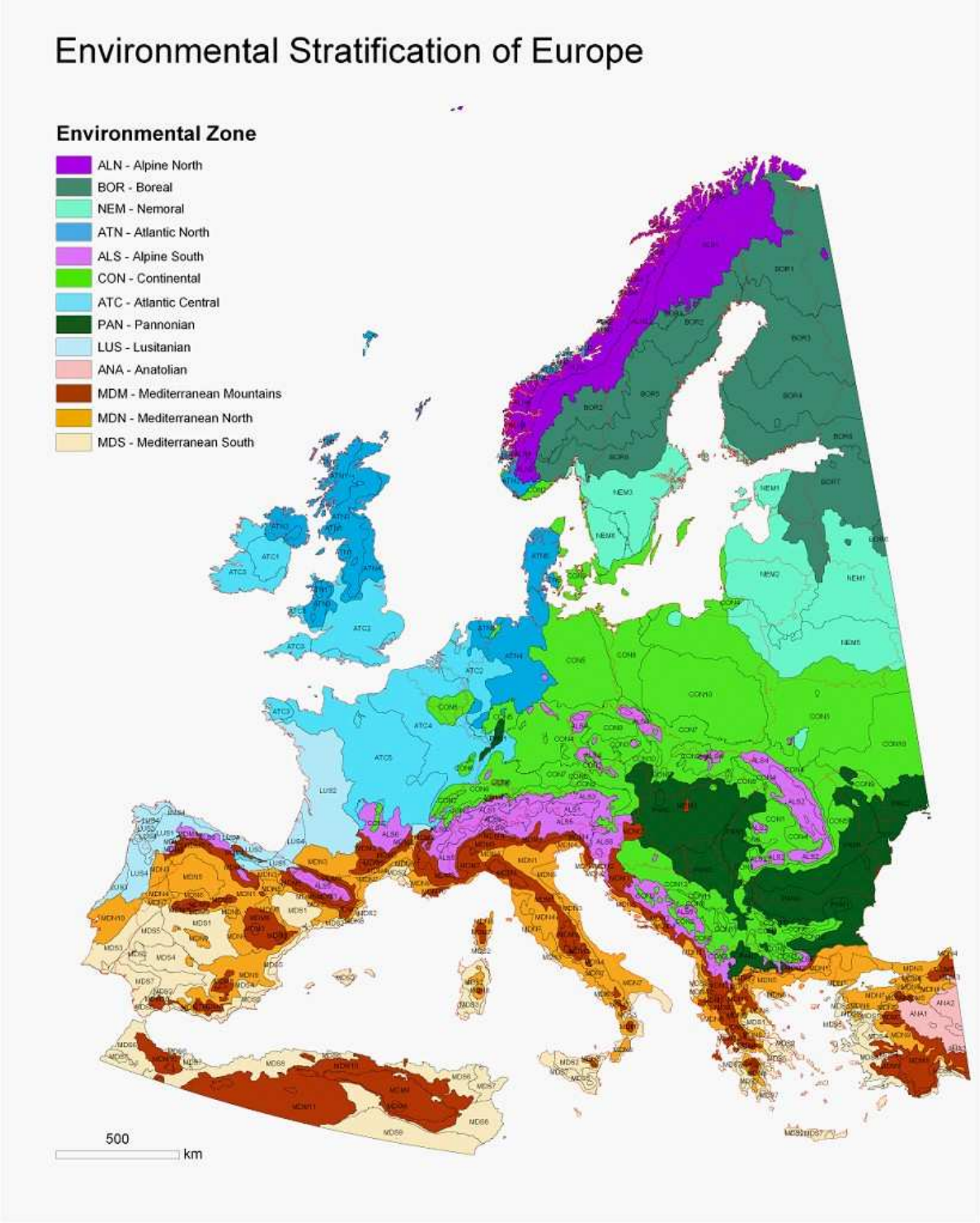

Figure 2. Environmental stratification of Europe (Metzger et al, 2006). The Zones are Alpine North: ALN, Alpine South: ALS, Atlantic North: ATN, Atlantic Central: ATC, Lusitanian: LUS, Boreal: BOR, Nemoral, NEM, Continental: CON, Pannonian: PAN, Mediterranean North: MDN, Mediterranean Mountains: MDM, Mediterranean South: MDS.

The system has already been tested during EBONE meetings in Morbegno (Italy in 2008), Almeria near Madrid and Picos de Europa (Spain in 2009). Workshops to add local information to the rule based system are being held in conjunction with other EBONE work. The first such workshop has already been held in Portugal and confirmed that the structure of the system was valid. Comments from local experts on particular habitats have been included. In addition supplementary local information is being prepared and will be added. Other experts will also be consulted, e.g. in the Netherlands and Slovakia. Inevitably there are many intergrades and local interpretations of the descriptions which need to be added in due course.

In addition indicator species have been added for each Annex I habitat (Chapter 4) that will assist in the classification of the class. How these will be included in the field computer will be decided shortly. Indicators were developed using the following guidelines:

1. In most cases the species were extracted from the Interpretation Manual and supplemented in some cases by personal experience

2. In virtually all habitats at least four species are provided except where the class is very poor in species or sufficient information is not available

3. The first one or two species are in bold and are usually dominant or at least very common. Also species in the title are always included as indicators.

4. The other species were selected from the Manual according to personal experience together with local species that are likely to indicate biogeographical circumstances.

5. In the tree and scrub (TRS) categories the major dominants are given followed by selected ground flora species

It is impossible to cover all variability in interpretation in the rule based system, but the field computer will hold full descriptions from Annex I and other interpretive material from the ETC-BD.

3 Main divisions of the Annex I rule based system

Note that many habitats do not have full combinations of the habitat qualifiers. For the abbreviations see page 5.

The Annex I habitats 8310 Caves not open to the public and 8330 Submerged or partially submerged sea caves are both excluded here because they are underground.

3.1 Summary overview

1 Landscape classes and habitat complexes (consisting of more than three GHC's)
1.1 Coastal landscapes
- 1.1.1 Estuaries (1130)
- 1.1.2 Mudflats and sand flats not covered by seawater at low tide (1140)
- 1.1.3 Coastal lagoons (1150))
- 1.1.4 Large shallow inlets and bays (1160)
- 1.1.5 Islands
- 1.1.6 Boreal Baltic narrow inlets (1650

1.2 Cliffs and screes
- 1.2.1 Vegetated sea cliffs
- 1.2.2 Vegetated Inland Cliffs
- 1.2.3 Screes

1.3 Habitat complexes
- 1.3.1 Coastal complexes of habitat mosaics of Western Ireland and Scotland
- 1.3.2 Karstic features
- 1.3.3 Springs
- 1.3.4 Bogs
- 1.3.5 Beach and coastal dune systems
- 1.3.6 River complexes
- 1.3.7 Agro-forestry systems

2 The element answers the definition of URBAN given in the BioHab manual; not included in Annex I, except point or areas may be present in some landscape classes

3. The element answers the definition of CROPS given in the BioHab manual; not included in Annex I, except for Dehesas (Montados) and Machairs.

4. Sparsely Vegetated
4.1 Sea/Tidal
4.2 Aquatic
4.3 Terrestrial
4.4 Ice/Snow

5. Less than 30% shrub/tree cover, herbaceous (HER)

5.1 Wet land
- 5.1.1 SHY
  - 5.1.1.1 Wet/eutrophic
  - 5.1.1.2 Wet/acid
  - 5.1.1.3 Wet/neutral
  - 5.1.1.4 Wet/basic
  - 5.1.1.5 Wet/saline
- 5.1.2 EHY
  - 5.1.2.1 Aquatic/neutral and Waterlogged/neutral

- 5.1.3 HEL
    - 5.1.3.1 Waterlogged/acid
    - 5.1.3.2 Seasonally wet/eutrophic

5.2 Other herbaceous

- 5.2.1 THE
    - 5.2.1.1 Waterlogged/saline
    - 5.2.1.2 Seasonally wet/eutrophic
    - 5.2.1.3 Seasonally wet/neutral
    - 5.2.1.4 Dry/neutral
    - 5.2.1.5 Very dry/neutral
    - 5.2.1.6 Very dry/basic
    - 5.2.1.7 Xeric/basic
- 5.2.2 LHE/CHE
    - 5.2.2.1 Heavy metal serpentine
    - 5.2.2.2 Waterlogged/acid
    - 5.2.2.3 Waterlogged/basic
    - 5.2.2.4 Seasonally wet/neutral
    - 5.2.2.5 Seasonally wet/basic
    - 5.2.2.6 Moist/acid
    - 5.2.2.7 Moist/neutral
    - 5.2.2.8 Moist/basic
    - 5.2.2.9 Moist/saline
    - 5.2.2.10 Dry/acid
    - 5.2.2.11 Dry/basic
    - 5.2.2.12 Dry/saline
    - 5.2.2.13 Very dry/neutral
    - 5.2.2.14 Very dry/basic
- 5.2.3 CHE
    - 5.2.3.1Seasonally wet/basic
    - 5.2.3.2 Wet/acid
    - 5.2.3.3 Wet/saline
    - 5.2.3.4 Moist/acid
    - 5.2.3.5 Moist/neutral
    - 5.2.3.6 Moist/saline
    - 5.2.3.7 Dry/acid
    - 5.2.3.8 Very dry
    - 5.2.3.9 Very dry/neutral
- 5.2.4 CRY
    - 5.2.4.1 Moist/acid
- 6.1 DCH
- 6.1.1 DCH/DEC
    - 6.1.1.1 Moist/acid
- 6.1.2 DCH/EVR
    - 6.1.2.1 Moist/acid
- 6.2 SCH
- 6.2.1 SCH/DEC
    - 6.2.1.1 Moist/acid
- 6.2.2 SCH/EVR
    - 6.2.2.1 Waterlogged/acid
    - 6.2.2.2 Moist/acid
    - 6.2.2.3 Moist/saline
    - 6.2.2.4 Dry/acid
    - 6.2.2.5 Dry/saline
    - 6.2.2.6 Very dry/neutral
    - 6.2.2.7 Very dry/basic
    - 6.2.2.8 Xeric/neutral
    - 6.2.2.9 Xeric/basic
- 6.3 LPH
- 6.3.1 LPH/DEC
    - 6.3.1.1 Waterlogged/neutral

    - 6.3.1.2 Moist acid
    - 6.3.1.3 Very dry/neutral
- 6.3.2 LPH/EVR
    - 6.3.2.1 Moist/acid
    - 6.3.2.2 Moist/saline
    - 6.3.2.3 Dry/neutral
    - 6.3.2.4 Very dry/neutral
    - 6.3.2.5 Xeric/eutrophic
    - 6.3.2.6 Xeric/neutral
- 6.3.3 LPH/CON
    - 6.3.3.1 Moist/acid
    - 6.3.3.1 Moist/basic
- 6.3.4 LPH/NLE
    - 6.3.4.1 Moist/acid
    - 6.3.4.2 Very dry/neutral
- 6.4 MPH
- 6.4.1 MPH/DEC
    - 6.4.1.1 Moist/neutral
    - 6.4.1.2 Dry/neutral
    - 6.4.1.3 Very dry/basic
- 6.4.2 MPH/EVR
    - 6.4.2.1 Wet/acid
    - 6.4.2.2 Dry/neutral
    - 6.4.2.3 Very dry/neutral
    - 6.4.2.4 Very dry/basic
    - 6.4.2.5 Xeric/eutrophic
    - 6.4.2.6 Xeric/neutral
- 6.4.3 MPH/CON
    - 6.4.3.1 Moist/acid
    - 6.4.3.2 Moist/basic
    - 6.4.3.3 Dry/neutral
    - 6.4.3.4 Very dry/neutral
- 6.4.4 MPH/NLE
    - 6.4.4.1 Moist/acid
- 6.5 TPH
- 6.5.1 TPH/EVR
    - 6.5.1.1 Dry/neutral
    - 6.5.1.2 Very dry/neutral
    - 6.5.1.3 Very dry/basic
- 6.5.2 TPH/CON
    - 6.5.2.1 Very dry/neutral
- 6.6 FPH
- 6.6.1 FPH/DEC
    - 6.6.1.1 Seasonally wet/eutrophic
    - 6.6.1.2 Wet/eutrophic
    - 6.6.1.3 Wet/acid
    - 6.6.1.4 Wet/neutral
    - 6.6.1.5 Moist /acid
    - 6.6.1.6 Moist/neutral
    - 6.6.1.7 Moist/basic
    - 6.6.1.8 Dry/neutral
    - 6.6.1.9 Dry/basic
    - 6.6.1.10 Very dry/neutral
    - 6.6.1.11 Very dry/basic
- 6.6.2 FPH/EVR
    - 6.6.2.1Moist/neutral
    - 6.6.2.2 Very dry/basic
    - 6.6.2.3 Very dry/neutral
    - 6.6.2.4 Xeric/neutral
- 6.6.3 FPH/CON

- 6.6.3.1 Waterlogged/acid
- 6.6.3.2 Wet/acid
- 6.6.3.3 Moist/acid
- 6.6.3.4 Moist/neutral
- 6.6.3.5 Moist/basic
- 6.6.3.6 Dry/acid
- 6.6.3.7 Dry/neutral
- 6.6.3.8 Dry/basic
- 6.6.3.9 Very dry/neutral
- 6.6.3.10 Xeric/neutral

- 6.6.4 FPH/DEC/CON
  - 6.6.4.1 Waterlogged/acid
  - 6.6.4.2 Wet/acid
  - 6.6.4.3 Moist/neutral
  - 6.6.4.4 Dry/neutral
  - 6.6.4.5 Dry/basic

3.2 Complete overview

1 Landscape classes and habitat complexes (consisting of more than three GHC's). Note that habitats marked with XX are often areas below 400 m^2.

1.1 Coastal landscapes

- 1.1.1 Estuaries (1130)
- 1.1.2 Mudflats and sandflats not covered by seawater at low tide (1140)
- 1.1.3 Coastal lagoons (1150)
- 1.1.4 Large shallow inlets and bays (1160)
- 1.1.5 Islands
  - 1.1.5.1 Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation (1610)
  - 1.1.5.2 Boreal Baltic islets and small islands (1620)
- 1.1.6 Boreal Baltic narrow inlets (1650)

1.2 Cliffs and screes

- 1.2.1 Vegetated sea cliffs
  - 1.2.1.1 Vegetated sea cliffs of the Atlantic and Baltic Coasts (1230)
  - 1.2.1.2 Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp. (1240)
  - 1.2.1.3 Vegetated sea cliffs with endemic flora of the Macaronesian coasts (1250)
- 1.2.2 Vegetated Inland Cliffs
  - 1.2.2.1 Calcareous rocky slopes with chasmophytic vegetation (8210)
  - 1.2.2.2 Siliceous rock slopes with chasmophytic vegetation (8220)
  - 1.2.2.3 Siliceous rock with pioneer vegetation of the *Sedo-Scleranthion* or of the *Sedo albi-Veronicion dillenii* (8230)
- 1.2.3 Screes
  - 1.2.3.1 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*, 8110)
  - 1.2.3.2 Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*, 8120)
  - 1.2.3.3 Western Mediterranean and thermophilous scree (8130)
  - 1.2.3.4 Eastern Mediterranean screes (8140)
  - 1.2.3.5 Medio-European upland siliceous screes (8150)
  - 1.2.3.6 Medio-European calcareous scree of hill and montane levels (8160)

1.3 Habitat complexes

- 1.3.1 Machairs (* in Ireland, 21A0)
- 1.3.2 Karstic features
  - 1.3.2.1 Turloughs (3180)

- 1.3.2.2 Lakes of gypsum karst (3190)
- 1.3.2.3 Limestone pavements (8240)

- 1.3.3 Springs
  - 1.3.3.1 Fennoscandian mineral-rich springs and springfens (7160)
  - 1.3.3.2 Petrifying springs with tufa formation (*Cratoneurion*, 7220)
- 1.3.4 Bogs
  - 1.3.4.1 Bogs with dome structure
    - 1.3.4.1.1 Active raised bogs (7110)
    - 1.3.4.1.2 Degraded raised bogs still capable of natural regeneration (7120)
  - 1.3.4.2 Bogs with no dome structure
    - 1.3.4.2.1 Blanket bogs (* if active bog, 7130)
    - 1.3.4.2.2 Transition mires and quaking bogs (7140)
    - 1.3.4.2.3 Aapa mires (7310)
  - 1.3.4.3 Mires with permafrost, with or without peat mounds
    - 1.3.4.3.1 With mounds or Palsa mires (7320)
- 1.3.5 Beach and coastal dune systems
  - 1.3.5.1 Boreal Baltic sandy beaches with perennial vegetation (1640)
  - 1.3.5.2 Dune systems
    - 1.3.5.2.1 Embryonic shifting dunes (2110)XX
    - 1.3.5.2.2 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes', 2120)
    - 1.3.5.2.3 Fixed coastal dunes with herbaceous vegetation ("grey dunes', 2130)
    - 1.3.5.2.4 *Crucianellion maritimae* fixed beach dunes (2210)
    - 1.3.5.2.5 Wooded dunes of the Atlantic, continental and Boreal region (2180)
    - 1.3.5.2.6 Humid dune slacks (2190)
- 1.3.6 River complexes
  - 1.3.6.1.1 Fennoscandian natural rivers (3210) in lowlands as well
  - 1.3.6.2 Rivers linked to Alpine and mountain regions
    - 1.3.6.2.1 Alpine rivers and the herbaceous vegetation along their banks ((3220)
    - 1.3.6.2.2 Alpine rivers and their ligneous vegetation with *Myricaria germanica* (3230)
    - 1.3.6.2.3 Alpine rivers and their ligneous vegetation with *Salix elaeagnos* (3240)
  - 1.3.6.3 Mediterranean rivers
    - 1.3.6.3.1 Constantly flowing Mediterranean rivers with *Glaucium flavum* (3250)
    - 1.3.6.3.2 Constantly flowing Mediterranean rivers with *Paspalo-Agrostidion* species and hanging curtains of *Salix* and *Populus alba* (3280)
    - 1.3.6.3.3 Intermittently flowing Mediterranean rivers of the *Paspalo-Agrostidion* (3290)
- 1.3.7 Agro-forestry systems
    - 1.3.7.1 Dehesas with evergreen *Quercus* spp. (6310)
    - 1.3.7.2 Fennoscandian wooded meadows (6530)

2 The element answers the definition of URBAN given in the BioHab manual; not included in Annex I, except point or areas may be present in some landscape classes

3. The element answers the definition of CROPS given in the BioHab manual; not included in Annex I, except for Dehesas/Montados (see 1.3.7) and Machairs (see 1.3.1)

4. Sparsely vegetated by vascular plants

4.1 SEA/TIDAL (SEA/TID)

- 4.1.1 Reefs (1170)
- 4.1.2 Submarine structures made by leaking gasses (1180)

4.2 AQUATIC (AQU)
- 4.2.1 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp (3140)XX

4.3 TERRESTRIAL (TER)
- 4.3.1 Fields of lava and natural excavations (8320)

4.4 ICE/SNOW (ICE)
- 4.4.1 Permanent glaciers (8340)

5. Less than 30% shrub/tree cover, herbaceous (HER)

5.1 Wetland
- 5.1.1 SHY
  - 5.1.1.1 Wet/eutrophic
    - 5.1.1.1.1 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* —type vegetation (3150)XX
  - 5.1.1.2 Wet/acid
    - 5.1.1.2.1 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*, 3110)XX
    - 5.1.1.2.2 Oligotrophic waters containing very few minerals generally on sandy soils of the West Mediterranean, with *Isoetes* spp. (3120)XX
    - 5.1.1.2.3 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletalia uniflorae* and/or of the *Isoëto-Nanojuncetea* (3130)XX
    - 5.1.1.2.4 Natural dystrophic lakes and ponds (3160)
  - 5.1.1.3 Wet/neutral
    - 5.1.1.3.1 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletalia uniflorae* and/or of the *Isoëto-Nanojuncetea* (3130) XX
    - 5.1.1.3.2 Transylvanian hot-spring lotus beds (31A0) XX
  - 5.1.1.4 Wet/basic
    - 5.1.1.4.1 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) XX
  - 5.1.1.5 Wet/saline
    - 5.1.1.5.1 Sandbanks which are slightly covered by sea water all the time (1110)
    - 5.1.1.5.2 *Posidonia* beds (*Posidonion oceanicae*, 1120)
- 5.1.2 EHY
  - 5.1.2.1 Aquatic/neutral and Waterlogged/neutral
    - 5.1.2.1.1 Calcareous fens with *Cladium mariscus* and species of the *Caricion davalianae* (7210)
- 5.1.3 HEL
  - 5.1.3.1 Waterlogged/acid
    - 5.1.3.1.1 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)XX
  - 5.1.3.2 Seasonally wet/eutrophic
    - 5.1.3.2.1 Depressions on peat substrates of the *Rhynchosporion* (7150)XX

5.2 Other herbaceous
- 5.2.1 THE
  - 5.2.1.1 Waterlogged/saline
    - 5.2.1.1.1 *Salicornia* ssp and other annuals colonizing mud and sand (1310)XX
  - 5.2.1.2 Seasonally wet/eutrophic
    - 5.2.1.2.1 Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270)XX

- 5.2.1.3 Seasonally wet/neutral
  - 5.2.1.3.1 Mediterranean temporary ponds (3170)XX
- 5.2.1.4 Dry/neutral
  - 5.2.1.4.1 Malcolmietalia dune grasslands (2230)XX
- 5.2.1.5 Very dry/neutral
  - 5.2.1.5.1 Dunes with *Euphorbia terracina* (2220)XX
  -
  - 5.2.1.5.2 Inland dunes with open *Corynephorus* and *Agrostis* grasslands (2330)XX
  - 5.2.1.5.3 Pannonic inland dunes (2340)
  - 5.2.1.5.4 Pannonic sand steppes (6260) (ontbreekt verderop)
- 5.2.1.6 Very dry/basic
  - 5.2.1.6.1 *Brachypodietalia* dune grasslands with annuals (2240)XX
  - 5.2.1.6.2 Rupicolous calcareous or basophilic grasslands of the *Alysso-Sedion albi* (6110)XX
- 5.2.1.7 Xeric/basic
  - 5.2.1.7.1 Xeric sand calcareous grasslands (6120)XX
  - 5.2.1.7.2 Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea* (6220)

5.2.2 LHE/CHE

- 5.2.2.1 Heavy metal serpentine
  - 5.2.2.1.1 Calaminarian grasslands of the *Violetalia calaminariae* (6130)XX
  - 5.2.2.1.2 Serpentinophilous grassland of Cyprus (62B0)
- 5.2.2.2 Waterlogged/acid
  - 5.2.2.2.1 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*, 6410)
- 5.2.2.3 Waterlogged/basic
  - 5.2.2.3.1 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*, 6410)
- 5.2.2.4 Seasonally wet/neutral
  - 5.2.2.4.1 Alluvial meadows of river valleys of the *Cnidion dubii* (6440)
  - 5.2.2.4.2 Northern boreal alluvial meadows (6450)
- 5.2.2.5 Seasonally wet/basic
  - 5.2.2.5.1 Peat grasslands of Troodos (6460)XX
- 5.2.2.6 Moist/acid
  - 5.2.2.6.1 Fennoscandian lowland species-rich dry to mesic grasslands (6270)
  - 5.2.2.6.2 Siliceous Pyrenean *Festuca eskia* grasslands (6140)
  - 5.2.2.6.3 Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in continental Europe, 6230)
- 5.2.2.7 Moist/neutral
  - 5.2.2.7.1 Macaronesian mesophile grasslands (6180)
  - 5.2.2.7.2 Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in continental Europe, 6230)
  - 5.2.2.7.3 Mediterranean tall humid herb grasslands of the *Molinio-Holoschoenion* (6420)
  - 5.2.2.7.4 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis* 6510)
  - 5.2.2.7.5 Mountain hay meadows (6520)
- 5.2.2.8 Moist/basic
  - 5.2.2.8.1 Nordic alvar and precambrian calcareous flat rocks (6280)XX
- 5.2.2.9 Moist/saline
  - 5.2.2.9.1 Annual vegetation of drift lines (1210)XX
  - 5.2.2.9.2 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*, 1330)
  - 5.2.2.9.3 Inland salt meadows (1340)XX

        - 5.2.2.9.4 Boreal Baltic coastal meadows (1630)
    - 5.2.2.10 Dry/acid
        - 5.2.2.10.1 Fennoscandian lowland species-rich dry to mesic grasslands (6270)
    - 5.2.2.11 Dry/basic
        - 5.2.2.11.1 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*, * important orchid sites, 6210)
    - 5.2.2.12 Dry/saline
        - 5.2.2.12.1 Mediterranean salt meadows (*Juncetalia maritimae*, 1410)XX
        - 5.2.2.12.2 Mediterranean salt steppes (*Limonietalia*, 1510)
        - 5.2.2.12.3 Pannonic salt steppes and salt marshes (1530)
    - 5.2.2.13 Very dry/neutral
        - 5.2.2.13.1 Sub-pannonic steppic grasslands (6240)
        - 5.2.2.13.2 Pannonic loess steppic grasslands (6250)
        - 5.2.2.13.3 Eastern sub-Mediterranean dry grasslands (*Scorzoneratalia villosae*, 62A0)
        - 5.2.2.13.4 Ponto-Sarmatic steppes (62C0)
    - 5.2.2.14 Very dry/basic
        - 5.2.2.14.1 Rupicolous pannonic grasslands (*Stipo-Festucetalia pallentis*, 6190)

- 5.2.3 CHE
    - 5.2.3.1 Seasonally wet/basic
        - 5.2.3.1.1 peat grasslands of Troodos (6460)
    - 5.2.3.2 Wet/acid
        - 5.2.3.2.1 Alkaline fens (7230)
    - 5.2.3.3 Wet/saline
        - 5.2.3.3.1 *Spartina* swards (*Spartinion maritimae*, 1320)
    - 5.2.3.4 Moist/acid
        - 5.2.3.4.1 Siliceous alpine and boreal grasslands (6150)
        - 5.2.3.4.2 Oro-Iberian *Festuca indigesta* grasslands (6160)
        - 5.2.3.4.3 Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe, 6230)
        - 5.2.3.4.4 Fennoscandian lowland species-rich dry to mesic grasslands (6270)
        - 5.2.3.4.5 Alpine pioneer formations of *Caricion bicoloris-atrofuscae* (7240)XX
    - 5.2.3.5 Moist/neutral
        - 5.2.3.5.1 Species-rich Nardus grasslands, on siliceous substrates in mountain areas and submountain areas, in continental Europe (6230)
    - 5.2.3.6 Moist/saline
        - 5.2.3.6.1 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae* 1330)
        - 5.2.3.6.2 Inland salt meadows (1340)XX
    - 5.2.3.7 Dry/acid
        - 5.2.3.7.1 Fennoscandian lowland species-rich dry to mesic grasslands 6270
    - 5.2.3.8 Very dry/acid
        - 5.2.3.8.1 Oro-Moesian acidophilous grasslands (62D0)
    - 5.2.3.9 Very dry/neutral
        - 5.2.3.9.1 Ponto-Sarmatic steppes 62C0
        - 5.2.3.9.2 Oro-Moesian acidophilous grasslands (62D0)
- 5.2.4 CRY
    - 5.2.4.1 Moist/acid
        - 5.2.4.1.1 Siliceous alpine and Boreal grasslands (6150)

- 6.1 DCH

- 6.1.1 DCH/DEC
  - 6.1.1.1 Moist/acid
    - 6.1.1.1.1 Sub-Arctic *Salix* spp. Scrub (4080)XX
    - 6.1.1.1.2 Siliceous alpine and Boreal grasslands (6150)
- 6.1.2 DCH/EVR
  - 6.1.2.1 Moist/acid
    - 6.1.2.1.1 Alpine and Boreal heaths (4060)

- 6.2 SCH
- 6.2.1 SCH/DEC
  - 6.2.1.1 Moist/acid
    - 6.2.1.1.1 Sub-Arctic *Salix* spp. Scrub (4080)XX
- 6.2.2 SCH/EVR
  - 6.2.2.1 Waterlogged/acid
    - 6.2.2.1.1 Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix* (4020)
  - 6.2.2.2 Moist/acid
    - 6.2.2.2.1 Decalcified fixed dunes with *Empetrum nigrum* (2140)
    - 6.2.2.2.2 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*, 2150)
    - 6.2.2.2.3 Dry sand heaths with *Calluna* and *Empetrum nigrum* (2320)
    - 6.2.2.2.4 European dry heaths (4030)
    - 6.2.2.2.5 Alpine and Boreal heaths (4060)
  - 6.2.2.3 Moist/saline
    - 6.2.2.3.1 Perennial vegetation of stony banks (1220)XX
    - 6.2.2.3.2 Mediterranean and thermo-Atlantic halophilous scrub (*Sarcocornetea fruticosi*, 1420)
  - 6.2.2.4 Dry/basic
    - 6.2.2.4.1 *Cistus palhinhae* formations on maritime wet heaths (5140)XX
  - 6.2.2.5 Dry/saline
    - 6.2.2.5.1 Mediterranean salt steppes (*Limonietalia,* 1510)
  - 6.2.2.6 Very dry/neutral
    - 6.2.2.6.1 *Cisto-Lavenduletalia* dune sclerophyllous scrubs (2260)
  - 6.2.2.7 Very dry/basic
    - 6.2.2.7.1 Iberian gypsum vegetation (*Gypsophiletalia*, 1520)
  - 6.2.2.8 Xeric/neutral
    - 6.2.2.8.1 Thermo-Mediterranean and pre-desert scrub (5330)
    - 6.2.2.8.2 Endemic phryganas of the *Euphorbio-Verbascion* (5340)XX
  - 6.2.2.9 Xeric/basic
    - 6.2.2.9.1 Thermo-mediterranean and pre-desert scrub (5330)

- 6.3 LPH
- 6.3.1 LPH/DEC
  - 6.3.1.1 Waterlogged/neutral
    - 6.3.1.1.1 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210)
  - 6.3.1.2 Moist/acid
    - 6.3.1.2.1 Sub-Arctic *Salix* spp. Scrub (4080)XX
  - 6.3.1.3 Very dry/neutral
    - 6.3.1.3.1 Subcontinental peri-Pannonic scrub (40A0)XX
- 6.3.2 LPH/EVR
  - 6.3.2.1 Moist/acid
    - 6.3.2.1.1 Decalcified fixed dunes with *Empetrum nigrum* (2140)
    - 6.3.2.1.2 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*, 2150)
    - 6.3.2.1.3 Dry sand heaths with *Calluna* and *Genista* (2310)
    - 6.3.2.1.4 Dry sand heaths with *Calluna* and *Empetrum nigrum* (2320)
    - 6.3.2.1.5 European dry heaths (4030)
    - 6.3.2.1.6 Dry Atlantic coastal heaths with *Erica vagans* (4040)
  - 6.3.2.2 Moist/saline

        - 6.3.2.2.1 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*, 1420)
    - 6.3.2.3 Dry/neutral
        - 6.3.2.3.1 Endemic oro-Mediterranean heaths with gorse (4090)
    - 6.3.2.4 Very dry/neutral
        - 6.3.2.4.1 *Cisto-Lavenduletalia* dune sclerophyllous scrubs (2260)
    - 6.3.2.5 Xeric/eutrophic
        - 6.3.2.5.1 Halo-nitrophilous scrubs (*Pegano-Salsoletea*) (1430)
    - 6.3.2.6 Xeric/neutral
        - 6.3.2.6.1 Arborescent matorral with *Zyziphus* (5220)
        - 6.3.2.6.2 Low formations of *Euphorbia* close to cliffs (5320)
        - 6.3.2.6.3 Thermo-Mediterranean and pre-desert scrub (5330)
        - 6.3.2.6.4 Endemic phryganas of the *Euphorbio-Verbascion* (5430)

- 6.3.3 LPH/CON
    - 6.3.3.1 Moist/acid
        - 6.3.3.1.1 Alpine and Boreal heaths (4060)
        - 6.3.3.1.2 *Juniperus communis* formations on heaths or calcareous grasslands (5130)
    - 6.3.3.2 Moist/basic
        - 6.3.3.2.1 *Juniperus communis* formations on heaths or calcareous grasslands (5130)
- 6.3.4 LPH/NLE
    - 6.3.4.1 Moist/basic
        - 6.3.4.1.1 Mountain *Cytisus purgans* formations (5120)
    - 6.3.4.2 Very dry/neutral
        - 6.3.4.2.1 Endemic oro-Mediterranean heaths with gorse (4090)
- 6.4 MPH
- 6.4.1 MPH/DEC
    - 6.4.1.1 Moist/neutral
        - 6.4.1.1.1 Dunes with *Hippophae rhamnoides* (2160)
    - 6.4.1.2 Very dry/neutral
        - 6.4.1.2.1 Rhodope *Potentilla fruticosa* thickets (40B0)XX
    - 6.4.1.3 Very dry/basic
        - 6.4.1.3.1 Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (*Berberidion* p.p., 5110)XX
- 6.4.2 MPH/EVR
    - 6.4.2.1 Wet/acid
        - 6.4.2.1.1 Alpine and Boreal heaths (4060)
        - 6.4.2.1.2 Bushes with *Pinus mugo* and *Rhododendron hirsutum* (4070)
    - 6.4.2.2 Dry/neutral
        - 6.4.2.2.1 Endemic Macaronesian heaths (4050)
    - 6.4.2.3 Very dry/neutral
        - 6.4.2.3.1 Arborescent matorral with *Laurus nobilis* (5230)
        - 6.4.2.3.2 Riparian formations on intermittent Mediterranean water courses with *Rhododendron ponticum, Salix* and others (92B0)XX
    - 6.4.2.4 Very dry/basic
        - 6.4.2.4.1 Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (*Berberidion* p.p., 5110)
    - 6.4.2.5 Xeric/eutrophic
        - 6.4.2.5.1 Halo-nitrophilous scrubs (*Pegano-Salsoletea,* 1430)
    - 6.4.2.6 Xeric/neutral
        - 6.4.2.6.1 Arborescent matorral with *Zyziphus* (5220)
        - 6.4.2.6.2 Low formations of *Euphorbia* close to cliffs (5320)XX
        - 6.4.2.6.3 Thermo-Mediterranean and pre-desert scrub (5330)
- 6.4.3 MPH/CON
    - 6.4.3.1 Moist/acid
        - 6.4.3.1.1 Bushes with *Pinus mugo* and *Rhododendron hirsutum* (4070)

        - 6.4.3.1.2 *Juniperus communis* formations on heaths or calcareous grasslands (5130)
    - 6.4.3.2 Moist/basic
        - 6.4.3.2.1 *Juniperus communis* formations on heaths or calcareous grasslands (5130)
    - 6.4.3.3 Dry/neutral
        - 6.4.3.3.1 Coastal dunes with *Juniperus spp.* (2250)
    - 6.4.3.4 Very dry/neutral
        - 6.4.3.4.1 Arborescent matorral with *Juniperus spp*. (5210)
        - 6.4.3.4.2 Endemic forests with *Juniperus spp*. (9560)
- 6.4.4 MPH/NLE
    - 6.4.4.1 Moist/acid
        - 6.4.4.1.1 Mountain *Cytisus purgans* formations (5120)
- 6.5 TPH
- 6.5.1 TPH/EVR
    - 6.5.1.1 Dry/neutral
        - 6.5.1.1.1 Riparian formations on intermittent Mediterranean water courses with *Rhododendron ponticum*, *Salix* and others (92B0)XX
        - 6.5.1.1.2 Endemic Macaronesian heaths (4050)
    - 6.5.1.2 Very dry/neutral
        - 6.5.1.2.1 Arborescent matorral with *Laurus nobilis* (5230)
        - 6.5.1.2.2 *Laurus nobilis* thickets (5310)
        - 6.5.1.2.3 Southern riparian galleries (92D0)
    - 6.5.1.3 Very dry/basic
        - 6.5.1.3.1 Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (*Berberidion* pp., 5110)
- 6.5.2 TPH/CON
    - 6.5.2.1 Very dry/neutral
        - 6.5.2.1.1 Arborescent matorral with *Juniperus spp*. (5210)
        - 6.5.2.1.2 Endemic forests with *Juniperus spp*. (9560)
- 6.6 FPH
- 6.6.1 FPH/DEC
    - 6.6.1.1 Seasonally wet/eutrophic
        - 6.6.1.1.1 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*, 91E0)XX
        - 6.6.1.1.2 *Salix alba* and *Populus alba* galleries (92A0)XX
    - 6.6.1.2 Wet/eutrophic
        - 6.6.1.2.1 Fennoscandinavian deciduous swamp woods (9080)
        - 6.6.1.2.2 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*, 91E0)XX
    - 6.6.1.3 Wet/acid
        - 6.6.1.3.1 Natural forests of primary succession stages of land upheaval coast (9030)
        - 6.6.1.3.2 Nordic subalpine/subarctic forests with *Betula pubescens spp czerrpanovii,* 9040)
    - 6.6.1.4 Wet/neutral
        - 6.6.1.4.1 Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris,* 91F0)
    - 6.6.1.5 Moist /acid
        - 6.6.1.5.1 *Luzulo-Fagetum beech* forests (9110)
        - 6.6.1.5.2 Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrub la*yer (Quercion robori-petraeae* or *Ilici-Fagion,* 9120)
        - 6.6.1.5.3 Old acidophilous oak woods with *Quercus robur* on sandy plains (9190)
        - 6.6.1.5.4 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0)
        - 6.6.1.5.5 Galicio-Portuguese oak woods with *Quercus robur* and *Quercus pyrenaica* (9230)

        - 6.6.1.5.6 *Castenea sativa* Woods (9260)
    - 6.6.1.6 Moist/neutral
        - 6.6.1.6.1 Wooded dunes of the Atlantic, Continental and Boreal region (2180)
        - 6.6.1.6.2 Fennoscandian hemiboreal natural old broad-leaved deciduous forests (*Quercus, Tilia, Acer, Fraxinus or Ulmus*) rich in epiphytes (9020)
        - 6.6.1.6.3 Medio-European subalpine beech woods with *Acer* and *Rumex arifolius* (9140)
        - 6.6.1.6.4 Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli* (9160)
        - 6.6.1.6.5 *Galio-Carpinetum* oak-hornbeam forests (9170)
        - 6.6.1.6.6 *Tilio-Acerion* forests of slopes, screes and ravines (9180)
        - 6.6.1.6.7 Thermophilous *Fraxinus excelsior* woods (91B0)
        - 6.6.1.6.8 *Platanus orientalis* and *Liquidambar orientalis* woods (92C0)
    - 6.6.1.7 Moist/basic
        - 6.6.1.7.1 *Asperulo-Fagetum* beech forests (9130)
        - 6.6.1.7.2 Illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*, 91K0)
    - 6.6.1.8 Dry/neutral
        - 6.6.1.8.1 Natural forests of primary succession stages of land upheaval coast (9030)
        - 6.6.1.8.2 Pannonic woods with *Quercus petraea* and *Carpinus betulus* (91G0)
        - 6.6.1.8.3 Dacian oak & hornbeam forest (91Y0)
        - 6.6.1.8.4 Moesian silver lime wood (91Z0)
        - 6.6.1.8.5 Illyrian oak-hornbeam forests (*Erythronio-Carpinion*, 91L0)
        - 6.6.1.8.6 Pannonian-Balkanic turrule based system turkey oak – sessile oak forests (91M0)
        - 6.6.1.8.7 *Quercus trojana* woods (9250)
        - 6.6.1.8.8 *Quercus frainetto* woods (9280)
        - 6.6.1.8.9 Aegean *Quercus brachyphylla* woods (9310)

        Beech forests:
        - 6.6.1.8.10 Dacian Beech forests (*Symphyto-Fagion*, 91V0)
        - 6.6.1.8.11 Moesian beech forests (91W0)
        - 6.6.1.8.12 Dobrogean beech forests (91X0)
        - 6.6.1.8.13 Western Pontic beech forests (91S0)
    - 6.6.1.9 Dry/basic
        - 6.6.1.9.1 Medio-European limestone beech forests of the *Cephalanthero-Fagion* (9150)
        - 6.6.1.9.2 Euro-Siberian steppic woods with *Quercus* spp. (91H0)
        - 6.6.1.9.3 *Quercus faginea* and *Quercus canariensis* Iberian woods (9240)
    - 6.6.1.10 Very dry/neutral
        - 6.6.1.10.1 Ponto-Sarmatic deciduous thickets (40C0)
        - 6.6.1.10.2 Euro-Siberian steppic woods with *Quercus* spp. (91I0)
        - 6.6.1.10.3 Eastern white oak woods (91AA)
        - 6.6.1.10.4 Scrub and low forest vegetation with *Quercus alnifolia* (9390)
    - 6.6.1.11 Very dry/basic
        - 6.6.1.11.1 Woodlands with *Quercus infectoria* (*Anagyro foetidae-Quercetum infectoriae,* 93A0)
- 6.6.2 FPH/EVR
    - 6.6.2.1 Moist/neutral
        - 6.6.2.1.1 Forests of *Ilex aquifolium* (9380)
    - 6.6.2.2 Very dry/basic
        - 6.6.2.2.1 *Quercus suber* forests (9330)
        - 6.6.2.2.2 *Quercus ilex* and *Quercus rotundifolia* woods (9340)
    - 6.6.2.3 Very dry/neutral
        - 6.6.2.3.1 Southern riparian galleries (92D0)
        - 6.6.2.3.2 *Olea* and *Ceratonia* woods (9320)

        - 6.6.2.3.3 *Quercus macrolepis* forests (9350)
        - 6.6.2.3.4 Macaronesian laurel forests with *Laurus azorica, Ocotea foetens* (9360)
    - 6.6.2.4 Xeric/neutral
        - 6.6.2.4.1 Palm groves of *Phoenix (*9370)
- 6.6.3 FPH/CON
    - 6.6.3.1 Waterlogged/acid
        - 6.6.3.1.1 Bog woodland (91D0)
    - 6.6.3.2 Wet/acid
        - 6.6.3.2.1 Natural forests of primary succession stages of land upheaval coast (9030)
    - 6.6.3.3 Moist/acid
        - 6.6.3.3.1 Western Taiga (9010)
        - 6.6.3.3.2 Caledonian forest (91C0)
        - 6.6.3.3.3 Holy Cross fir forest*, Abietetum polonicum* (91P0)
        - 6.6.3.3.4 Acidophilous *Picea* forests of the montane to alpine levels, *Vaccinio-Piceetea* (9410)
        - 6.6.3.3.5 Alpine *Larix decidua* and/or *Pinus cembra* forests (9420)
    - 6.6.3.4 Moist/neutral
        - 6.6.3.4.1 Wooded dunes with *Pinus pinea* and/or *Pinus pinaster* (2270)
        - 6.6.3.4.2 Fennoscandian herb-rich forests with *Picea abies* (9050)
        - 6.6.3.4.3 Coniferous forests on, or connected to, glaciofluvial eskers (9060)
        - 6.6.3.4.4 *Taxus baccata* woods of the British Isles (91J0)
        - 6.6.3.4.5 Southern Apennine *Abies alba* forests (9510)
        - 6.6.3.4.6 Mediterranean *Taxus baccata* woods (9580)
    - 6.6.3.5 Moist/basic
        - 6.6.3.5.1 Subalpine and montane *Pinus uncinata* forests (*if on gypsum or limestone, 9430)
        - 6.6.3.5.2 (Sub-)Mediterranean pine forests with endemic black pines (9530)
    - 6.6.3.6 Dry/acid
        - 6.6.3.6.1 Western Taiga (9010)
        - 6.6.3.6.2 Central European lichen Scots pine forests (91T0)
        - 6.6.3.6.3 Sarmatic steppe pine forest (91U0)
    - 6.6.3.7 Dry/neutral
        - 6.6.3.7.1 Moesian silver fir forests (91BA)
        - 6.6.3.7.2 Rhodopide and Balkan Range Scots pine forests (91CA)
        - 6.6.3.7.3 Mediterranean pine forests with endemic Mesogean pines (9540)
        - 6.6.3.7.4 Canarian endemic pine forests (9550)
        - 6.6.3.7.5 *Cedrus brevifolia* forests (*Cedrosetum breviofoliae*, 9590)
        - 6.6.3.7.6 High oro-Mediterranean pine forest (95A0)
    - 6.6.3.8 Dry/basic
        - 6.6.3.8.1 Western Carpathian calcicolous *Pinus sylvestris* forests (91Q0)
        - 6.6.3.8.2 Dinaric dolomite Scots pine forests (*Genisto januensis-Pinetum,* 91R0)
    - 6.6.3.9 Very dry/neutral
        - 6.6.3.9.1 *Cupressus* forests (*Acero-Cupression,* 9290)
    - 6.6.3.10 Xeric/neutral
        - 6.6.3.10.1 *Abies pinsapo* forests (9520)
        - 6.6.3.10.2 *Tetraclinis articulata* forests (9570)
- 6.6.4 FPH/DEC/CON
    - 6.6.4.1 Waterlogged/acid
        - 6.6.4.1.1 Bog woodland (91D0)
    - 6.6.4.2 Wet/acid
        - 6.6.4.2.1 Natural forests of primary succession stages of land upheaval coast (9030)

- 6.6.4.3 Moist/neutral
  - 6.6.4.3.1 Coniferous forests on, or connected to, glaciofluvial eskers (9060)
  - 6.6.4.3.2 Fennoscandian wooded pastures (9070)
  - 6.6.4.3.3 Apennine beech forests with *Taxus baccata* and *Ilex aquifolium* (9210)
  - 6.6.4.3.4 Apennine beech forests with *Abies alba* and beech forests with *Abies nebrodensis (*9220)
- 6.6.4.4 Dry/neutral
  - 6.6.4.4.1 Pannonic inland sand dune thicket (*Junipero-Populetum albae*, 91N0)
  - 6.6.4.4.2 Moesian silver fir forests (91BA)
  - 6.6.4.4.3 Hellenic beech forests with *Abies borisii-regis* (9270)
- 6.6.4.5 Dry/basic
  - 6.6.4.5.1 Western Carpathian calcicolous *Pinus sylvestris* forests (91Q0)

4 Rule based system of Annex I habitats

In the rule based system for identification of Annex I habitats the following criteria have been used:

- GHC's present including environmental qualifiers (Bunce et al, 2005, 2008)
- Distribution in Environmental zones including altitudinal bands (Metzger et al 2006)
- For habitat categories (section 4.2): environmental qualifiers have been added
- Mapping rules
- Indicator plant species (in bold : dominant/general indicator species)

4.1 Landscape classes and habitat complexes

Category 1: landscape classes and Habitat complexes

1 .1 Coastal landscapes

1.1.1 European Estuaries

GHC (BioHab):	SEA+TER+SHY+EHY+CHE+LHE/CHE + Shallow coastlines + expert knowledge.
Distribution:	BOR+NEM+ATN+CON+ATC+LUS+MDN+MDS
Mapping rules:	SEA river mouths
Indicators:	***Spartina maritima*****,** *Zostera noltii*
1130	Estuaries

1.1.2 European mudflats and sand flats

GHC (BioHab):	TID+TER+SHY+EHY+CHE+LHE/CHE
Distribution:	BOR+NEM+ATN+CON+ATC+LUS+MDN+MDS
Mapping rules:	Between high and low water mark + mud and / or sand.
Indicators:	***Zostera noltii,*** *Salicornia spp, Puccinella maritima*
1140	Mudflats and sand flats not covered by seawater at low tide

1.1.3 Coastal lagoons

GHC (BioHab):	AQU+TER+SHY+EHY+CHE+LHE/CHE. Mainly SHY with locally patches of EHY + brackish to salt water + highly saline + shallow water separated from sea in lagoons or ponds.
Distribution:	BOR+NEM+PAN+ATN+CON+ATC+LUS+MDN+MDS
Mapping rules:	Coastal lagoons in CLC which will miss small patches.
Indicators:	***Phragmites australis****, Chara ssp., Potamogeton ssp., Ruppia spp.*
1150	Coastal lagoons

1.1.4 Large shallow inlets and bays

GHC (BioHab):	SEA+TER+SHY+EHY+CHE+LHE/CHE coastal indentations+ expert knowledge
Distribution:	BOR+NEM+ATN+CON+ATC+LUS+MDN+MDS
Mapping rules:	A landscape level class which will be difficult to separate from 1130 which only differs from 1160 in being influenced by freshwater. A combined map would be indicative of their likely distribution by using the same ENZ's.
Indicators:	***Zostera spp.*****,** ***Potamogeton spp****.,* benthic algae
1160	Large shallow inlets and bays

1.1.5 Islands

1.1.5.1 Baltic esker islands

GHC (BioHab):	SEA + TID + SEA/TID + TER + islands + expert knowledge
Distribution:	BOR+NEM
Mapping rules:	Mask of Baltic islands.
Indicators:	***Honkenya peploides, Cakile maritima****, Fucus vesiculosus,*
1610	Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation

1.1.5.2 Baltic islets

GHC (BioHab):	SEA + TID + SEA/TID + islands + expert knowledge.
Distribution:	BOR+NEM+CON
Mapping rules:	Needs to be separated from 1610 by presence of rocky coast otherwise distribution the same, but Baltic + definition of islets as opposed to islands.
Indicators:	***Agrostis stolonifera****, Allium schoenoprasum, Cochlearia danica, Cladophora spp., Silene visc*osa.
1620	Boreal Baltic islets and small islands

1.1.6 Boreal Baltic narrow inlets

GHC (BioHab):	Coastal landscape + SHY + EHY + HEL + CHE + LHE + SPV/TER + mildly saline
Distribution:	BOR+NEM+CON
Mapping rules:	BOR+NEM+CON + inlets and bays + mildly saline
Indicators:	***Phragmites australis****, Potamogeton perfoliatus, Hippuris vulgaris*
1650	Boreal Baltic narrow inlets

1.2 Cliffs and screes

All cliffs and screes will have a proportion of SPV/TER but are included here as a geomorphological category because the cover of vegetation may be over 30% and will not therefore appear in the rule based system whereas cliff formations (over 5m) of rock or occasionally softer material, are readily recognised.

1.2.1 Vegetated sea cliffs

Cliffs that are adjacent to the coast and affected by salt spray. May have over 30% vegetation but at least 10% vegetation.

1.2.1.1 Atlantic and Baltic

GHC (BioHab):	Sea cliff +CHE+LHE+ LHE/CHE+SCH/EVR+TER + coastal + saline tolerant species + expert knowledge.
Distribution:	BOR+NEM+ATN+CON+ATC+LUS+MDN
Mapping rules:	Atlantic coast rules + coastal mask 100 m + local height differences.
Indicators:	***Brassica oleracea, Cochlearia officinalis****, Asplenium marinum, Inula crithmoides*.
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts

1.2.1.2 Mediterranean coasts with endemic *Limonium*

GHC (BioHab):	Sea cliff + CHE + LHE + LHE/CHE + SCH/EVR + TER + saline tolerant species + expert knowledge.
Distribution:	MDN+MDS
Mapping rules:	Coastal mask 100 m + rocky – accuracy depends on Limonium spp.
Indicators:	***Crithmum maritimum, Limonium*** **spp.,** *Asteriscus maritimus, Plantago subulata*
1240	Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp.

1.2.1.3 Endemic flora of the Macaronesian coasts

GHC (BioHab):	Sea cliff + CHE + LHE + LHE/CHE+ SCH/EVR + TER + saline tolerant species.
Distribution:	Macaronesia only
Mapping rules:	Macaronesia only.
Indicators:	***Festuca petraea***, *Limonium pectinatum*, *Frankenia ericifolia,*
1250	Vegetated sea cliffs with endemic flora of the Macaronesian coasts

1.2.2 Vegetated Inland Cliffs

Cliffs usually of rock, although in deserts they may be formed by softer materials. Eroded mud cliffs are also rarely encountered in mountain regions by eroding rivers.

1.2.2.1 Calcareous rocky slopes with chasmophytic vegetation

GHC (BioHab):	Inland cliff + limestone rocks + chasmophytes + LHE + CHE + LHE/CHE+SCH/EVR+ TER + possible HCH.
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MD+MDS
Mapping rules:	Calcareous + limestone rocks.
Indicators:	***Potentilla caulescens,*** *Ramonda myconi (Pyrenees only), Cystopteris fragilis, Asplenium trichomanes, Asplenium viride, Woodsia glabella*.
8210	Calcareous rocky slopes with chasmophytic vegetation

1.2.2.2 Siliceous rock slopes with chasmophytic vegetation

GHC (BioHab):	Inland cliff + siliceous rocks + chasmophytes TER+LHE+CHE+LHE/CHE +SCH/EVR possible HCH
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MD+MDS
Mapping rules:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MD+MDS + siliceous rocks + inland cliffs
Indicators:	*Androsace vandelli, Eritrichium nanum, Asplenium adiantum-nigrum,* ***Rhodiola rosea***
8220	Siliceous rock slopes with chasmophytic vegetation

1.2.2.3 Siliceous rock with pioneer vegetation

GHC (BioHab):	Inland cliff + siliceous rocks + chasmophytes TER+LHE+CHE+LHE/CHE+SCH/EVR+ possible HCH
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MD+MDS
Mapping rules:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MD+MDS + acidic rocks
Indicators:	*Veronica fruticans, Sempervivum arachnoideum, Scleranthus perennis,* ***Sedum acre***
8230	Siliceous rock with pioneer vegetation of the *Sedo-Scleranthion* or of the *Sedo albi-Veronicion dillenii*

1.2.3 Screes

Inland feature of variable sized rocks and different slope angles but usually still actively moving.

1.2.3.1 Siliceous scree of the montane to snow levels

GHC (BioHab):	screes + siliceous rocks TER + LHE + CHE + LHE/CHE + HCH.
Distribution:	ALN+BOR+ATN+ALS+CON+MDM
Mapping rules:	ALN > 800 m, ATN > 900 m, CON + ALS > 2000 m + acidic soils.
Indicators:	***Androsace alpina, Oxyria digyna****, Saxifraga bryoides,* ***Cryptogramma crispa****, Athyrium alpestre*
8110	Siliceous scree of the montane to snow levels (*Androsacetalia alpinae and Galeopsietalia ladani*)

1.2.3.2 Calcareous and calcshist screes of the montane to alpine levels

GHC (BioHab):	screes + calcareous rock +TER + LHE + CHE + LHE/CHE + HCH.
Distribution:	ALN+ATN+ALS+CON+MDM
Mapping rules:	ALN above 800 m, ATN above 450 m, CON + ALS above 2000 m.
Indicators:	*Campanula cenisia, Saxifraga biflora,* ***Thlaspi rotundifolium****, Hutchinsia alpina, Galium villarsi.* ***Rumex scutatus***
8120	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)

1.2.3.3 Western Mediterranean

GHC (BioHab):	Screes + calcareous/siliceous rocks TER+ LHE + CHE + LHE/CHE+ SCH/EVR + HCH + exposure indicators.
Distribution:	ALS+CON+ATC+LUS+MDM+MDN+MDS

Mapping rules:	CON + ALS 300 m-1200 m south facing, MDM + MDN above 500m + screes + calcareous.
Indicators:	***Centranthus ruber***, ***Polystichum lonchitis***, *Linaria saxatilis, Crepis pygmaea*
8130	Western Mediterranean and thermophilous scree

1.2.3.4 Eastern Mediterranean

GHC (BioHab):	screes + siliceous rocks TER+LHE+CHE + LHE/CHE+SCH/EVR+ HCH + indicators+ geographical location.
Distribution:	MDN+MDM
Mapping rules:	MDN+MDM above 500m + Greece
Indicators:	***Drypis spinosa,*** *Ranunculus brevifolius, Senecio thapsoides, Arenaria serpentini*
8140	Eastern Mediterranean screes

1.2.3.5 Medio-European upland

GHC (BioHab):	screes + siliceous rocks + TER+LHE+CHE+LHE/CHE+SCH/EVR+HCH+ indicators + geographical location.
Distribution:	ATN+ALS+CON+ATC+PAN
Mapping rules:	Acid + calcareous rocks ALN + BOR 600 m-1000m ATN + ATC over 700m CON + ALS 900-1500m.
Indicators:	***Epilobium collinum***, *Galeopsis segetum, Cryptogramma crispa*
8150	Medio-European upland siliceous screes

1.2.3.6 Medio-European hill and montane levels

GHC (BioHab):	screes + calcareous rocks TER+ LHE + CHE + LHE/CHE+ SCH/EVR+HCH+ indicators.
Distribution:	ATN+ALS+CON+ATC+MDM
Mapping rules:	ALS 400 m-2500 m + CON 400 m-2500 m.
Indicators:	***Gymnocarpium robertianum,*** *Rumex scutatus, Petasites paradoxus, Achnatherum calamagrostis*
8160	Medio-European calcareous scree of hill and montane levels

1.3 Habitat complexes

Habitat complexes often related to a geo-morphological feature with the following classes:

1.3.1 Machairs

GHC (BioHab):	CHE+LHE+LHE/CHE+SCHE/EVR+LPH/EVR+TER+CRO + expert knowledge
Distribution:	ATN+ATC
Mapping rules:	ATN+ATC. This class is a landscape unit as it includes complexes of other recognised habitats. The separation of Irish Machairs as a priority habitat from Scottish examples is historical. Whilst Machair is mainly dunes it also includes cultivated land, grassland, rock and even small groups of buildings and salt marsh intergrades with dune. West coast of Ireland and Scotland in ATN + ATC + dunes although not all dunes are within Machair.
Indicators:	***Festuca rubra, Trifolium repens,*** *Galium verum, Lotus corniculatus, Dactylorhiza fuchsii ssp.*
21A0	Machairs (* in Ireland)

1.3.2 Karstic features

1.3.2.1 Turloughs

GHC (BioHab):	A karstic geomorphological feature + evidence of winter flooding + indicator species+ expert knowledge.
Distribution:	ATN+ATC, CON, BOR, ALS
Mapping rules:	ATN+ATC below 200m, but also maybe in other karstic areas.
Indicators:	***Potentilla anserina,*** *Cinclidotus fontinaloides, Fontinalis antipyretica*
3180	Turloughs

1.3.2.2 Lakes of gypsum karst

GHC (BioHab):	Comparable to 3180 but gypsum rather than limestone + indicators + water + green/purple bacteria
Distribution:	MDM+MDN+MDS
Mapping rules:	MDM + MDN below 600m + MDS below100m. Gypsum soils.
Indicators:	*Chara* spp, **mats of green/purple bacteria,** *Potamogeton spp.*
3190	Lakes of gypsum karst

1.3.2.3 Limestone pavements

GHC (BioHab):	TER up to 90% +CHE+LHE+LHE/CHE + TRS locally
Distribution:	ATN+ALS+CON+ATC+MDM+MDN
Mapping rules:	On limestone (Cambrian, Carboniferous, Jurassic, : ATN may occur elsewhere but rare comparable karstic habitats occur in MDM + ALS + MDN + MDS at no specific altitudinal levels. 8310 Below ground-not relevant
Indicators:	*Gymnocarpium robertianum,* ***Dryopteris villarii,*** *Geranium robertianum*
8240	Limestone pavements

1.3.3 Springs

1.3.3.1 Fennoscandian mineral-rich springs

GHC (BioHab):	AQU+TER+CRY+ CHE/CRY+ CHE+ LHE/CHE + springs + cold water + indicators
Distribution:	ALN+BOR+NEM
Mapping rules:	BOR + NEM very localized and small scale. Impossible to predict.
Indicators:	***Cardamine amara,*** *Breutelia chrysocoma, Carex dioica, Schoenus nigricans*
7160	Fennoscandian mineral-rich springs and springfens

1.3.3.2 Petrifying springs with tufa formation (*Cratoneurion*))

GHC (BioHab):	AQU+TER+CHE/CRY+CHE+ LHE/CHE + tufa + indicators.
Distribution:	BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	Point features – on calcareous bedrock
Indicators:	*Saxifraga aizoides,* ***Cratoneuron commutatum****, Campylium stellatum, Selaginella selaginoides*
7220	Petrifying springs with tufa formation (*Cratoneurion*)

1.3.4 Bogs

Complexes of life forms with accumulated organic matter, not decomposed. The subcategories will have complexes of life forms of various shrub categories, grasses, sedges, cryptogams, areas of open water and trees and shrubs in various stages of development. However, they will all be coded as mires and bogs.

1.3.4.1 Bogs with dome structure

1.3.4.1.1 Active raised bogs

GHC (BioHab):	Complexes of AQU+ CHE+ CRY+CHE/CRY+SCH/EVR+LPH/EVR + raised bog structure + FPH in rand + Sustained mainly by rain water with vigorous *Sphagnum* growth
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC
Mapping rules:	CON + ATC + ATN + BOR + NEM below 300m.
Indicators:	***Eriophorum angustifolium***, *Andromeda polifolia, Vaccinium oxycoccos, Drosera anglica, Drosera intermedia.* ***Sphagnum magellanicum***
7110	Active raised bogs

1.3.4.1.2 Degraded raised bogs

Bogs still with evidence of former domed structure but now degraded
With poor Sphagnum growth caused by drainage and/or peat cutting (7120)

GHC (BioHab):	As 7110: Complexes of AQU+CHE+CRY+CHE/CRY+SCH/EVR +LPH/EVR + raised bog structure + FPH in rand + Sustained mainly by rain water with limited *Sphagnum* growth
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC

Mapping rules:	ATC + ATN + BOR + NEM below 300m
Indicators:	*Eriophorum angustifolium, Nardus stricta, Deschampsia flexuosa*
7120	Degraded raised bogs still capable of natural regeneration

1.3.4.2 Bogs with no dome structure

1.3.4.2.1 Blanket bogs

GHC (BioHab):	CHE + CRY + SCH/EVR + LPH/EVR with poor *Sphagnum* growth caused by drainage and/or peat cutting
Distribution:	ATC+ATN
Mapping rules:	above 300m.
Indicators:	*Drosera rotundifolia,* ***Eriophorum vaginatum, Empetrum nigrum****, Rubus chamaemorus*, *Spagnum magellanicum*
7130	Blanket bogs (* if active bog)

1.3.4.2.2 Transition mires and quaking bogs

GHC (BioHab):	Often more CHE than other bogs + LPH/EVR + SCH/EVR + AQU + CRY.
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	Probably the only way is to extract 7130 and 7110 and leave the remainder as 7140.
Indicators:	*Carex rostrata, Menyanthes trifoliata,* ***Spagnum papillosum, Molinia caerulea***
7140	Transition mires and quaking bogs

1.3.4.2.3 Aapa mires

GHC (BioHab):	Mosaics of AQU+CHE+CRY+SCH + without mounds
Distribution:	ALN+BOR
Mapping rules:	-
Indicators:	*Saxifraga hirculus, Thricophorum cespitosum,* ***Rubus chamaemorus, Sphagnum spp.***
7310	Aapa mires

1.3.4.3 Mires with permafrost, with peat mounds

1.3.4.3.1 Palsa mires

GHC (BioHab):	Mosaic of AQU+CHE+CRY+SCH labelled with bog code + Palsa mounds over 2 m
Distribution:	ALN+BOR
Mapping rules:	-
Indicators:	***Eriophorum russeolum****,* ***Cladonia spp.,*** *Betula nana, Vaccinium microcarpum, Ledum palustre*
7320	Palsa mires

1.3.5 Beach and coastal dune systems

This division consists of various dune systems, which contain more than three GHC's and are better defined as landscape classes.

1.3.5.1 Boreal Baltic sandy beaches

GHC (BioHab):	LHE+CHE+LHE/CHE + sandy beaches + geographical location
Distribution:	BOR+NEM+CON
Mapping rules:	BOR + NEM + coastal beaches on the Baltic coast
Indicators:	***Ammophila arenaria, Elymus arenaria,*** *Atriplex littoralis, Cakile maritima*
1640	Boreal Baltic sandy beaches with perennial vegetation

1.3.5.2 Dune systems

Note that dunes with mature grassland are included under section 5.2 and wooded dunes under section 6.

1.3.5.2.1 Embryonic shifting dunes

GHC (BioHab):	TER (sand) +THE+CHE+ THE/CHE + LHE/CHE
Distribution:	BOR+NEM+ATN+CON+ATC+LUS+MDN+MDS
Mapping rules:	Coastal only.
Indicators:	***Elymus farctus**, Euphorbia peplis, Honkenya peploides*
2110	Embryonic shifting dunes

1.3.5.2.2 Shifting dunes with *Ammophila arenaria*

GHC (BioHab):	TER (sand) +THE+ CHE+ THE/CHE+LHE/CHE
Distribution:	BOR+NEM+ATN+CON+ATC+LUS+MDN+MDS
Mapping rules:	Coastal only.
Indicators:	***Ammophila arenaria,** Euphorbia paralias, Eryngium maritimum*
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)

1.3.5.2.3 Fixed grey coastal dunes

GHC (BioHab):	LHE+CHE+THE+ LHE/CHE
Distribution:	NEM+ATN+CON+ATC+LUS+ MDS+MDN+PAN
Mapping rules:	Coastlines + Atlantic and Black sea coast.
Indicators:	***Carex Arenaria**, Gentiana campestris, Ononis repens, Carex arenaria, Salix repens*
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)

1.3.5.2.4 Fixed beach dunes

GHC (BioHab):	LHE+GEO + fixed dunes + geographical location
Distribution:	MDN+MDS
Mapping rules:	Coastal dunes only. Adriatic + Ionian Sea coast.
Indicators:	***Crucianella maritima,** Ephedra distachya, Silene nicaeensis*
2210	*Crucianellion maritimae* fixed beach dunes

1.3.5.2.5 Wooded dunes

GHC (BioHab):	Habitat complex + FPH/DEC+FPH/EVR+FPH/CON+FPH/EVR/CON + dunes + expert knowledge
Distribution:	BOR+NEM+CON+ ATC+ATN+LUS+MDN+MDS
Mapping rules:	BOR+NEM+CON+ ATC+ATN+LUS+MDN+MDS + coastal mask of 1 km + forest + dunes
Indicators:	***Crataegus monogyna,** Betula* spp., ***Pinus pinaster,** Quercus ilex, Pinus sylvestris*
2180	Wooded dunes of the Atlantic, Continental and Boreal region

1.3.5.2.6 Dune slacks

GHC (BioHab):	Habitat complex + AQU + LHE/CHE+ wet soils
Distribution:	BOR+NEM+CON+ ATC+ATN+LUS+MDN+MDS
Mapping rules:	BOR+NEM+CON+ ATC+ATN+LUS+MDN+MDS + coastal mask of 1 km + dune slack + dunes
Indicators:	*Hippuris vulgaris, Hydrocotyle vulgaris, **Salix repens,** Calliergon cuspiatum*
2190	Humid dune slacks

1.3.6 Landscape class river complexes

These are complex systems including banks, aquatic vegetation and bare materials of the river bed such as gravel banks.

1.3.6.1.1 Fennoscandian natural rivers

GHC (BioHab):	FPH/DEC + FPH/CON + FPH/DEC/CON + rivers + lakes + expert knowledge
Distribution:	ALN +BOR+NEM
Mapping rules:	Digital outline of large rivers plus buffer of 100m. Abundant where present.
Indicators:	*Stellaria nemorum, **Salix daphnoides**, Sparganium glomeratum*
3210	Fennoscandian natural rivers

1.3.6.2 Rivers linked to Alpine and mountain regions

1.3.6.2.1 Alpine rivers and herbaceous vegetation

GHC (BioHab):	LHE+TPH/DEC+FPH/DEC
Distribution:	ALN+BOR+ALS+CIN+MDM
Mapping rules:	ALN + BOR over 700m maybe with outliers lower down ALS + CON 1000-3000m. Lines of rivers only, only so could use physiographic map to indicate abundance.
Indicators:	*Saxifraga aizoides, Euphorbia cyparissias,* ***Salix spp,*** *Calamagrostis pseudophragmites*
3220	Alpine rivers and the herbaceous vegetation along their banks

1.3.6.2.2 Alpine rivers and their ligneous vegetation with *Myricaria germanica*

GHC (BioHab):	TPH/DEC+FPH/DEC + alpine rivers + indicator species + expert knowledge
Distribution:	ALS+CON+MDM
Mapping rules:	Alpine river but with distribution of *Myricaria*
Indicators:	***Myricaria germanica****, Salix daphnoides, Salix nigricans*
3230	Alpine rivers and their ligneous vegetation with *Myricaria germanica*

1.3.6.2.3 Alpine rivers and their ligneous vegetation with *Salix elaeagnos*

GHC (BioHab):	TPH/DEC + FPH/DEC + alpine rivers + *Salix* species + expert knowledge
Distribution:	ALS+CON+LUS+MDM+MDN
Mapping rules:	Alpine river but with distribution of *Salix elaeagnos* and other shrubby but not dwarf *Salix* species
Indicators:	***Salix elaeagnos,*** *Salix purpurea ssp. gracilis, Hippophae rhamnoides.*
3240	Alpine rivers and their ligneous vegetation with *Salix elaeagnos*

1.3.6.3 Mediterranean rivers

1.3.6.3.1 Mediterranean rivers with *Glaucium flavum*

GHC (BioHab):	River gravels in the Mediterranean +AQU+ LHE + indicators
Distribution:	MDM+MDN+MDS
Mapping rules:	As 3220 with distribution of *Glaucium flavum*.
Indicators:	*Myricaria germanica,* ***Glaucium flavum,*** *Oenothera biennis*
3250	Constantly flowing Mediterranean rivers with *Glaucium flavum*

1.3.6.3.2 Mediterranean rivers with *Salix* and *Populus* alba

GHC (BioHab):	FPH/DEC + flowing Mediterranean rivers + nitrophilous + annual species
Distribution:	MDM+MDN+MDS
Mapping rules:	*Populus alba* plus large rivers.
Indicators:	***Salix alba, Populus alba,*** *Paspalum paspalodes, Cyperus fuscus*
3280	Constantly flowing Mediterranean rivers *with Paspalo-Agrostidion* species and hanging curtains of *Salix* and *Populus* alba

1.3.6.3.3 Intermittently flowing Mediterranean rivers

GHC (BioHab):	A landscape class of intermittently flowing Mediterranean rivers + expert knowledge + indicators + very variable vegetation cover in both time and space + residual pools from water flow
Distribution:	MDM+MDN+MDS
Mapping rules:	MDM below 700m + MDN + MDS all but only indicative as it is likely to have a sporadic distribution.
Indicators:	***Paspalum paspaloides***, *Polygonum amphibium, Ranunculus fluitans, Potamogeton natans*
3290	Intermittently flowing Mediterranean rivers of the *Paspalo-Agrostidion*

1.3.7 Agro-forestry systems

1.3.7.1 Dehesas with Evergreen *Quercus* spp.

GHC (BioHab):	FPH/EVR + FPH/EVR over 10% + various combinations of CRO + LHE/CHE + CHE + THE + SCH + LPH + MPH + Quercus ilex + Quercus suber
Distribution:	MDM+MDN+MDS Mainly Spain but also in France and Italy
Mapping rules:	The description makes it clear that this class only occurs in the Iberian peninsula and also takes the strict definition of only evergreen (EVR) Quercus species. In practice there have been problems because of the difference in interpretation between Spain and Portugal leading to confusion with sclerophyllous scrub. Therefore the rule is: MDM + MDN + MDS in the Iberian peninsula. There will be an altitudinal limit but that will not be needed as the class is mapped directly.
Indicators:	***Quercus suber, Quercus ilex****,* ***Quercus rotundifolia,*** *Cistus ladanifer, Lavendula stoechas*
6310	Dehesas with Evergreen *Quercus* spp.

1.3.7.2 Fennoscandian wooded meadows

GHC (BioHab):	Habitat complex, wood pastures + FPH/DEC + expert knowledge especially on history of management
Distribution:	BOR+NEM
Mapping rules:	BOR+NEM + under 200m + forest + brown soils + dispersed and very difficult to predict.
Indicators:	***Fraxinus excelsior, Ulmus glabra,*** *Orchis mascula, Trifolium pratense*
6530	Fennoscandian wooded meadows

4.2 Single habitat categories

The Following section follows the structure of the General Habitat Categories given in the BioHab Field Handbook (Bunce et al 2005).

Category 2: The element answers the definition of URBAN given in the BioHab manual: not included in Annex I, except point features and small areas within landscape classes.

Category 3. The element answers the definition of CROPS given in the BioHab manual; not included in Annex I, except for Dehesas (Montados), and Machairs.

Category 4. Sparsely Vegetated
The element has more than 70% of bare- rocks, screes, fresh water or sea

4.1 SEA/TIDAL (wet/saline)

4.1.1 Reefs

GHC (BioHab):	SEA + TID or SEA/TID.
Env. Qualifier:	1.5
Distribution:	BOR+NEM+ATN+CON+ATC+LUS+MDN+MDS
Mapping rules:	Marine only.
Indicators:	-
1170	Reefs

4.1.2 Submarine leaking gases

GHC (BioHab):	SEA
Env. Qualifier:	1.5
Distribution:	-
Mapping rules:	Marine only.
Indicators:	-
1180	Submarine structures made by leaking gases

4.2 AQUATIC

4.2.1 Oligo-mesotrophic. It includes reservoirs and mountain lakes with no vegetation as well as many other small water bodies)

GHC (BioHab):	AQU + CRY + Chara + expert knowledge
Env. Qualifier:	1.3+1.4
Distribution:	BOR+NEM
Mapping rules:	Not predictable
Indicators:	***Chara spp.,*** *Nitella* spp.
3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp

4.3 TERRESTRIAL

4.3.1 Fields of lava

GHC (BioHab):	SPV/TER + Lava fields
Env. Qualifier:	NA
Distribution:	MDM+MDN+MDS
Mapping rules:	Adjacent to active volcanoes only.
Indicators:	-
8320	Fields of lava and natural excavations

4.4 ICE/SNOW

4.4.1 Glacier

GHC (BioHab):	SPV/ICE + SPV/TER/ICE + glacier + rock qualifier if ice is covered by debris
Env. Qualifier:	NA
Distribution:	ALN+ALS
Mapping rules:	-
Indicators:	-
8340	Permanent glacier

5. Less than 30% shrub/tree cover: herbaceous

5.1 Wetland

The element has more than 30 % cover of helophytes or emergent aquatic plants or submerged aquatic plants.

5.1.1 SHY

5.1.1.1

5.1.1.1.1 Natural eutrophic lakes

GHC (BioHab):	SHY + fresh water + eutrophic soils + indicator species.
Env. Qualifier:	1.1
Distribution:	BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	ALN + BOR + NEM + ATN + ATC below 300m ALS + CON below 700m + MDM 400-1500m + MDN + MDS
Indicators:	***Stratiotes aloides,*** *Hydrocharis morsus-ranae, Utricularia australis*
3150	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation

5.1.1.2

5.1.1.2.1 Lakes with *Isoetes lacustris*

GHC (BioHab):	SHY + fresh water + indicators
Env. Qualifier:	1.2
Distribution:	BOR+NEM+ATN+ALS+CON+ATC+LUS

Mapping rules:	All zones except MDS acid soils but from the biogeographic reference list has probably been interpreted beyond sand plains.
Indicators:	***Isoetes lacustris,*** *Isoetes echinospora, Lobelia dortmanna, Deschampsia setacea*
3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

5.1.1.2.2 West Mediterranean with *Isoetes* spp

GHC (BioHab):	SHY + fresh water + sandy soils nearby + indicators
Env. Qualifier:	1.2
Distribution:	LUS+MDN
Mapping rules:	Below 1200m.
Indicators:	***Isoetes velata, Isoetes setacea****, Pilularia minor, Serapias* spp
3120	Oligotrophic waters containing very few minerals generally on sandy soils of the West Mediterranean with *Isoetes* spp.

5.1.1.2.3 Lakes with *Littorelletea*

GHC (BioHab):	SHY + fresh water + indicator species.
Env. Qualifier:	1.2+1.3
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	ALS + BOR below 300m + NEM + ATC + ATN below 400m + CON + ALS + PAN below 1000m + MDM over 700m..
Indicators:	***Littorella uniflora,*** *Pilularia globulifera, Juncus bulbosus* spp*. Bulbosus, Sparganium minimum*
3130	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoëto-Nanojuncetea*

5.1.1.2.4 Natural dystrophic lakes

GHC (BioHab):	SHY +fresh water + acid soils + indicator species + expert knowledge
Env. Qualifier:	1.2
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM
Mapping rules:	ALN + BOR + NEM below 400m + ATN + ATC below 500m + ALS + CON below 700m.
Indicators:	*Utricularia minor,* ***Rhynchospora alba****, Nuphar lutea, Nuphar pumila, Nymphaea candida*
3160	Natural dystrophic lakes and ponds

5.1.1.3

5.1.1.3.1 Lakes with *Littorelletea*

GHC (BioHab):	SHY + fresh water + indicator species.
Env. Qualifier:	1.2+1.3
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	ALS + BOR below 300m + NEM + ATC + ATN below 400m + CON + ALS + PAN below 1000m + MDM over 700m..
Indicators:	***Littorella uniflora,*** *Pilularia globulifera, Juncus bulbosus* spp*. Bulbosus, Sparganium minimum*
3130	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoëto-Nanojuncetea*

5.1.1.3.2 Hot-spring lotus beds

GHC (BioHab):	SHY + non-saline water + high temperature + indicators
Env. Qualifier:	1.3
Distribution:	CON
Mapping rules:	Petea lake Romania only.
Indicators:	***Nymphaea lotus,*** *Butomus umbellatus, Alisma plantago-aquatica*
31A0	Transylvanian hot-spring lotus beds

5.1.1.4

5.1.1.4.1 Water courses

GHC (BioHab):	SHY + water courses + indicators + expert knowledge.
Env. Qualifier:	1.4
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	ALN + BOR + NEM below 600m + ATC + ATN + LUS below 800m + CON + PAN + ALS below 1200m + MDM + all MDN over 200m + MDS over 400m. Lines of rivers could be used but this class is likely to be rare especially in the Mediterranean.
Indicators:	***Ranunculus fluitans,*** *Ranunculus aquatilis,* ***Callitriche*** **spp.** *Zannichellia palustri, Fontinalis antipyretica*
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

5.1.1.5

5.1.1.5.1 Sandbanks

GHC (BioHab):	SHY + saline water + over 30% Zostera
Env. Qualifier:	1.5
Distribution:	BOR+NEM+ATN+CON+ATC+LUS+MDN+MDS
Mapping rules:	Sea and ocean but with shallow coast lines in ATC + ATN + LUS + Atlantic coast of MDN + Atlantic coast of MDS.
Indicators:	***Zostera marina,*** *Potamogeton pectinatus*
1110	Sandbanks which are slightly covered by sea water all the time

5.1.1.5.2 *Posidonia* beds

GHC (BioHab):	SHY + saline water + over 30% Posidonia
Env. Qualifier:	1.5
Distribution:	MDM+MDN+MDS
Mapping rules:	Sea and ocean but with shallow coastlines only in the Mediterranean in MDN + MDS.
Indicators:	***Posidonia oceanica***
1120	*Posidonia* beds (*Posidonion oceanicae*)

5.1.2 EHY

5.1.2.1.1 Calcareous fens

GHC (BioHab):	EHY+CHE + fresh water + eutrophic/calcareous + indicators
Env. Qualifier:	1.3+2.3
Distribution:	NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	Adjacent to water bodies but also wetlands – difficult to identify.
Indicators:	***Cladium mariscus****, Schoenus nigricans, Salix repens*
7210	Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*

5.1.3 HEL

5.1.3.2.1 Depressions on peat substrates with *Rhynchospora alba*

GHC (BioHab):	HEL + fresh + standing water + acid peat soils + indicator species.
Env. Qualifier:	2.2
Distribution:	BOR+NEM+ATN+ALS+CON+ATC+LUS+MDM
Mapping rules:	Localized and at a small scale. Usually present below 300 m.
Indicators:	***Rhynchospora alba,*** *R. fiscal, Drosera intermedia, Lycopodiella inundata*
7150	Depressions on peat substrates of the *Rhynchosporion*

5.1.3.1.1 Tall herb fringe

GHC (BioHab):	HEL + seasonally eutrophic wet alluvial soils + water courses + indicator species.
Env. Qualifier:	3.1
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	Very localized and usually occurring in narrow bands by major rivers or in small patches by smaller streams or on forest edges, cliff ledges or flushed areas in the

	mountains, which are difficult to predict therefore the major rivers only are likely to be indicative of likely extent. Otherwise wet alluvial soils. ALN + BOR below 500m + NEM all, likely to be very rare and difficult to identify in ATC + ATN, so omit + PAN below 500 m + CON + ALS seems to be sub-alpine therefore 800 m-1800m + probably rare in LUS too.
Indicators:	***Epilobium hirsutum,*** *Adenostyles alliariae & Cicerbita alpina, Cirsium oleraceum, Filipendula ulmaria, Crepis paludosa*
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

5.2 Other herbaceous

5.2.1 THE
All units with Therophytes (annuals) are included here

5.2.1.1

5.2.1.1.1 *Salicornia* salt marshes

GHC (BioHab):	THE + SPV/TER + mud + saline
Env. Qualifier:	2.5
Distribution:	ATN+ATC+CON+LUS+MDN+MDS
Mapping rules:	ATN+ATC+CON+LUS+MDN+MDS + 1km coastal mask + (bare mud if possible).
Indicators:	***Salicornia* spp**, *Suaeda maritima, Sagina maritima, Sagina nodosa, Cochlearia danica.*
1310	*Salicornia* and other annuals colonising mud and sand

5.2.1.2

5.2.1.2.1 Rivers with muddy banks

GHC (BioHab):	THE + LHE + LHE/THE + muddy river banks + indicators + expert knowledge
Env. Qualifier:	3.1
Distribution:	ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	ALN + BOR + NEM below 600m + ATC + ATN + LUS below 800m + CON + PAN + ALS below1200m + MDM + all MDN over 200m + MDS over 400m. Lines of rivers could be used but this class is likely to be rare especially in the Mediterranean. As 3260 but with larger rivers and in lowland.
Indicators:	***Chenopodium rubrum***, *Bidens frondosa, Polygonum lapathifolium*
3270	Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation

5.2.1.3

5.2.1.3.1 Mediterranean temporary ponds

GHC (BioHab):	THE + GEO + THE/GEO + evidence of winter flooding + indicator species
Env. Qualifier:	3.3
Distribution:	LUS+MDM+MDN+MDS
Mapping rules:	MDM + MDN below 600m + MDS below 1000m + LUS
Indicators:	***Juncus bufonius,*** *Serapias lingua, Graphalium uliginosum*
3170	Mediterranean temporary ponds

5.2.1.4

5.2.1.4.1 Coastal dunes with *Malcolmia lacera*

GHC (BioHab):	LHE/THE + coastal dunes + local knowledge + indicator species.
Env. Qualifier:	6.3
Distribution:	MDN+MDS
Mapping rules:	Coastal only + sand dunes -only possible to indicate region.
Indicators:	***Malcolmia lacera,*** *Anthyllis Hermosa, Lineria pedunculata*
2230	*Malcolmietalia* dune grasslands

5.2.1.5

5.2.1.5.1 Dunes with *Euphorbia terracina*

GHC (BioHab):	LHE/CHE + CHE but restricted information probably best tested as a landscape class but needs criteria to separate from 2210.
Env. Qualifier:	7.3
Distribution:	MDN+MDS
Mapping rules:	Coastal only. No other information is given except distribution in Greece and Malta.
Indicators:	***Euphorbia terracina**, Ephedra distachya, Silene nicaeensis*
2220	Dunes with *Euphorbia terracina*

5.2.1.5.2 Inland dunes with *Corynephorus*

GHC (BioHab):	CHE/THE + scrub below30% + inland dunes + dry sandy soils + expert knowledge.
Env. Qualifier:	7.3
Distribution:	NEM+ATN+CON+ATC+PAN
Mapping rules:	Inland siliceous dunes. -may be mixed with 3210.
Indicators:	***Corynephorus canescens**, Carex arenaria*
2330	Inland dunes with open *Corynephorus* and *Agrostis* grasslands

5.2.1.5.3 Pannonic inland dunes

GHC (BioHab):	CHE + LHE + LHE/CHE and/or THE and/or CRY
Env. Qualifier:	7.3
Distribution:	PAN
Mapping rules:	Inland dunes. Related to 6260.
Indicators:	*Thymus serpyllum, **Cerastium semidecandrum**, Spergula morisonii, Alyssum montanum* spp., *Cynodon dactylon*
2340	Pannonic inland dunes

5.2.1.5.4 Pannonic sand steppes

GHC (BioHab):	LHE +CHE + LHE/CHE + THE + xeric inland sands + critical species + expert knowledge.
Env. Qualifier:	7.3
Distribution:	PAN + CON + MDN
Mapping rules:	PAN below 500 m but distribution given in France and Italy so maybe CON or even MDN at low altitudes –literature check needed. Sands / inland dunes.
Indicators:	***Stipa capillata***, *Helichrysum arenarium, Dianthus serotinus, Alyssum montanum spp. Gmelinii, Cynodon dactylon.*
6260??	Pannonic sand steppes

5.2.1.6

5.2.1.6.1 *Brachypodietalia* dune

GHC (BioHab):	CHE/THE + coastal dunes + further expert knowledge.
Env. Qualifier:	7.4
Distribution:	MDN+MDS
Mapping rules:	Coastal only + coastal dunes + calcareous soils but fragmented and possible to define potential region only.
Indicators:	**Annual species,** *Brachypodium* spp
2240	*Brachypodietalia* dune grasslands with annuals

5.2.1.6.2 Rupicolous

GHC (BioHab):	THE/SUC + dry calcareous soils + expert knowledge + indicator species.
Env. Qualifier:	7.4
Distribution:	ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	May not appear as grassland as it has many herbs but also because it occurs in small patches below the 25 ha unit. Skeletal calcareous soils. NEM below 100m + ALS + CON below 300m + ATN + ATC, probably not in BOR
Indicators:	***Alyssum alyssoides,** Hornungia petraea*
6110	Rupicolous calcareous or basophilic grasslands of the *Alysso-Sedion* albi

5.2.1.7

5.2.1.7.1 Sand calcareous grasslands

GHC (BioHab):	LHE/THE + bare sand + dry neutral / calcareous + expert knowledge + indicator species.
Env. Qualifier:	8.4
Distribution:	NEM+CON+ATC+PAN
Mapping rules:	Calcareous and sandy soils. below 300m
Indicators:	*Alyssum montanum spp gmelinii, Astragalus arenarius,* ***Dianthus deltoides****, Gypsophila fastigiata, Helichrysum arenarium,* ***Koeleria glauca***
6120	Xeric sand calcareous grasslands

5.2.1.7.2 Pseudo-steppe with *Brachypodium distachum*

GHC (BioHab):	CHE/THE + xeric + calcareous + critical species + expert knowledge.
Env. Qualifier:	8.4
Distribution:	ALS+PAN+LUS+MDM+MDN+MDS
Mapping rules:	Although included in grasslands the signal could be confused with fallow and sparsely vegetated depending on the proportion of bare ground. Calcareous soils. MDM below 800m + MDN below 1200m + MDS below 1600m.
Indicators:	***Brachypodium distachyon,*** *Brachypodium retusum, Stipa spp.*
6220	Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*

5.2.2 LHE/CHE

5.2.2.1 Heavy metal/Serpentine

5.2.2.1.1 Calaminarian grasslands with *Viola calaminaria*

GHC (BioHab):	LHE/CHE + heavy metal rich soils + indicator species + expert knowledge.
Env. Qualifier:	NA
Distribution:	ATN+CON+MDN+ALS
Mapping rules:	Likely to be present along linear or in point features specifically related to heavy metals and therefore probably not predictable except from expert knowledge or probabilities within certain regions.
Indicators:	***Viola calaminaria****, Thlaspi caerulescens, Cochleria alpina, Festuca ovina,* ***Minuartia verna***
6130	Calaminarian grasslands of the *Violetalia calaminariae*

5.2.2.1.2 Serpentine soils

GHC (BioHab):	LHE/CHE + Serpentine soils + indicator species
Env. Qualifier:	NA
Distribution:	MDS
Mapping rules:	Only in Troodos mountains and Akamas peninsula, Cyprus. Serpentine soils. No other information but such vegetation on such soils is usually stable.
Indicators:	*Acinos troodi, Alyssum cypricum, Onosma troodi*
62B0	Serpentinophilous grassland of Cyprus

5.2.2.2

5.2.2.2.1 *Molinia* meadows

GHC (BioHab):	LHE/CHE + wet peaty / clay soils + Molinia+ indicator species.
Env. Qualifier:	2.2
Distribution:	BOR+NEM+ATN+ALS+CON+ATC+LUS+PAN+MDM+MDN+MDS
Mapping rules:	Wet calcareous peaty clays but variability in soil type makes it difficult to predict and it is also likely to be found in small patches. Remove ALN classes 2 and but the rest of ALN under 300m + BOR below 300m + NEM + ATC below 200m + CON below 300m.
Indicators:	***Molinion caerulea,*** *Potentilla erecta, Juncus acutiflorus*

6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

5.2.2.3

5.2.2.3.1 *Molinia* meadows

GHC (BioHab):	LHE/CHE + wet peaty / clay soils + Molinia+ indicator species.
Env. Qualifier:	2.4
Distribution:	BOR+NEM+ATN+ALS+CON+ATC+LUS+PAN+MDM+MDN+MDS
Mapping rules:	Wet calcareous peaty clays but variability in soil type makes it difficult to predict and it is also likely to be found in small patches. Remove ALN classes 2 and but the rest of ALN under 300m + BOR below 300m + NEM + ATC below 200m + CON below 300m.
Indicators:	***Molinion caerulea**, Potentilla erecta, Juncus acutiflorus*
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

5.2.2.4 Seasonally wet/neutral

5.2.2.4.1 Alluvial meadows

GHC (BioHab):	LHE/CHE + wet seasonally flooded alluvial soils + river valleys.
Env. Qualifier:	3.3
Distribution:	CON+PAN
Mapping rules:	BOR + NEM below 300 m + ATC + PAN below 500 m + probably 800 m-1400 m ALS + CON but needs more information Also occurs in small patches on transitions so will be infrequent so the map will be indicative only. Brown earths
Indicators:	***Cnidium dubium,** Viola persicifolia, Lythrum virgatum*
6440	Alluvial meadows of river valleys of the *Cnidion dubii*

5.2.2.4.2 Northern boreal alluvial meadows

GHC (BioHab):	LHE/CHE + neutral seasonally wet soils + adjacent to large rivers + no longer managed
Env. Qualifier:	3.3
Distribution:	BOR+NEM
Mapping rules:	BOR+NEM + 1 km mask by large rivers
Indicators:	*Carex acuta, **Calamagrostis purpurea,** Trollius europaeus*
6450	Northern boreal alluvial meadows

5.2.2.5

5.2.2.5.1 Peat grasslands of Troodos

GHC (BioHab):	CHE + LHE/CHE+ wet/seasonally flooded basic peat soil + indicator species + expert knowledge.
Env. Qualifier:	3.4
Distribution:	MDS
Mapping rules:	Troodos mountains in Cyprus only. Peat soils.
Indicators:	***Calamagrostis epigejeos, Juncus littoralis,** Alyssum cypricum*
6460	Peat grasslands of Troodos

5.2.2.6 Moist/acid

5.2.2.6.1 Fennoscandian species-rich grasslands

GHC (BioHab):	LHE/CHE + moist / dry acid soils + grazing / mowing + indicator species.
Env. Qualifier:	5.2+6.2
Distribution:	BOR+NEM
Mapping rules:	Below 200 m. Siliceous soils.
Indicators:	***Agrostis capillaries***, *Botrychium spp., Antennaria dioica, Gentianella campestris, Primula veris*
6270	Fennoscandian lowland species-rich dry to mesic grasslands

5.2.2.6.2 Pyrenean *Festuca eskia*

GHC (BioHab):	LHE/CHE + acid soils + over 1000m + indicator species + local knowledge.
Env. Qualifier:	5.2
Distribution:	ALS
Mapping rules:	ALS + Pyrenees and Cantabrian mountains (from local knowledge, not in description). Over 1000 m but check Festuca eskia distribution in the Flora Europea.
Indicators:	***Festuca eskia,*** *Arnica montana, Ranunculus pyrenaeus.*
6140	Siliceous Pyrenean *Festuca eskia* grasslands

5.2.2.6.3 Species-rich *Nardus* grasslands

GHC (BioHab):	LHE/CHE + moist neutral / acidic soils + *Nardus* + wide range of species. If in BOR + in Scandinavia then refer to 6270
Env. Qualifier:	5.2+5.3
Distribution:	ATN+ALS+CON+ATC+LUS+MDM+MDN
Mapping rules:	Making rules for this class is difficult because it depends on interpretation of the term species rich. There are two forms of this habitat, a lowland and upland type. More species rich grasslands with Nardus are rare in GB but rather common in continental Germany and at quite high elevations in the Alps and other high mountains. The comment in the text suggests that irreversibly degraded grasslands should be excluded which probably means many of those in GB. The rules below cover the whole range but mean that very different frequencies are likely to be involved. Mapping rules: Siliceous soils + rocks ALN + BOR below 700m + NEM + ATC all altitudes + ATN below 900 m + CON + ALS + LUS over 700m + MDM over 700m.
Indicators:	***Nardus stricta,*** *Antennaria dioica, Arnica alpina, Gentiana spp., Campanula spp.*
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

5.2.2.7 Moist/neutral

5.2.2.7.1 Macaronesian

GHC (BioHab):	LHE/CHE
Env. Qualifier:	5.3
Distribution:	MAC
Mapping rules:	Macaronesia only.
Indicators:	***Holcus rigidus, Festuca jubata****, Cardamine caldeirarum, Dryopteris azorica*
6180	Macaronesian mesophile grasslands

5.2.2.7.2 Species-rich *Nardus* grasslands

GHC (BioHab):	LHE/CHE + moist neutral / acidic soils + *Nardus* + wide range of species.
Env. Qualifier:	5.2+5.3
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+LUS+MDM+MDN
Mapping rules:	Making rules for this class is difficult because it depends on interpretation of the term species rich. More species rich grasslands with Nardus are rare in GB but are rather common in Continental Germany and at quite high elevations in the Alps and other high mountains. The comment in the text suggests that irreversibly degraded grasslands should be excluded which means many of those in GB. The rules below cover the whole range but mean that very different frequencies are likely to be involved. Mapping rules: Siliceous soils + rocks ALN + BOR below 700m + NEM + ATC all altitudes + ATN below 900 m + CON + ALS + LUS over 700m + MDM over 700m.
Indicators:	***Nardus stricta,*** *Antennaria dioica, Arnica alpina, Gentiana spp., Campanula spp.*
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

5.2.2.7.3 Mediterranean tall humid herb grasslands

GHC (BioHab):	LHE/CHE but dominated by grasses + moist neutral soils + indicator species.
Env. Qualifier:	5.3
Distribution:	MDM+MDN+MDS
Mapping rules:	Wet soils but likely to be in small patches due to local conditions and therefore difficult to locate plus dunes on Black sea coast but likely to be in small patches. MDM + MDN below 500m + MDS over 700m.
Indicators:	***Scirpus holoschoenus, Molinia caerulea****, Orchis laxiflora, Eupatorium cannabinum*
6420	Mediterranean tall humid herb grasslands of the *Molinio-Holoschoenion*

5.2.2.7.4 Lowland hay meadows

GHC (BioHab):	LHE/CHE + moist neutral soils + lowland situations + indicator species.
Env. Qualifier:	5.3
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	ALN + BOR-below 400m + NEM + ATC all altitudes + ATN below 250m, ALS + CON 700-900m + PAN below 800m + LUS below 1000m + MDM below 1400m + MDN over 1000m. Brown earth soils.
Indicators:	***Alopecurus pratensis, Sanguisorba officinalis****, Leucanthemum vulgare, Lathyrus pratensis*
6510	Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)

5.2.2.7.5 Mountain hay meadows

GHC (BioHab):	LHE/CHE but high proportion of LHE + moist neutral soils + upland situation + indicator species.
Env. Qualifier:	5.3
Distribution:	ALN+BOR+ATN+ALS+CON+MDM
Mapping rules:	This class is included as a particularity of CORINE land cover class 321 but its distribution needs to be examined. BOR + ALN 400-700 m but probably now no longer harvested except in protected areas ALS + CON 700-1200 m + LUS 700-1000m + MDM 800-1100.
Indicators:	***Trisetum flavescens,*** *Heracleum sphondylium, Astrantia major, Silene vulgaris, Trollius europaeus*
6520	Mountain hay meadows

5.2.2.8

5.2.2.8.1 Alvar and flat rocks

GHC (BioHab):	LHE/CHE + bare calcareous rocks + invading sands + expert knowledge
Env. Qualifier:	5.4
Distribution:	BOR+NEM
Mapping rules:	Below 200m and probably a coastal mask of 20 km. Pre-Cambrian / Silurian calcareous rocks.
Indicators:	***Festuca ovina,*** *Asperula tinctoria, Potentilla tabernaemontani, Saxifraga tridactylites, Hornungia petraea*
6280	Nordic alvar and precambrian calcareous flat rocks

5.2.2.9 Moist/saline (5.5)

5.2.2.9.1 Drift lines

GHC (BioHab):	LHE/CHE + saline soils + sand or gravel + linear coastal feature.
Env. Qualifier:	5.5
Distribution:	BOR+NEM+ATN+CON+ATC+LUS+MDN+MDS
Mapping rules:	Occur along coast but discontinuous and only probabilistic.
Indicators:	***Cakile maritima****, Salsola kali, Glaucium flavum, Matthiola sinuata.*
1210	Annual vegetation of drift lines

5.2.2.9.2 Atlantic salt marshes

GHC (BioHab):	CHE + LHE/CHE strongly saline.
Env. Qualifier:	5.5
Distribution:	NEM+ATN+CON+ATC+LUS
Mapping rules:	Coastal marsh + saline soils.
Indicators:	***Puccinellia maritima, Festuca rubra,*** *Spergularia marina, Aster tripolium*
1330	Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae)

5.2.2.9.3 Inland salt marshes

GHC (BioHab):	CHE + LHE/CHE + moist strongly saline soils.
Env. Qualifier:	5.5
Distribution:	ATN+CON+PAN
Mapping rules:	Too small and fragmented to predict unless the distribution of inland saline soils areas is available.
Indicators:	***Puccinellia distans,*** *Aster tripolium, Atriplex hastata, Puccinellia distans, Salicornia spp. Spergularia salina*
1340	Inland salt meadows

5.2.2.9.4 Boreal Baltic salt marshes

GHC (BioHab):	CHE+LHE/CHE
Env. Qualifier:	5.5
Distribution:	BOR+NEM+CON
Mapping rules:	BOR+NEM+CON + Baltic coast only + mask of 1 km +saline
Indicators:	***Juncus gerardii, Festuca rubra,*** *Plantago maritima, Primula sibirica*
1630	Boreal Baltic coastal meadows

5.2.2.10 Dry/acid

5.2.2.10.1 Fennoscandian species-rich

GHC (BioHab):	LHE/CHE + moist / dry acid soils + grazing / mowing + indicator species.
Env. Qualifier:	5.2+6.2
Distribution:	BOR+NEM
Mapping rules:	Below 200 m. Siliceous soils.
Indicators:	**Agrostis capillaries,** *Botrychium spp., Dianthus deltoides, Gentianella campestris, Primula veris*
6270	Fennoscandian lowland species-rich dry to mesic grasslands

5.2.2.11

5.2.2.11.1 Semi-natural dry grasslands

GHC (BioHab):	LHE/CHE + dry calcareous soils + indicators.
Env. Qualifier:	6.4
Distribution:	BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	Calcareous soils. BOR + NEM below 200m + ATN below 300m All ATC + CON + ALS below 700m + MDM below 1400m.
Indicators:	*Arabis hirsuta, Dianthus carthusianorum, Ophrys apifera, Orchis mascula,* ***Bromus erectus****, Adonis vernalis*
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*, * important orchid sites)

5.2.2.12 Dry/saline (6.5)

5.2.2.12.1 Mediterranean salt

GHC (BioHab):	LHE/CHE + saline + SCH.
Env. Qualifier:	6.5
Distribution:	LUS+MDM+MDN+MDS

Mapping rules:	Coastal marsh < 1 km. Inland only possible on saline soils.
Indicators:	***Juncus maritimus, Artemisia caerulescens,*** *Aster tripolium, Trifolium squamosum*
1410	Mediterranean salt meadows (*Juncetalia maritimi)*

5.2.2.12.2 Mediterranean salt steppes

GHC (BioHab):	LHE/CHE + SCH/EVR + Moist/dry saline soils
Env. Qualifier:	6.5
Distribution:	MDN+MDS
Mapping rules:	Impossible to map unless distribution of inland saline soils available
Indicators:	***Limonium spp.,*** *Lygeum spartum, Salicornia patula, Anthrocremum glauca*
1510	Mediterranean salt steppes (*Limonietalia*)

5.2.2.12.3 Pannonic salt marshes

GHC (BioHab):	CHE + LHE/CHE
Env. Qualifier:	6.5
Distribution:	PAN
Mapping rules:	PAN below 300m. + outliers according to expert opinion + saline soils
Indicators:	***Juncus maritimus, Puccinellia* spp**. *Aster tripolium, Plantago maritima*
1530	Pannonic salt steppes and salt marshes

5.2.2.13 very dry/neutral (7.3)

5.2.2.13.1 Sub-pannonic

GHC (BioHab):	LHE/CHE + xeric soils + variable soil structure + species + expert knowledge + indicator species
Env. Qualifier:	7.3
Distribution:	PAN+CON
Mapping rules:	Eastern CON classes below 500m + clays + sands + gravels. South facing.
Indicators:	***Festuca valesiaca,*** *Alyssum alyssoides, Astragalus austriacus, Iris humilis ssp. Arenaria,* ***Stipa capillata***
6240	Sub-pannonic steppic grasslands

5.2.2.13.2 Pannonic loess

GHC (BioHab):	LHE/CHE + xeric loess soils + critical species + expert knowledge + indicator species
Env. Qualifier:	7.3
Distribution:	PAN
Mapping rules:	Below 500 m. Loess soils.
Indicators:	***Bromus inermis, Festuca valesiaca,*** *Artemisia pontica, Ornithogalum pannonicum, Achillea pannonica*
6250	Pannonic loess steppic grasslands

5.2.2.13.3 Eastern sub-Mediterranean

GHC (BioHab):	LHE/CHE + xeric + indicators
Env. Qualifier:	7.3
Distribution:	PAN+MDN+MDS
Mapping rules:	East of Italy to the Balkans below 300m + PAN below 300m.
Indicators:	*Bromus erectus, Carex humilis*
62A0	Eastern sub-Mediterranean dry grasslands (*Scorzoneratalia villosae*)

5.2.2.13.4 *Ponto-Sarmatic* steppes

GHC (BioHab):	CHE + LHE/CHE + dry soils + indicators + expert knowledge
Env. Qualifier:	7.3
Distribution:	PAN+CON
Mapping rules:	PAN+CON + eastern Balkans + below 200 m.
Indicators:	***Stipa spp****,* ***Koeleria lobata,*** *Teucrium polium, Iris pumila*
62C0	*Ponto-Sarmatic* steppes

5.2.2.14

5.2.2.14.1 Rupicolous pannonic grasslands

GHC (BioHab):	LHE/CHE + dry calcareous + rare and threatened Pannonic species + expert knowledge + indicators
Env. Qualifier:	7.4
Distribution:	PAN+CON
Mapping rules:	Rendzinas. 150-900 m.
Indicators:	***Festuca pallens, Sesleria albicans,*** *Pulsatilla grandis, Anacamptis pyramidalis*
6190	Rupicolous pannonic grasslands (*Stipo-Festucetalia pallentis*)

5.2.3 CHE

5.2.3.1

5.2.3.1.1 Peat grasslands of Troodos

GHC (BioHab):	CHE + LHE/CHE+ wet/seasonally flooded basic peat soil + indicator species + expert knowledge.
Env. Qualifier:	3.4
Distribution:	MDS
Mapping rules:	Troodos mountains in Cyprus only. Peat soils.
Indicators:	***Calamagrostis epigejeos, Juncus littoralis***, ***Alyssum cypricum,***
6460	Peat grasslands of Troodos

5.2.3.2

5.2.3.2.1 Alkaline fens

GHC (BioHab):	CHE + wet alkaline fen peat + indicators + expert knowledge from phytosociology.
Env. Qualifier:	4.2
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	Alkaline peat soils / wet ALN + BOR: below 200 m, NEM: all, ATN: below 250m, ATC: all, CON + ALS + LUS: below 1500 m (MED too rare to predict).
Indicators:	***Schoenus nigricans, Eriophorum latifolium,*** *Primula farinose, Campylium stellatum*
7230	Alkaline fens

5.2.3.3

5.2.3.3.1 *Spartina* swards

GHC (BioHab):	CHE + saline soils + Spartina maritimae coverage > 30% SPV < 70%, otherwise TER + indicator species
Env. Qualifier:	4.5
Distribution:	ATN+ATC+LUS+MDN+MDS
Mapping rules:	ATN + ATC + coastal mask 1 km.
Indicators:	***Spartina spp***
1320	*Spartina* swards (*Spartinion maritimae*)

5.2.3.4

5.2.3.4.1 Alpine and Boreal

GHC (BioHab):	CHE+CHE/CRY + some DCH/DEC+ shallow acidic soils + mud bare rock + indicator species.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS+CON
Mapping rules:	Acid rocks + soils. Look at adjacency of 332 and 333. ALS over 1500m + ALN + BOR over 700m + ATN over 900m.
Indicators:	***Juncus trifidus, Carex bigelowii,*** *Cassiope tetragona, Racomitrium lanuginosum*
6150	Siliceous alpine and Boreal grasslands

5.2.3.4.2 Oro-Iberian *Festuca indigesta* grasslands

GHC (BioHab):	CHE + acid soils + expert knowledge + species indicators + Festuca indigesta.
Env. Qualifier:	5.2
Distribution:	ALS+LUS+MDM
Mapping rules:	Acid soils / rocks. LUS + MDM over 1800m + ALS (Pyrenees only over 1800m). Look up distribution of Festuca indigesta.
Indicators:	***Festuca indigesta,***
6160	Oro-Iberian *Festuca indigesta* grasslands

5.2.3.4.3 Species-rich *Nardus* grasslands

GHC (BioHab):	LHE/CHE +CHE+ moist neutral / acidic soils + Nardus + wide range of species.
Env. Qualifier:	5.2+5.3
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+LUS+MDM+MDN
Mapping rules:	Making rules for this class is difficult because it depends on interpretation of the term species rich. More species rich grasslands with Nardus are rare in GB but are rather common in Continental Germany and at quite high elevations in the Alps. The comment in the text suggests that irreversibly degraded grasslands should be excluded which probably means many of those in GB. The rules below cover the whole range but mean that very different frequencies are likely to be involved. Mapping rules: Siliceous soils + rocks ALN + BOR below 700m + NEM + ATC all altitudes + ATN below 900 m + CON + ALS + LUS over 1000m + MDM over 1500m.
Indicators:	***Nardus stricta****, Antennaria dioica, Arnica alpina, Gentiana spp., Campanula spp.*
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

5.2.3.4.4 Fennoscandian species-rich

GHC (BioHab):	LHE/CHE +CHE+ moist / dry acid soils + grazing / mowing + indicator species.
Env. Qualifier:	5.2+6.2
Distribution:	BOR+NEM
Mapping rules:	Below 200 m. Siliceous soils.
Indicators:	***Agrostis capillaris***, *Botrychium spp., Dianthus deltoides, Gentianella campestris, Primula veris*
6270	Fennoscandian lowland species-rich dry to mesic grasslands

5.2.3.4.5 Alpine pioneer

GHC (BioHab):	CHE + wet acid soils + indicators + phytosociological units + solifluction terraces.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS
Mapping rules:	Acid + peats + sands, ALN + BOR on 500m, ATN on 900 m CON + ALS on 2000 m.
Indicators:	***Carex atrofusca, Carex bicolor****, Juncus triglumis, Tofieldia pusilla*
7240	Alpine pioneer formations of Caricion bicoloris-atrofuscae

5.2.3.5

5.2.3.5.1 Species-rich *Nardus* grasslands

GHC (BioHab):	LHE/CHE +CHE+ moist neutral / acidic soils + Nardus + wide range of species.
Env. Qualifier:	5.2+5.3
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+LUS+MDM+MDN
Mapping rules:	Making rules for this class is difficult because it depends on interpretation of the term species rich. If it is assumed that the extensive generally species

	poor Nardus grasslands of the Atlantic zone are included then it is widespread. More species rich grasslands with Nardus are rare in GB but are rather common at quite high elevations in the Alps. The comment in the text suggests that irreversibly degraded grasslands should be excluded which probably means many of those in GB. The rules below cover the whole range but mean that very different frequencies are likely to be involved. Soils + rocks ALN + BOR below 700m + NEM + ATC all altitudes + ATN below 900 m + CON + ALS + LUS over 1000m + MDM over 1500m.
Indicators:	***Nardus stricta,*** *Antennaria dioica, Arnica alpina, Gentiana spp., Campanula spp.*
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

5.2.3.6

5.2.3.6.1 Atlantic salt marshes

GHC (BioHab):	CHE + LHE/CHE + strongly saline soils + indicator species.
Env. Qualifier:	5.5
Distribution:	NEM+ ATN+CON+ATC+LUS
Mapping rules:	Coastal marsh + saline soils.
Indicators:	***Puccinellia maritima, Festuca rubra,*** *Spergularia marina, Aster tripolium*
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

5.2.3.6.2 Inland salt marshes

GHC (BioHab):	CHE + LHE/CHE + moist strongly saline soils + indicator species
Env. Qualifier:	5.5
Distribution:	ATN+CON+PAN
Mapping rules:	Too small and fragmented to predict unless the distribution of inland saline soils areas is available.
Indicators:	***Puccinellia distans,*** *Aster tripolium, Atriplex hastata, Puccinellia distans, Salicornia spp. Spergularia salina*
1340	Inland salt meadows

5.2.3.7

5.2.3.7.1 Fennoscandian species-rich

GHC (BioHab):	LHE/CHE +CHE+ moist / dry acid soils + grazing / mowing + indicator species.
Env. Qualifier:	5.2+6.2
Distribution:	BOR+NEM
Mapping rules:	Below 200 m. Siliceous soils.
Indicators:	***Agrostis capillaries***, *Botrychium spp., Dianthus deltoides, Gentianella campestris, Primula veris*
6270	Fennoscandian lowland species-rich dry to mesic grasslands

5.2.3.8

5.2.3.8.1 Oro-Moesian

GHC (BioHab):	CHE +LHE/CHE dry acid soils + indicators
Env. Qualifier:	7.2
Distribution:	CON+ALS+MDM
Mapping rules:	CON+ALS+MDM over 1600m. + south and central Balkans + indicators
Indicators:	***Festuca paniculata***, ***Festuca airoides,*** *Carex bulgarica, Sesleria comosa*
62D0	Oro-Moesian acidophilous grasslands

5.2.3.9

5.2.3.9.1 Ponto-Sarmatic

GHC (BioHab):	CHE + LHE/CHE + dry soils + indicators + expert knowledge
Env. Qualifier:	7.3
Distribution:	PAN+CON
Mapping rules:	PAN+CON + eastern Balkans + below 200 m.
Indicators:	***Stipa spp***, ***Koeleria lobata,*** *Teucrium polium, Iris pumila*

62C0	Ponto-Sarmatic steppes

5.2.3.9.2 Oro-Moesian

GHC (BioHab):	CHE + LHE/CHE + dry acid soils + indicators
Env. Qualifier:	7.3
Distribution:	CON+ALS+MDM
Mapping rules:	CON+ALS+MDM over 1600m. + south and central Balkans + indicators
Indicators:	***Festuca paniculata*, *Festuca airoides,*** *Carex bulgarica, Sesleria comosa*
62D0	Oro-Moesian acidophilous grasslands

5.2.4 CRY

All classes with significant cover of cryptogames (CRY)

5.2.4.1

5.2.4.1.1 Alpine and Boreal

GHC (BioHab):	CHE/CRY + some DCH/DEC+ shallow acidic soils + up to 30% bare rock + indicator species.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS+CON
Mapping rules:	Acid rocks / soils. Look at adjacency of 332 and 333. ALS over 1500m + ALN + BOR over 700m + ATN over 900m.
Indicators:	***Juncus trifidus, Carex bigelowii,*** *Cassiope tetragona, Racomitrium lanuginosum*
6150	Siliceous alpine and Boreal grasslands

Other significant patches of CRY will be in bogs, as well as ground vegetation if layers are being recorded.

6 More than 30% shrub/tree cover: Trees and shrub

The element has over 30 % shrub or tree cover, note that the plants do not have to be woody. Subsequent divisions are made according to deciduous, evergreen, conifers and mixtures

6.1 DCH

6.1.1 DCH/DEC

6.1.1.1

6.1.1.1.1 Sub-Arctic *Salix*

GHC (BioHab):	DCH/DEC + SCH/DEC + locally LPH/ DEC + moist acidic soils + exposed mountain situations + Salix species + indicator species.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS+CON
Mapping rules:	ALN over 700m + ATN over 800m + BOR over 800m + ALS over 1800m.
Indicators:	***Salix lapponum, Salix myrsinites*** and other dwarf Salix species
4080	Sub-Arctic *Salix* spp. Scrub

6.1.1.1.2 Alpine and Boreal

GHC (BioHab):	DCH/DEC+ CHE/CRY + shallow moist acidic soils + much bare rock + indicator species.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS+CON
Mapping rules:	Acid rocks + soils. Look at adjacency of 332 and 333. ALS over 1500m + ALN + BOR over 700m + ATN over 900m.

Indicators:	***Juncus trifidus, Carex bigelowii,*** *Cassiope tetragona, Racomitrium lanuginosum*
6150	Siliceous alpine and Boreal grasslands

6.1.2 DCH/EVR

6.1.2.1.1 Alpine and Boreal heaths

GHC (BioHab):	DCH/EVR but locally SCH/EVR + Moist acidic soils + up to 30% bare ground / rocks + indicators. Also LPH/CON + MPH/EVR.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS+CON+ATC+LUS+MDM
Mapping rules:	ALN + BOR over 800m + ATN over 800 m + small patches on exposed coastal areas in the north + ALS over 1800 m. LUS over 1200m. No soils as highly variable, although skeletal soils e.g. rankers predominate
Indicators:	***Arctostaphylos alpina, Vaccinium uliginosum,*** *Cassiope tetragona, Cornus suecica*
4060	Alpine and Boreal heaths

6.2 SCH

6.2.1 SCH/DEC

6.2.1.1.1 Sub-Arctic *Salix* spp. Scrub **4080**

GHC (BioHab):	SCH/DEC + DCH/DEC + locally LPH/ DEC + moist acidic soils + exposed mountain situations + Salix species + indicator species
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS+CON
Mapping rules:	ALN over 1100m + ATN over 900m + BOR over 1000m + ALS over 1800m.
Indicators:	***Salix lapponum, Salix myrsinites*** and other dwarf Salix species
4080	Sub-Arctic *Salix* spp. Scrub

6.2.2 SCH/EVR

6.2.2.1.1 Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix*

GHC (BioHab):	SCH/ EVR + wet peat soils + indicator species + expert knowledge.
Env. Qualifier:	2.2
Distribution:	ALS+ATC+LUS+MDM+MDN+MDS
Mapping rules:	ATC all within 80 km of coast + LUS below 800m. Podsols / peaty gleys.
Indicators:	***Erica ciliaris****,* ***Erica tetralix,*** *Ulex minor, Genista anglica*
4020	Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix*

6.2.2.2

6.2.2.2.1 Decalcified fixed dunes

GHC (BioHab):	SCH/EVR + LPH/EVR + moist sandy soils + coastal dunes + Calluna or Empetrum
Env. Qualifier:	5.2
Distribution:	BOR+NEM+ATN+CON
Mapping rules:	Technically moors and heath lands but likely to be in patches in dune systems which are too small to map.
Indicators:	***Empetrum nigrum,*** *Pyrola rotundifolia, Genista tinctoria*
2140	Decalcified fixed dunes with *Empetrum nigrum*

6.2.2.2.2 Atlantic decalcified fixed dunes

GHC (BioHab):	SCH/EVR + LHP/EVR + moist sands + moist sandy soils + coastal dune + Calluna/Ulex spp.
Env. Qualifier:	5.2

Distribution:	ATN+ATC
Mapping rules:	As 2140 but only ATC + ATN in France, Belgium and Britain.
Indicators:	***Calluna vulgaris,*** *Festuca ovina, Carex arenaria, Ulex minor*
2150	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)

6.2.2.2.3 Sand heaths

GHC (BioHab):	SCH/EVR + LPH/EVR + moist acid sands + indicator + expert knowledge.
Env. Qualifier:	5.2
Distribution:	NEM+ATN+CON
Mapping rules:	May include inland dunes as well so all dune systems in BOR + NEM + ATN + ATC but probably so rare in CON as not to be included here. 4010. ALN below 700m + ATN below 900m Acid peaty podsols, peats and rankers
Indicators:	***Calluna vulgaris, Empetrum nigrum***
2320	Dry sand heaths with *Calluna* and *Empetrum nigrum*

6.2.2.2.4 European heaths

GHC (BioHab):	LPH/ EVR + SCH/ EVR + moist acid soils + wide range of conditions + better definition.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	ALN + BOR below 700m NEM + CON + ATC + all ATN below 500m + ALS over 1500m + MDM over 1800m + below 700m + LUS below 800m.
Indicators:	*Calluna vulgaris, Genista anglica, Erica cinerea*
4030	European dry heaths

6.2.2.2.5 Alpine and Boreal heaths

GHC (BioHab):	SCH/EVR but locally DCH/EVR + Moist acid soils + up to 30% bare ground / rocks + rule based system indicators. Also LPH/CON + MPH/EVR.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS+CON+ATC+LUS+MDM
Mapping rules:	ALN + BOR over 800m + ATN over 900 m + small patches on exposed coastal areas in the north + ALS over 1800 m. No soils as highly variable, although skeletal soils e.g. rankers predominate
Indicators:	***Arctostaphylos alpina, Vaccinium uliginosum,*** *Cassiope tetragona, Cornus suecica*
4060	Alpine and Boreal heaths

6.2.2.3

6.2.2.3.1 Coastal shingle

GHC (BioHab):	SCH/EVR + saline + pebbles.
Env. Qualifier:	5.5
Distribution:	BOR+NEM+ATN+CON+ATC
Mapping rules:	Coastal mask 1 km. Discontinuous. Coastal only. Probably included here although it is not sandy but pebbles. Of restricted localised occurrence and could be checked by looking at well known examples e.g. Chesil Beach and Dungeness. Coastal mask plus shingle if available.
Indicators:	***Crambe maritima****, Crithmum maritimum, Honkenya peploides*
1220	Perennial vegetation of stony banks

6.2.2.3.2 Mediterranean and thermo-Atlantic

GHC (BioHab):	SCH/EVR or LPH/ EVR + saline soils + indicator species.
Env. Qualifier:	5.5
Distribution:	LUS + MDN + MDS
Mapping rules:	Mean high water mark + Saline mud.
Indicators:	***Sarcocornia fruticosus,*** *Inula crithmoides, Sarcocornia perennis, Suaeda vera*

1420	Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)

6.2.2.4

6.2.2.4.1 *Cistus palhinhae*

GHC (BioHab):	SCH/EVR + dry basic soils + Cistus palhinhae + endemics.
Env. Qualifier:	6.4
Distribution:	MDS
Mapping rules:	Portugal and <1km from coast.
Indicators:	***Cistus palhinhae,*** *Juniperus turbinata, Serratula monardii, Sideritis arborescens*
5140	*Cistus palhinhae* formations on maritime wet heaths

6.2.2.5

6.2.2.5.1 Mediterranean salt steppes

GHC (BioHab):	SCH/EVR + LHE/CHE + dry saline soils
Env. Qualifier:	6.5
Distribution:	MDN + MDS
Mapping rules:	Impossible to map unless distribution of inland saline soils available
Indicators:	***Limonium* spp.*, Lygeum spartum,*** *Salicornia patula, Senecio auricula*
1510	Mediterranean salt steppes (*Limonietalia*)

6.2.2.6

6.2.2.6.1 *Cistus* and *Lavendula* scrub

GHC (BioHab):	SCH / EVR + LPH/ EVR + dry sandy soils + rule based system species + expert knowledge.
Env. Qualifier:	7.3
Distribution:	MDN + MDS
Mapping rules:	232 + coastal mask of 500m and/or adjacent to dunes 331.
Indicators:	***Cistus spp, Lavendula spp****, Rhamnus spp.*
2260	*Cisto-Lavenduletalia* dune sclerophyllous scrubs

6.2.2.7

6.2.2.7.1 Iberian gypsum vegetation

GHC (BioHab):	SCH/EVR+LPH/EVR + gypsum soils + expert knowledge
Env. Qualifier:	7.4
Distribution:	MDM+MDS
Mapping rules:	MDM + MDS under 500m. Iberian peninsular only + gypsum soils
Indicators:	***Gypsophila hispanica****, Thymus* spp, *Teucrium* spp**,** *Helianthemum squamatum,*
1520	Iberian gypsum vegetation (*Gypsophiletalia)*

6.2.2.8

6.2.2.8.1 Pre-desert scrub

GHC (BioHab):	LPH/EVR+ xeric soils + indicators
Env. Qualifier:	8.3+8.4
Distribution:	MDS
Mapping rules:	MDS below 200m. southern classes only
Indicators:	*Euphorbia dendroides, Periploca laevigata,* ***Chamaerops humilis,*** *Genista spp.*
5330	Thermo-mediterranean and pre-desert scrub

6.2.2.8.2 Endemic phryganas

GHC (BioHab):	LHP/EVR + xeric soils
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	MDS southern classes only + 10 km from the coast + xeric soils
Indicators:	***Euphorbia acanthothamnos,*** *Genista acanthoclada, Verbascum* ***spinosum****, Phlomis cretica*

5430	Endemic phryganas of the *Euphorbio-Verbascion*

6.2.2.9

6.2.2.9.1 Pre-desert scrub

GHC (BioHab):	LPH/EVR+ xeric soils + indicators
Env. Qualifier:	8.3+8.4
Distribution:	MDS
Mapping rules:	MDS below 200m. southern classes only
Indicators:	*Euphorbia dendroides, Periploca laevigata,* ***Chamaerops humilis,*** *Genista spp.*
5330	Thermo-mediterranean and pre-desert scrub

6.3 LPH

6.3.1 LPH/DEC

6.3.1.1.1 Calcareous fens

GHC (BioHab):	LPH/DEC + wet soil + dune slacks + indicator species
Env. Qualifier:	2.3
Distribution:	NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	Adjacent to water bodies but also wetlands – difficult to identify.
Indicators:	***Cladium mariscus, Phragmites australis****, Schoenus nigricans, Salix repens*
7210	Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*

6.3.1.2.1 Sub-Arctic Salix

GHC (BioHab):	LPH/ DEC + SCH/DEC + DCH/DEC + moist, basic, soils + exposed mountain situations + *Salix* species.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS+CON
Mapping rules:	Distribution often related to snow depth, & favouring areas of deep snow, ALN over 1100m + ATN over 900m + BOR over 1000m + ALS over 1800m.
Indicators:	***Salix lapponum, Salix myrsinites*** and other dwarf Salix species
4080	Sub-Arctic Salix spp. Scrub

6.3.1.3.1 peri-Pannonic

GHC (BioHab):	LPH/ DEC+ very dry variable soils + in mosaics with CHE/LHE + rule based system species + expert knowledge
Env. Qualifier:	7.3
Distribution:	PAN+ALS+CON
Mapping rules:	PAN below 900m ALS (Carpathians only) below 900 m.
Indicators:	***Amygdalus nana,*** *Cornus mas, Euonymus verrucosus, Vincetoxicum hirundinaria*
40A0	Subcontinental peri-Pannonic scrub

6.3.2 LPH/EVR

6.3.2.1

6.3.2.1.1 Decalcified fixed dunes

GHC (BioHab):	LPH/EVR + SCH/EVR + moist sandy soils + coastal dunes + *Calluna* or *Empetrum*
Env. Qualifier:	5.2
Distribution:	BOR + NEM+ATN+CON

Mapping rules:	Technically moors and heath lands, but likely to be in patches in dune systems which are too small to map..
Indicators:	***Empetrum nigrum,*** *Pyrola rotundifolia, Genista tinctoria*
2140	Decalcified fixed dunes with *Empetrum nigrum*

6.3.2.1.2 Atlantic decalcified fixed dunes

GHC (BioHab):	LHP/EVR + SCH/EVR + moist sands + moist sandy soils + coastal dune + *Calluna*/*Ulex* spp + indicator species.
Env. Qualifier:	5.2
Distribution:	ATN+ATC
Mapping rules:	As 2140 but only in France / Belgium and Britain.
Indicators:	***Calluna vulgaris,*** *Festuca ovina, Carex arenaria, Ulex minor*
2150	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)

6.3.2.1.3 Inland and coastal dune

GHC (BioHab):	LPH/EVR + moist sands + expert knowledge + indicator species
Env. Qualifier:	5.2
Distribution:	ATN+CON+ATC
Mapping rules:	Many areas will be limited in extent and may be included into dune systems within the 25 ha unit. Examples need to be checked. May include inland dunes as well so all dune systems in ATN + ATC but probably so rare in CON as not to be included here.
Indicators:	***Calluna vulgaris, Genista anglica***
2310	Dry sand heaths with *Calluna* and *Genista*

6.3.2.1.4 Sand heaths with *Calluna* and *Empetrum nigrum*

GHC (BioHab):	LPH/EVR with patches of SCH/EVR + moist acid sands + expert knowledge + indicator species.
Env. Qualifier:	5.2
Distribution:	NEM+ATN+CON
Mapping rules:	Many areas will be limited in extent and may be included into dune systems within the 25 ha unit. Examples need to be checked. May include inland dunes as well so all dune systems in ATN + ATC but probably so rare in CON as not to be included here. 4010. ALN below 700m + ATN below 900m and all British Check!!) + ATC all British otherwise only within 80 km of coast. Acid peaty podsols, peats and rankers
Indicators:	***Calluna vulgaris, Empetrum nigrum,*** *Genista pilosa*
2320	Dry sand heaths with *Calluna* and *Empetrum nigrum*

6.3.2.1.5 Inland European heaths

GHC (BioHab):	LPH/ EVR or SCH/ EVR + moist acid soils + wide range of conditions + better definition.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	ALN + BOR below 700m + NEM + CON + ATC + all ATN below 500m + ALS over 1500m + MDM over 1800m below 700m LUS below 800 m.
Indicators:	***Calluna vulgaris, Vaccinium myrtillis*** *Genista anglica, Erica cinerea*
4030	European dry heaths

6.3.2.1.6 Atlantic coastal heaths

GHC (BioHab):	LPH/EVR + moist acid soils + *Erica vagans* and other indicators.
Env. Qualifier:	5.2
Distribution:	ATC+LUS
Mapping rules:	Within 20 km of coast. Podsols.
Indicators:	***Erica vagans,*** *Ulex europaeus*
4040	Dry Atlantic coastal heaths with *Erica vagans*

6.3.2.2

6.3.2.2.1 Mediterranean and thermo-Atlantic

GHC (BioHab):	LPH/EVR + SCH/EVR + saline soils + indicator species.
Env. Qualifier:	5.5
Distribution:	LUS + MDN + MDS
Mapping rules:	Mean high water mark + Saline mud.
Indicators:	***Sarcocornia fruticosus,*** *Inula crithmoides, Sarcocornia perennis, Suaeda vera*
1420	Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)

6.3.2.3

6.3.2.3.1 Endemic oro-Mediterranean

GHC (BioHab):	LPH/EVR + LPH/NLE + locally on exposed situations SCH+ rocky soils + hedgehog heaths + indicators + local knowledge.
Env. Qualifier:	6.3
Distribution:	ALS+LUS+MDM+MDN+MDS
Mapping rules:	LUS 700 m-1200 m + MDM over 600m + MDS over 1500m + ALS Pyrenees / Cantabria only 800 m-1500 m.
Indicators:	***Echinospartum horridum****, Astragalus angustifolius Ononis fruticosa, Genista aetnensis*
4090	Endemic oro-Mediterranean heaths with gorse

6.3.2.4

6.3.2.4.1 Coastal dunes

GHC (BioHab):	LPH/ EVR + SCH/ EVR + dry sandy soils + expert knowledge + indicator species.
Env. Qualifier:	7.3
Distribution:	MDN + MDS
Mapping rules:	232 + coastal mask of 500m and / or adjacent to dunes 331.
Indicators:	***Cistus spp, Lavendula spp****, Rhamnus spp.*
2260	*Cisto-Lavenduletalia* dune sclerophyllous scrubs

6.3.2.5

6.3.2.5.1 Halo-nitrophilous scrubs

GHC (BioHab):	LPH/EVR + MPH/EVR + xeric eutrophic + indicators.
Env. Qualifier:	8.1
Distribution:	MDN+MDS
Mapping rules:	Probably only MDS, but otherwise impossible to map because of requirement to access nitrophilous status. Indicators maybe available.
Indicators:	***Peganum harmala,*** *Salsola vermiculata, Atriplex halimus, Atriplex glauca*
1430	Halo-nitrophilous scrubs (*Pegano-Salsoletea*)

6.3.2.6

6.3.2.6.1 Pre-desert with **Zyziphus**

GHC (BioHab):	LPH/EVR + MPH/EVR + Zyziphus lotus.
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	Near Almeria (Spain)
Indicators:	***Zyziphus lotus****, Asparagus albus, Chamaerops humilis, Phlomis purpurea*
5220	Arborescent matorral with *Zyziphus*

6.3.2.6.2 *Euphorbia*

GHC (BioHab):	SCH/EVR+LPH/EVR + xeric soils + adjacent cliffs + indicators + expert knowledge
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	MDS southern classes only below 200m. + shallow rocky soils
Indicators:	***Euphorbia pithyusa,*** *Thymelaea passerina, Pistacia lentiscus, Helichrysum italicum*

5320	Low formations of *Euphorbia* close to cliffs

6.3.2.6.3 Pre-desert scrub

GHC (BioHab):	LPH/EVR+ xeric soils + indicators
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	MDS below 200m. southern classes only
Indicators:	*Euphorbia dendroides, Periploca laevigata,* ***Chamaerops humilis,*** *Genista spp.*
5330	Thermo-mediterranean and pre-desert scrub

6.3.2.6.4 Endemic phryganas

GHC (BioHab):	LHP/EVR + xeric soils
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	MDS southern classes only + 10 km from the coast + xeric soils
Indicators:	***Euphorbia acanthothamnos,*** *Genista acanthoclada ,****Verbascum spinosum****, Phlomis cretica*
5430	Endemic phryganas of the *Euphorbio-Verbascion*

LPH/CON

6.3.3.1

6.3.3.1.1 Alpine and Boreal heaths

GHC (BioHab):	SCH/EVR but locally DCH/EVR + Moist acid soils + up to 30% bare ground / rocks + rule based system indicators. Also LPH/CON + MPH/EVR.
Env. Qualifier:	5.2
Distribution:	ALN+BOR+ATN+ALS+CON+ATC+LUS+MDM
Mapping rules:	ALN + BOR over 800m + ATN over 900 m + small patches on exposed coastal areas in the north + ALS over 1800 m. No soils as highly variable, although skeletal soils e.g. rankers predominate
Indicators:	***Arctostaphylos alpina, Vaccinium uliginosum,*** *Cassiope tetragona, Cornus suecica*
4060	Alpine and Boreal heaths

6.3.3.1.2 *Juniperus communis*

GHC (BioHab):	LPH/CON or MPH/CON + moist acid calcareous soils + *Juniperus* + local knowledge.
Env. Qualifier:	5.2+5.4
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	Includes a wide range of conditions and the distribution of *Juniperus communis* and the suggested zones below could indicate its likely extent. ALN below 500m + ATN below 400m + BOR below 500m + NEM + ATC + PAN + all CON + LUS + ALS below 800m + MDN 500-1000m + MDM over 800m.
Indicators:	***Juniperus communis***
5130	*Juniperus communis* formations on heaths or calcareous grasslands

6.3.3.2

6.3.3.2.1 *Juniperus communis*

GHC (BioHab):	LPH/CON or MPH /CON + moist acid calcareous soils + *Juniperus* + local knowledge.
Env. Qualifier:	5.2+5.4
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	Includes a wide range of conditions and the distribution of *Juniperus communis* and the suggested zones below could indicate its likely extent. ALN below 500m + ATN below 400m + BOR below 500m + NEM + ATC +

	PAN + all CON + LUS + ALS below 800m + MDN 500-1000m + MDM over 800m.
Indicators:	***Juniperus communis***
5130	*Juniperus communis* formations on heaths or calcareous grasslands

6.3.4 LPH/NLE

6.3.4.1

6.3.4.1.1 *Cytisus purgans*

GHC (BioHab):	LPH/ NLE + MPH / NLE + shallow acidic soils + Mountain situations + Cytisus purgens + expert knowledge.
Env. Qualifier:	5.2
Distribution:	ALS+MDM+MDN
Mapping rules:	MDM over 700m + LUS 700-1500m. Skeletal soils.
Indicators:	***Cytisus purgans***
5120	Mountain *Cytisus purgens* formations

6.3.4.2

6.3.4.2.1 Endemic oro-Mediterranean heaths with gorse

GHC (BioHab):	LPH/NLE + LPH/EVR locally on exposed situations SCH+ rocky soils + hedgehog heaths + indicators + local knowledge.
Env. Qualifier:	7.3
Distribution:	ALS+LUS+MDM+MDN+MDS
Mapping rules:	LUS 700 m-1200 m + MDM over 600m + MDS over 1500m + ALS Pyrenees / Cantabria only 800 m-1500 m.
Indicators:	***Echinospartum horridum****, Astragalus angustifolius Ononis fruticosa, Genista aetnensis*
4090	Endemic oro-Mediterranean heaths with gorse

6.4 MPH

6.4.1 MPH/DEC

6.4.1.1.1 Dunes with *Hippophaé rhamnoides*

GHC (BioHab):	MPH/DEC + over 30% *Hippophaé rhamnoides* + sand dunes
Env. Qualifier:	5.3
Distribution:	ATC+ATN+CON+LUS
Mapping rules:	ATC+ATN+CON+LUS + coastal mask 1 km + sand dunes
Indicators:	***Hippophaé rhamnoides***
2160	Dunes with *Hippophaé rhamnoides*

6.4.1.2

6.4.1.2.1 Rhodope with *Potentilla fruticosa*

GHC (BioHab):	MPH/DEC + dry soils + *Potentilla fruticosa* over 30% + expert knowledge
Env. Qualifier:	7.3
Distribution:	MDM
Mapping rules:	MDM over 700m. Rhodope mountains only
Indicators:	***Potentilla fruticosa****, Galium boreale, Veronica rhodopaea*
40B0	Rhodope *Potentilla fruticosa* thickets

6.4.1.3

6.4.1.3.1 *Buxus sempervirens*

GHC (BioHab):	MPH/DEC + MPH/EVR + TPH/EVR + variable soils + *Buxus* + expert knowledge.
Env. Qualifier:	7.4
Distribution:	CON+LUS+MDM+MDN

Mapping rules:	ALS south facing slopes below 800m + MDN 200-800m + CON warm south facing shallow soils but in small patches+ MDM probably only small patches best predicted by distribution of Buxus. Calcareous soils.
Indicators:	***Buxus sempervirens**, Prunus mahaleb, Ligustrum vulgare, Amelanchier ovalis*
5110	Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (*Berberidion* p.p.)

6.4.2 MPH/EVR

6.4.2.1

6.4.2.1.1 Alpine and Boreal heaths

GHC (BioHab):	SCH/EVR but locally DCH/EVR/DEC + Moist acid soils + up to 30% bare ground + rocks + rule based system indicators. Also LPH/CON + MPH/EVR.
Env. Qualifier:	4.2
Distribution:	ALN+BOR+ATN+ALS+CON+ATC+LUS+MDM
Mapping rules:	ALN + BOR over 800m + ATN over 900m + small patches on exposed coastal areas in the north + ALS over 1800m. No soils as highly variable, although skeletal soils e.g. rankers predominate.
Indicators:	***Arctostaphylos alpina, Vaccinium uliginosum,** Cassiope tetragona, Cornus suecica*
4060	Alpine and Boreal heaths

6.4.2.1.2 Pinus mugo and *Rhododendron hirsutum*

GHC (BioHab):	MPH/EVR/CON + moist acid soils + montane situation + indicators + *Rhododendron hirsutum*
Env. Qualifier:	4.2
Distribution:	ALS+CON
Mapping rules:	CON + ALS over 1800m + distribution of *Pinus mugo*
Indicators:	***Pinus mugo,** Rhododendron chamaecistus, **Rhododendron hirsutum***
4070	Bushes with *Pinus* mugo and *Rhododendron hirsutum*

6.4.2.2

6.4.2.2.1 Endemic Macaronesian

GHC (BioHab):	MPH/EVR +TPH/EVR + Ericoid indicator + Macaronesia
Env. Qualifier:	6.3
Distribution:	MAC
Mapping rules:	Macaronesia only.
Indicators:	*Daboecia azorica, **Erica arborea,** Teline canariensis*
4050	Endemic Macaronesian heaths

6.4.2.3

6.4.2.3.1 *Laurus nobilis*

GHC (BioHab):	MPH/EVR + TPH/EVR + *Laurus nobilis* + further expert knowledge.
Env. Qualifier:	7.3
Distribution:	LUS+MDN+MDS
Mapping rules:	*Laurus nobilis,* otherwise badly defined.
Indicators:	***Laurus nobilis**, Quercus ilex.*
5230	Arborescent matorral with *Laurus nobilis*

6.4.2.3.2 Mediterranean water courses with *Rhododendron ponticum*

GHC (BioHab):	MPH/EVR + water courses + expert knowledge.
Env. Qualifier:	7.3
Distribution:	MDS
Mapping rules:	MDS below 400m + Presence of *Rhododendron ponticum*, but rare and fragmented
Indicators:	***Rhododendron ponticum*** spp. *baeticum, Betula parvibracteata*.
92B0	Riparian formations on intermittent Mediterranean water courses with *Rhododendron ponticum, Salix* and others

6.4.2.4

6.4.2.4.1 *Buxus sempervirens* shrub

GHC (BioHab):	MPH/DEC + MPH/EVR + TPH/EVR + variable soils + *Buxus* + expert knowledge.
Env. Qualifier:	7.4
Distribution:	CON+LUS+MDM+MDN
Mapping rules:	ALS south facing slopes below 800m + MDN 200-800m + CON warm south facing shallow soils but in small patches+ MDM probably only small patches best predicted by distribution of Buxus. Calcareous soils.
Indicators:	***Buxus sempervirens**, Prunus mahaleb, Ligustrum vulgare, Amelanchier ovalis*
5110	Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (*Berberidion* p.p.)

6.4.2.5

6.4.2.5.1 Halo-nitrophilous scrubs

GHC (BioHab):	LPH/EVR + MPH/EVR + xeric eutrophic + indicators.
Env. Qualifier:	8.1
Distribution:	MDM+MDS
Mapping rules:	Probably only MDS, but otherwise impossible to map because of requirement to access nitrophilous status. Indicators maybe available.
Indicators:	***Peganum harmala,** Salsola Vermiculata, Atriplex halimus, Atriplex glauca*
1430	Halo-nitrophilous scrubs (*Pegano-Salsoletea*)

6.4.2.6

6.4.2.6.1 Pre-desert with *Zyziphus lotus*

GHC (BioHab):	LPH/EVR + MPH/EVR + *Zyziphus lotus*
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	Near Almeria (Spain)
Indicators:	*Zyziphus lotus, Asparagus albus, Chamaerops humilis, Phlomis purpurea*
5220	Arborescent matorral with *Zyziphus*

6.4.2.6.2 Close to cliffs with *Euphorbia pithyusa*

GHC (BioHab):	SCH/EVR+LPH/EVR+MPH/EVR + xeric soils + adjacent cliffs + indicators + expert knowledge
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	MDS southern classes only below 200m. + shallow rocky soils
Indicators:	***Euphorbia pithyusa,** Thymelaea passerina, Pistacia lentiscus, Helichrysum italicum*
5320	Low formations of *Euphorbia* close to cliffs

6.4.2.6.3 Pre-desert scrub with *Euphorbia dendroides*

GHC (BioHab):	LPH/EVR+MPH/EVR + xeric soils + indicators
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	MDS below 200m. southern classes only
Indicators:	*Euphorbia dendroides, Periploca laevigata, **Chamaerops humilis,** Genista spp.*
5330	Thermo-mediterranean and pre-desert scrub

6.4.3 MPH/CON

6.4.3.1

6.4.3.1.1 *Pinus mugo* and *Rhododendron hirsutum*

GHC (BioHab):	MPH/EVR/CON + moist acid soils + montane situation + indicators + *Rhododendron hirsutum*

Env. Qualifier:	5.2
Distribution:	ALS+CON
Mapping rules:	ALS over 1800m + distribution of *Pinus mugo.*
Indicators:	***Pinus mugo,*** *Rhododendron chamaecistus,* ***Rhododendron hirsutum***
4070	Bushes with *Pinus mugo* and *Rhododendron hirsutum*

6.4.3.1.2 *Juniperus communis*

GHC (BioHab):	LPH/CON + MPH/CON + moist acid calcareous soils + *Juniperus* + local knowledge.
Env. Qualifier:	5.2+5.4
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	Includes a wide range of conditions and the distribution of Juniperus communis and the suggested zones below could indicate its likely extent. ALN below 500m ATN below 400m BOR below 500m NEM + ATC + PAN + all CON + LUS + ALS below 800m + MDN 500-1000m + MDM over 800 m.
Indicators:	***Juniperus communis***
5130	*Juniperus communis* formations on heaths or calcareous grasslands

6.4.3.2

6.4.3.2.1 *Juniperus communis*

GHC (BioHab):	LPH/CON + MPH/CON + moist acid calcareous soils + *Juniperus* + local knowledge.
Env. Qualifier:	5.2+5.4
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	Includes a wide range of conditions and the distribution of Juniperus communis and the suggested zones below could indicate its likely extent. ALN below 500m ATN below 400m BOR below 500m NEM + ATC + PAN + all CON + LUS + ALS below 800m + MDN 500-1000m + MDM over 800 m.
Indicators:	***Juniperus communis***
5130	*Juniperus communis* formations on heaths or calcareous grasslands

6.4.3.3

6.4.3.3.1 Coastal dunes with *Juniperus*

GHC (BioHab):	MPH/CON + dry sandy soils + coastal dunes + Juniperus species
Env. Qualifier:	6.3
Distribution:	ATN+MDN+MDS
Mapping rules:	MDN + MDS but only Iberia + ATN (Jutland) + coastal mask of 500m + adjacent to dunes 331. Romeo also comments that it could also be within coniferous forest 312 but this is likely to be mostly 2270.
Indicators:	***Juniperus turbinata spp. turbinata****, Juniperus macrocarpa, Juniperus navicularis, Juniperus communis,* ***Juniperus oxycedrus***
2250	Coastal dunes with *Juniperus* spp.

6.4.3.4

6.4.3.4.1 *Juniperus* spp except *Juniperus communis*

GHC (BioHab):	MPH/CON + TPH/CON + very dry soils + *Juniperus* species + expert knowledge.
Env. Qualifier:	7.3
Distribution:	ALS+LUS+MDM+MDN+MDS
Mapping rules:	MDM below 500m + MDN below 800m + MDS all.
Indicators:	***Juniperus oxycedrus, Juniperus phoenicea****, Juniperus excelsa*
5210	Arborescent matorral with *Juniperus* spp.

6.4.3.4.2 Endemic forests with *Juniperus* spp.

GHC (BioHab):	MPH/CON + TPH/CON + with other scrub facies between trees + Juniperus species + expert knowledge.
Env. Qualifier:	7.3
Distribution:	MDM+MDN+MDS
Mapping rules:	MDS+MDN+MDM 300 m-1200 m + *Juniperus* spp.

Indicators:	*Juniperus brevifolia, Juniperus cedrus, Juniperus drupacea, Juniperus excelsa,* ***Juniperus foetidissima****, Juniperus oxycedrus, Juniperus phoenicea,* ***Juniperus thurifera***
9560	Endemic forests with *Juniperus* spp.

6.4.4 MPH/NLE

6.4.4.1

6.4.4.1.1 Mountain *Cytisus purgans*

GHC (BioHab):	LPH/NLE + MPH/NLE + shallow acidic soils + Mountain situations + *Cytisus purgens* + expert knowledge.
Env. Qualifier:	5.2
Distribution:	ALS+MDM+MDN
Mapping rules:	MDM over 700 m + LUS 700-1500m. Skeletal soils.
Indicators:	***Cytisus purgans***
5120	Mountain *Cytisus purgans* formations

6.5 TPH

> 30% tall scrub 2-5 m

6.5.1 TPH/EVR

6.5.1.1

6.5.1.1.1 Intermittent Mediterranean water courses

GHC (BioHab):	MPH/EVR + TPH/EVR + R. ponticum + endemics + + endemics + moist soils + steep-sided valleys + local expert information.
Env. Qualifier:	6.3
Distribution:	MDS
Mapping rules:	MDS below 300m + Presence of *Rhododendron ponticum*.
Indicators:	***Rhododendron ponticum*** **spp**. b*aeticum, Betula parvibracteata*, *Frangula alnus, Arisareum probiscideum*
92B0	Riparian formations on intermittent Mediterranean water courses with *Rhododendron ponticum, Salix* and others

6.5.1.1.2 Macaronesian heaths

GHC (BioHab):	MPH/EVR + TPH/EVR + Ericoid indicator + Macaronesia
Env. Qualifier:	6.3
Distribution:	-
Mapping rules:	Macaronesia only.
Indicators:	*Daboecia azorica,* ***Erica arborea,*** *Teline canariensis*
4050	Endemic Macaronesian heaths

6.5.1.2

6.5.1.2.1 Laurus *nobilis* **woods**

GHC (BioHab):	MPH/EVR + TPH/EVR + Laurus nobilis + further expert knowledge.
Env. Qualifier:	7.3
Distribution:	LUS+MDN+MDS
Mapping rules:	Distribution of Laurus nobilis, otherwise badly defined.
Indicators:	***Laurus nobilis****, Quercus ilex.*
5230	Arborescent matorral with *Laurus nobilis*

6.5.1.2.2 *Laurus nobilis thickets*

GHC (BioHab):	TPH/EVR + dry soils + indicators + expert knowledge
Env. Qualifier:	7.3
Distribution:	LUS+MDN+MDS

Mapping rules:	LUS+MDN+MDS below 200m as dry soils, but fragmented and almost impossible to predict
Indicators:	*Laurus nobilis*
5310	*Laurus nobilis* thickets

6.5.1.2.3 Southern riparian galleries

GHC (BioHab):	TPH/EVR+ FPH/EVR + *Nerium oleander* + endemics + very dry soils + steep-sided valleys + local expert knowledge.
Env. Qualifier:	7.3
Distribution:	MDS
Mapping rules:	MDS + below 300m but rare and fragmented
Indicators:	*Nerium oleander,* ***Tamarix*** **spp**, ***Securinega tinctoria,*** *Vitex agnus-castus*
92D0	Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*)

6.5.1.3

6.5.1.3.1 *Buxus sempervirens*

GHC (BioHab):	MPH/DEC + MPH/EVR + TPH/EVR + variable soils + *Buxus* + expert knowledge, with some MPH/DEC.
Env. Qualifier:	7.4
Distribution:	CON+LUS+MDM+MDN
Mapping rules:	ALS south facing slopes below 800m + MDN 200-800m + CON warm south facing shallow soils but in small patches+ MDM probably only small patches best predicted by distribution of *Buxus*. Calcareous soils.
Indicators:	***Buxus sempervirens****, Prunus mahaleb, Ligustrum vulgare, Amelanchier ovalis*
5110	Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (*Berberidion* p.p.)

6.5.2 TPH/CON

6.5.2.1

6.5.2.1.1 *Juniperus* spp. except *Juniperus communis*

GHC (BioHab):	MPH/CON + TPH/CON + dry or xeric soils + *Juniperus* species + expert knowledge.
Env. Qualifier:	7.3
Distribution:	MDM+MDN+MDS
Mapping rules:	MDM below 500m + MDN below 800m + MDS all.
Indicators:	***Juniperus oxycedrus, Juniperus phoenicea****, Juniperus excelsa, Juniperus thurifera*
5210	Arborescent matorral with *Juniperus* spp.

6.5.2.1.2 Endemic forests with *Juniperus* spp.

GHC (BioHab):	MPH/CON + TPH/CON + with other scrub facies between trees + *Juniperus* species + expert knowledge.
Env. Qualifier:	7.3
Distribution:	MDM+MDN+MDS
Mapping rules:	MDS+MDN+MDM 300 m-1200 m + *Juniperus* spp.
Indicators:	*Juniperus brevifolia, Juniperus cedrus, Juniperus drupacea, Juniperus excelsa,* ***Juniperus foetidissima****, Juniperus oxycedrus, Juniperus phoenicera,* ***Juniperus thurifera***
9560	Endemic forests with *Juniperus* spp.

6.6 FPH

6.6.1 FPH/DEC

6.6.1.1

6.6.1.1.1 Alluvial forest

GHC (BioHab):	FPH/DEC + *Fraxinus excelsior* + *Alnus glutinosa* + *Salix* spp. all over 30% + wet or seasonally wet eutrophic soils
Env. Qualifier:	4.1 + 3.1
Distribution:	ALN+ATN+ATC+BOR+NEM+CON+ALS+LUS
Mapping rules:	ALN below 200m., BOR+NEM below 300 m., ATN+ATC below 400m. ALS below 800m., LUS 900m.
Indicators:	***Alnus glutinosa, Fraxinus excelsior****, Filipendula ulmaria, Angelica sylvestris*
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae*, *Salicion albae*)

6.6.1.1.2 Softwood forests of *Salix alba* and *Populus alba*

GHC (BioHab):	FPH/DEC + *Populus* species as well as *Alnus* and *Salix* over 30 % + wet soils + adjacent to major rivers + further expert information.
Env. Qualifier:	3.1
Distribution:	CON+ATC+PAN+LUS+MDM+MDN+MDS
Mapping rules:	MDN + MDS + MDM Plus major rivers which will only identify the main stands. Those by smaller rivers will be too small anyway to be identified.
Indicators:	***Salix alba, Salix fragilis, Populus alba,*** *Fraxinus angustifolia*
92A0	*Salix alba* and *Populus alba* galleries

6.6.1.2

6.6.1.2.1 Fennoscandinavian swamp woods

GHC (BioHab):	FPH/DEC + more than 30% of *Alnus, Betula, Salix* or *Fraxinus* + wet soils + eutrophic + indicator species.
Env. Qualifier:	4.1
Distribution:	ALN+BOR+NEM+CON
Mapping rules:	BOR below 300 + NEM all + Wet peats.
Indicators:	***Fraxinus excelsior, Alnus glutinosa****, Alnus incana, Lycopus europaeus, Lysimachia thyrsiflora*.
9080	Fennoscandinavian deciduous swamp woods

6.6.1.2.2 Alluvial forests

GHC (BioHab):	FPH/DEC + *Fraxinus excelsior* + *Alnus glutinosa* + *Salix* spp. all over 30% + wet or seasonally wet eutrophic soils
Env. Qualifier:	4.1+ 3.1
Distribution:	ALN+ATN+ATC+BOR+NEM+CON+ALS+LUS
Mapping rules:	ALN below 200m., BOR+NEM below 300 m., ATN+ATC below 400m. ALS below 800m., LUS 900m.
Indicators:	***Alnus glutinosa, Fraxinus excelsior,*** *Filipendula ulmaria, Angelica sylvestris*
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae*, *Salicion albae*)

6.6.1.3

6.6.1.3.1 Natural forests of primary succession stages of land upheaval coast **9030**

GHC (BioHab):	FPH/DEC + FPH/CON + acid wet soils + *Salix/Alnus/Picea* + indicators + local knowledge
Env. Qualifier:	4.2
Distribution:	ALN+BOR+NEM
Mapping rules:	10 km mask on the Baltic coast in BOR / NEM. All CLC forest categories to be included .Consultation required as to the extent of the mask.
Indicators:	***Betula pendula,*** *Molinia caerulea, Vaccinium myrtillis*
9030	Natural forests of primary succession stages of land upheaval coast

6.6.1.3.2

GHC (BioHab):	FPH/DEC + *Betula pubescens* spp *czerrpanovii* over 70% + variable ground vegetation + expert knowledge.
Env. Qualifier:	4.2
Distribution:	ALN+BOR
Mapping rules:	Western sector 400-800m. Boreal eastern sector northern classes only.
Indicators:	***Betula pubescens ssp. czerepanovii**, Empetrum hermaphroditum, Vaccinium myrtillis, Aconitum lycoctonum*
9040	Nordic subalpine/subarctic forests with *Betula pubescens* spp *czerrpanovii*

6.6.1.4

6.6.1.4.1 Hardwood gallery forests along the major rivers

GHC (BioHab):	FPH/DEC + mixtures of Quercus robur, Ulmus minor and Fraxinus species + tall herb ground vegetation + alluvial wet soils + adjacent to large rivers.
Env. Qualifier:	4.3
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+PAN+LUS
Mapping rules:	ATN + ATC + CON below 300m + 500m buffer by large river.
Indicators:	***Quercus robur**, Ulmus laevis, **Ulmus minor**, Ulmus glabra**, Fraxinus excelsior,** Tamus communis, Phalaris arundinacea*
91F0	Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*

6.6.1.5

6.6.1.5.1 Luzulo-Fagetum beech forests **9110**

GHC (BioHab):	FPH/DEC over 70% *Fagus* + moist acid soils.
Env. Qualifier:	5.2
Distribution:	NEM+ATN+ALS+CON+ATC+PAN+MDM+MDN
Mapping rules:	NEM South Sweden only ATC + CON below 200 + ALS 300-1400 + MDM 800-1500M but only in north + Acid brown earth soils + Distribution of *Fagus*.
Indicators:	***Fagus sylvatica**, Luzula luzuloides, Pteridium aquilinum, Vaccinium myrtillis*
9110	*Luzulo-Fagetum* beech forests

6.6.1.5.2 Atlantic acidophilous beech forests with *Ilex* and sometimes also Taxus

GHC (BioHab):	FPH/DEC + *Fagus* usually over 70%+ Ilex and or *Taxus* + most acid soils + local guidance.
Env. Qualifier:	5.2
Distribution:	CON+ATC
Mapping rules:	ATN southern classes only and within 100km of coast + ATC within 100km of coast + Acid brown soils + Fagus.
Indicators:	***Fagus sylvatica*** over 70%*, Deschampsia flexuosa, Pteridium aquilinum, Vaccinium myrtillis*
9120	Atlantic acidophilous beech forests with *Ilex* and sometimes also Taxus in the shrub la*yer (Quercion robori-petraeae* or *Ilici-Fagenion)*

6.6.1.5.3 Old *Quercus robur* on sand

GHC (BioHab):	FPH/DEC *Quercus robur* + *Betula* 30-70 % + old forests + Acid moist podsols
Env. Qualifier:	5.2
Distribution:	NEM+ATN+CON+ATC+PAN+LUS
Mapping rules:	100km from coast of Estonia to the Netherlands + Podsols + *Quercus robur* / *Betula*.
Indicators:	***Quercus robur**, **Betula spp**., Deschampsia flexuosa, Pteridium aquilinum*
9190	Old acidophilous oak woods with *Quercus robur* on sandy plains

6.6.1.5.4 Old oak woods with *Ilex* and *Blechnum* in the British Isles

GHC (BioHab):	FPH/DEC Quercus petraea over 70% + old forests + moist acid soils + rich herb layer of mosses and ferns.
Env. Qualifier:	5.2
Distribution:	ATN+ATC
Mapping rules:	100 km from west coast of GB + Acid brown earths.

Indicators:	*Ilex aquifolium, Arbutus unedo,* ***Quercus petraea,*** *Blechnum spicant*
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

6.6.1.5.5 Galicio-Portuguese oak woods with Quercus robur and Quercus pyrenaica

GHC (BioHab):	FPH/DEC + Quercus pyrenaica + dry and moist acid soils.
Env. Qualifier:	5.2
Distribution:	ALS+LUS+MDN+MDM+MDS
Mapping rules:	Over 400 Iberian peninsula only but outlier in SW France
Indicators:	***Quercus robur*****, *Quercus pyrenaica,*** *Melampyrum pratense, Holcus mollis*
9230	Galicio-Portuguese oak woods with *Quercus robur* and *Quercus pyrenaica*

6.6.1.5.6 *Castenea sativa* Woods

GHC (BioHab):	FPH/DEC probably over 70 % + moist acid soils + local knowledge.
Env. Qualifier:	5.2
Distribution:	ALS+LUS+MDM+MDN+MDS
Mapping rules:	MDN + MDM + *Castanea sativa* but distribution needs to include non-native stands.
Indicators:	***Castanea sativa***
9260	*Castanea sativa* Woods

6.6.1.6

6.6.1.6.1 Wooded dunes

GHC (BioHab):	Habitat complex + FPH/DEC+FPH/EVR+FPH/CON+FPH/CON/EVR + dunes + expert knowledge
Env. Qualifier:	5.3
Distribution:	BOR+NEM+CON+ ATC+ATN+LUS+MDN+MDS
Mapping rules:	BOR+NEM+CON+ ATC+ATN+LUS+MDN+MDS + coastal mask of 1 km + forest + dunes
Indicators:	***Crataegus monogyna,*** *Betula* spp., ***Pinus pinaster,*** *Quercus ilex, Pinus sylvestris*
2180	Wooded dunes of the Atlantic, Continental and Boreal region

6.6.1.6.2 Fennoscandian hemiboreal natural

GHC (BioHab):	FPH/DEC + mixtures of *Quercus* / *Tilia* / *Acer* / *Fraxinus* and *Ulmus* + evidence of continuity of forest cover + dead wood + epiphytes.
Env. Qualifier:	5.3
Distribution:	ALN+BOR+NEM
Mapping rules:	BOR below 500m + NEM all + Brown earth soils + Presence of Ulmus and Quercus.
Indicators:	***Quercus robur, Tilia cordata***, *Anemone nemorosa, Dentaria bulbifera, Hepatica nobilis, Mercurialis perennis*.
9020	Fennoscandian hemiboreal natural old broad-leaved deciduous forests (*Quercus, Tilia, Acer, Fraxinus or Ulmus*) rich in epiphytes

6.6.1.6.3 Medio-European subalpine with Fagus and *Acer psedoplatanus*

GHC (BioHab):	FPH/DEC + Fagus 30-70 + Acer psedoplatanus 30-70 + expert local knowledge.
Env. Qualifier:	5.3
Distribution:	ALS+CON+MDM
Mapping rules:	ALS + CON 700-1200m.
Indicators:	***Fagus sylvatica****, Acer pseudoplatanus,* ***Rumex alpestris (arifolius)***
9140	Medio-European subalpine beech woods with *Acer* and *Rumex arifolius*

6.6.1.6.4 Sub-Atlantic oak or oak-hornbeam

GHC (BioHab):	FPH/DEC *Quercus petraea* and or *Quercus robur* and *Carpinus* all 30-70% + moist neutral soils.
Env. Qualifier:	5.3
Distribution:	NEM+ATN+ALS+CON+ATC+PAN+LUS

Mapping rules:	ATC + all CON below 800m + ALN + LUS below 300m + BOR too restricted to predict but look at possibility of species + Brown earth soils + *Quercus robur* (mainly but can also be *petraea* but not often) + *Carpinus.*
Indicators:	***Quercus robur, Quercus petraea, Carpinus betulus**, Stellaria holostea, Ranunculus nemorosus*
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*

6.6.1.6.5 *O*ak-hornbeam forests

GHC (BioHab):	FPH/DEC + *Quercus petraea* + *Carpinus* + *Tilia* all 30-70 % + moist neutral soils.
Env. Qualifier:	5.3
Distribution:	ATN+ALS+CON+ATC+PAN
Mapping rules:	CON below 400 + Distribution of *Quercus petraea* and *Carpinus.*
Indicators:	***Quercus petraea, Carpinus betulus**, Sorbus torminalis, Convallaria majalis*
9170	*Galio-Carpinetum* oak-hornbeam forests

6.6.1.6.6 Slopes, screes and ravines forest

GHC (BioHab):	FPH/DEC + *Acer pseudoplatanus* + *Tilia* + *Fraxinus* all 30-70% + moist neutral soils + shallow rock soils + steep slopes.
Env. Qualifier:	5.3
Distribution:	BOR+NEM+ATN+ALS+CON+ATC+PAN+MDM+MDN
Mapping rules:	ALS 400-1200M + ATN below 200m. ATN + BOR + NEM likely to be rare. Steep slopes-adjacent to scree in description but does not seem to fit British types + shallow soils.
Indicators:	***Acer pseudoplatanus, Tilia cordata,** Actaea spicata, Hellborus viridis*
9180	*Tilio-Acerion* forests of slopes, screes and ravines

6.6.1.6.7 *Fraxinus angustifolia* forests

GHC (BioHab):	FPH/DEC + Fraxinus angustifolia over 70% + moist neutral soils + usually grazed by domestic stock. Occurrence. Localised usually small patches often linear (Bensetti and Barbéro, 2009)
Env. Qualifier:	5.3
Distribution:	MDM+MDN+MDS
Mapping rules:	MDN + all MDM below 1200m + MDS probably too rare to predict but check + distribution of *Fraxinus angustifolia*.
Indicators:	***Fraxinus angustifolia**, Quercus pubescens, Quercus pyrenaica*
91B0	Thermophilous *Fraxinus angustifolia woods*

6.6.1.6.8 *Platanus orientalis* and *Liquidambar orientalis* woods

GHC (BioHab):	FPH/DEC + *Platanus orientalis*+ endemics + moist soils + steep-sided valleys + local expert information.
Env. Qualifier:	5.3
Distribution:	MDM+MDN+MDS
Mapping rules:	MDS + Presence of *Platanus orientalis,*
Indicators:	***Platanus orientalis, Liquidambar orientalis**, Ranunculus ficaria, Helleborus cyclophyllus, Pteridium aquilinum*
92C0	*Platanus orientalis* and *Liquidambar orientalis* woods (*Platanus orientalis)*

6.6.1.7

6.6.1.7.1 *Asperulo-Fagetum* beech forests

GHC (BioHab):	FPH/DEC + *Fagus* usually over 70% + brown earth soils + indicators
Env. Qualifier:	5.4
Distribution:	NEM+ATN+ALS+CON+ATC+PAN+MDM+MDN
Mapping rules:	Probably best to omit the western examples as they are fragmented and difficult to identify-the core distribution will be given by the following rules. ALS + CON 400 m-1200m + PAN over 400m. Basic/calcareous soils.

Indicators:	***Fagus sylvatica, Asperula oderata**, Anemone nemorosa, Lamium galeobdolon, Dentaria* spp
9130	*Asperulo-Fagetum* beech forests

6.6.1.7.2 Illyrian *Fagus sylvatica* forests

GHC (BioHab):	FPH/DEC + *Fagus* usually over 70% + moist calcareous soil.
Env. Qualifier:	5.4
Distribution:	ALS+PAN+MDM
Mapping rules:	ALS over 300m Balkans only + *Fagus* + Dolomite limestone + maybe outliers in SE Alps and PAN.
Indicators:	***Fagus sylvatica,** Lonicera nigra Omphalodes verna, Primula vulgaris*
91K0	Illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*)

6.6.1.8

6.6.1.8.1 Fennoscandian land upheaval coast

GHC (BioHab):	FPH/DEC + FPH/CON +FPH/DEC/CON + acid wet soils + *Salix/Alnus/Picea* + indicators + local knowledge
Env. Qualifier:	6.3
Distribution:	BOR+NEM
Mapping rules:	10 km mask on the Baltic coast. All CLC forest categories to be included .Consultation required as to the extent of the mask.
Indicators:	***Betula pendula**, Molinia caerulea, Vaccinium myrtillus, Deschampsia flexuosa*
9030	Natural forests of primary succession stages of land upheaval coast

6.6.1.8.2 Pannonic with *Quercus petraea* and *Carpinus betulus*

GHC (BioHab):	FPH/DEC + *Quercus petraea* 30-70- and *Carpinus* 30-70 + local PAN species + local knowledge.
Env. Qualifier:	6.3
Distribution:	CON+PAN
Mapping rules:	PAN below 500m + Quercus petraea and Carpinus + mixed soils.
Indicators:	***Quercus petraea, Carpinus betulus**, Carex pilosa, Galium sylvaticum*
91G0	Pannonic woods with *Quercus petraea* and *Carpinus betulus*

6.6.1.8.3 Dacian oak and hornbeam forests

GHC (BioHab):	FPH/DEC + *Carpinus* + *Quercus cerris or Quercus frainetto* + dry soils + expert knowledge.
Env. Qualifier:	6.3
Distribution:	Only in Romania, CON+PAN
Mapping rules:	CON+PAN Eastern 300 to 600 m. + dry soils + North Balkans
Indicators:	***Carpinus betulus, Quercus cerris**, Carpesium cernuum, Galium schultesii, Festuca heterophylla*
91Y0	Dacian oak & hornbeam forest

6.6.1.8.4 Moesian silver lime wood

GHC (BioHab):	FPH/DEC + *Tilia tomentosa* over 30% + other deciduous trees + expert knowledge
Env. Qualifier:	6.3
Distribution:	CON+MDN
Mapping rules:	CON+MDN 300 to 600m. + North and central Balkan + acid moist soils
Indicators:	***Tilia tomentosa**, Corydalis solida, Scilla bifolia, Carex sylvatica*
91Z0	Moesian silver lime wood

6.6.1.8.5 Balkan with *Quercus robur* and *Quercus petraea*

GHC (BioHab):	FPH/DEC + *Quercus robur* + *Quercus petraea* + *Quercus cerris* + *Carpinus* all between 30 and 70% + dry neutral soils.

Env. Qualifier:	6.3
Distribution:	ALS+PAN+MDM+MDN
Mapping rules:	ALS Balkans over 300m + PAN over 300m outlier in N Apennines + Quercus species + Carpinus + Neutral / acidic brown earths
Indicators:	***Quercus robur, Quercus petraea****, Erythronium dens canis, Cyclamen purpurascens*
91L0	Illyrian oak-hornbeam forests (*Erythronio-Carpinion*)

6.6.1.8.6 Pannonian-Balkanic oak forests

GHC (BioHab):	FPH/DEC + Quercus petraea + Quercus cerris both 30-70% + dry neutral and acidic soils.
Env. Qualifier:	6.3
Distribution:	CON+PAN
Mapping rules:	ALS northern Balkans only 300-600m + PAN southern only 300-600m + Brown soils.
Indicators:	***Quercus petraea****,* ***Quercus cerris,*** *Asphodelus alba, Glechoma hirsuta*
91M0	Pannonian-Balkanic turrule based system oak –sessile oak forests

6.6.1.8.7 *Quercus trojana* woods

GHC (BioHab):	FPH/DEC + *Quercus trojana* over 70% + dry soils + expert local information.
Env. Qualifier:	6.3
Distribution:	MDN+MNS
Mapping rules:	MDS + presence of *Quercus trojana* only, maybe outliers in southern classes of MDN.
Indicators:	***Quercus trojana,*** *Quercus pubescens, Quercus ilex*
9250	*Quercus trojana* woods

6.6.1.8.8 *Quercus frainetto* woods

GHC (BioHab):	FPH/DEC+ *Quercus frainetto* and *Fagus* 30-70 % but needs further expert information.
Env. Qualifier:	6.3
Distribution:	MDM+MDN+MDS
Mapping rules:	MDM below 700m + MDS + distribution of *Quercus frainetto* only but Fagus may also be involved-needs checking.
Indicators:	***Quercus frainetto, Fagus sylvatica***
9280	*Quercus frainetto* woods

6.6.1.8.9 *Quercus brachyphylla* woods

GHC (BioHab):	FPH/DEC + expert knowledge.
Env. Qualifier:	6.3
Distribution:	MDS
Mapping rules:	Below 500m + *Quercus brachyphylla* + Aegean margins only.
Indicators:	***Quercus brachyphylla***
9310	Aegean *Quercus brachyphylla* woods

6.6.1.8.10 Dacian Beech forests with *Fagus sylvatica*

GHC (BioHab):	FPH/DEC + over 70% *Fagus sylvatica* + local expert knowledge.
Env. Qualifier:	6.3
Distribution:	ALS+CON
Mapping rules:	ALS eastern only 800-1400m? (Dacian is not well defined) + Fagus
Indicators:	***Fagus sylvatica****, Symphytum cordatum, Primula alatia, Plumeria rubra*
91V0	Dacian Beech forests (*Symphyto-Fagion*)

6.6.1.8.11 Moesian Beech forests

GHC (BioHab):	FPH/DEC + *Fagus sylvatica* or *Fagus moesiaca* over 30% + indicator + expert knowledge
Env. Qualifier:	6.3
Distribution:	ALS+CON+MDN

Mapping rules:	ALS+CON+MDN over 600m, under 1500m. Balkans + deciduous forest + Fagus spp.
Indicators:	***Fagus moesiaca,*** *Calamagrostis arundinacea, Prenanthes purpurea*
91W0	Moesian beech forests

6.6.1.8.12 Dobrogean Macin Mountains

GHC (BioHab):	FPH/DEC + *Fagus sylvatica or Fagus taurica* either over 30% + dry soils + expert knowledge
Env. Qualifier:	6.3
Distribution:	CON
Mapping rules:	CON over 500m. Macin mountains only
Indicators:	***Fagus sylvatica, Fagus taurica****, Cystopteris fragilis, Carpesium cernuum*
91X0	Dobrogean beech forests

6.6.1.8.13 Western Pontic beech forests with *Fagus orientalis*

GHC (BioHab):	FPH/DEC+ *Fagus orientalis* + Laurophyllous shrubs
Env. Qualifier:	6.3
Distribution:	CON+MDN
Mapping rules:	CON+MDN above 800m below 1500m, Southeast Balkans
Indicators:	***Fagus orientalis****, Daphne pontica, Rhododendron ponticum, Epimedium pubigerum*
91S0	Western Pontic beech forests

6.6.1.9

6.6.1.9.1 Medio-European limestone beech forests of the *Cephalanthero-Fagion*

GHC (BioHab):	FPH/DEC + *Fagus* over 70% + shallow dry calcareous soils, on slopes and rich ground flora
Env. Qualifier:	6.4
Distribution:	ATN+ALS+CON+ATC+PAN+LUS+MDM+MDN
Mapping rules:	ATC + all ALS + CON 400-1200m + Calcareous soils + Fagus.
Indicators:	***Fagus sylvatica,*** *Carex digital, Cephalanthera spp., Neottia nidus-avis*
9150	Medio-European limestone beech forests of the *Cephalanthero-Fagion*

6.6.1.9.2 Euro-Siberian steppic woods with *Quercus* spp.

GHC (BioHab):	FPH/DEC + *Quercus pubescens* over 30% + dry calcareous soils + local knowledge.
Env. Qualifier:	6.4
Distribution:	PAN
Mapping rules:	Below 500m + *Quercus pubescens* + shallow calcareous soils.
Indicators:	***Quercus pubescens****, Fraxinus ornus, Sorbus domestica, Cornus mas*
91H0	Euro-Siberian steppic woods with *Quercus* spp.

6.6.1.9.3 Quercus faginea and Quercus canariensis Iberian woods

GHC (BioHab):	FPH/DEC + *Quercus faginea* + *Quercus canariensis* + moist acid soils + further expert information.
Env. Qualifier:	6.4
Distribution:	LUS+MDM+MDN+MDS
Mapping rules:	Possibly MDM 400-1500m otherwise distribution of *Quercus faginea* and *Quercus canariensis.*
Indicators:	***Quercus faginea, Quercus canariensis***
9240	*Quercus faginea* and *Quercus canariensis* Iberian woods

6.6.1.10

6.6.1.10.1 Ponto-Sarmatic deciduous thickets

GHC (BioHab):	TPH/DEC + dry soils + expert knowledge
Env. Qualifier:	7.3
Distribution:	NEM+CON+PAN
Mapping rules:	NEM+CON+PAN + Sarmatic zone definition + indicators

Indicators:	***Prunus spinosa, Jasminum fruticans**, Paeonia tenuifolia*
40C0	Ponto-Sarmatic deciduous thickets

6.6.1.10.2 Euro-Siberian steppic woods with *Quercus ssp*

GHC (BioHab):	FPH/DEC over 30% Quercus cerris and or Quercus petraea or pubescens + expert knowledge.
Env. Qualifier:	7.3
Distribution:	CON+PAN
Mapping rules:	Eastern CON classes only + *Quercus* spp + Loess soil.
Indicators:	***Quercus cerris, Quercus pubescens**, Tanacetum corymbosum, Vincetoxicum hirundinaria*
91I0	Euro-Siberian steppic woods with *Quercus* spp.

6.6.1.10.3 Eastern white oak woods

GHC (BioHab):	FPH/DEC + *Quercus pubescens* over 30% + *Quercus virgiliana* + dry soils + expert knowledge
Env. Qualifier:	7.3
Distribution:	CON+MDN
Mapping rules:	CON 100 to 400m. + MDN over 300m. Southeast Balkans
Indicators:	***Quercus pubescens, Quercus virgiliana**, Ostrya carpinifolia, Fraxinus ornus, Paeonia peregrina*
91AA	Eastern white oak woods

6.6.1.10.4 Scrub and low forest vegetation with *Quercus alnifolia*

GHC (BioHab):	FPH/DEC + *Quercus alnifolia* Troodos mountains only.
Env. Qualifier:	7.3
Distribution:	MDS
Mapping rules:	FPH/DEC + *Quercus alnifolia* only, over 30% m + expert information.
Indicators:	***Quercus alnifolia,** Acer sempervirens, Salvia cypria, Sedum cyprium*
9390	Scrub and low forest vegetation with *Quercus alnifolia*

6.6.1.11

6.6.1.11.1 Woodlands with *Quercus infectoria*

GHC (BioHab):	FPH/DEC+ *Quercus infectoria* over 30%? + dry limestone soils + expert knowledge
Env. Qualifier:	7.4
Distribution:	MDS
Mapping rules:	*Quercus infectoria* Troodos mountains only 600-1100 + dry limestone soils.
Indicators:	***Quercus infectoria,** Arbutus andrachne, Allium neapolitanum, Ferula communis*
93A0	Woodlands with *Quercus infectoria* (*Anagyro foetidae-Quercetum infectoriae*)

6.6.2 FPH/EVR

6.6.2.1

6.6.2.1.1 Forests of *Ilex aquifolium*

GHC (BioHab):	FPH/ EVR + Ilex aquifolium over 70% + occasionally *Taxus* present.
Env. Qualifier:	5.3
Distribution:	LUS+MDM+MDN
Mapping rules:	Too rare to be predicted.
Indicators:	***Ilex aquifolium, Taxus baccata***
9380	Forests of *Ilex aquifolium*

6.6.2.2

6.6.2.2.1 *Quercus suber* forests **9330**

GHC (BioHab):	FPH/EVR + dry acid soils + May have some *Quercus faginea* and *Quercus pyrenaica*.
Env. Qualifier:	7.2
Distribution:	LUS+MDM+MDN+MDS
Mapping rules:	MDN + MDS + distribution of *Quercus suber* + Acid soils.
Indicators:	***Quercus suber***
9330	*Quercus suber* forests

6.6.2.2.2 *Quercus ilex* and *Quercus rotundifolia* woods **9340**

GHC (BioHab):	FPH/EVR + *Quercus ilex* and *Quercus rotundifolia* over 70 %(canopy cover over 5m only) + dry soils.
Env. Qualifier:	7.2
Distribution:	LUS+MDM+MDN+MDS
Mapping rules:	MDM below 900m + MDN + MDS + *Quercus ilex* + *Quercus rotundifolia* + dry soils. Otherwise difficult to specify due to local, patterns.
Indicators:	***Quercus ilex, Quercus rotundifolia,*** *Ostrya carpinifolia, Rubra peregrina*
9340	*Quercus ilex* and *Quercus rotundifolia* woods

6.6.2.3

6.6.2.3.1 Southern riparian galleries

GHC (BioHab):	TPH/EVR+ FPH/EVR + *Nerium oleander* + *Securinega tinctoria* + endemics + very dry soils + steep-sided valleys + local expert knowledge.
Env. Qualifier:	7.3
Distribution:	MDS
Mapping rules:	MDS + below 300m but rare and fragmented
Indicators:	*Nerium oleander*, ***Tamarix* spp**, ***Securinega tinctoria,*** *Vitex agnus-castus*
92D0	Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*)

6.6.2.3.2 *Olea* and *Ceratonia* woods

GHC (BioHab):	FPH/EVR + 30-70 lea + 30-70 n% *Ceratonia* + xeric soils + indicator species.
Env. Qualifier:	7.3
Distribution:	MDN+MDS
Mapping rules:	MDS below 400m + distribution of *Olea* and *Ceratonia*.
Indicators:	***Olea europaea ssp. sylvestris, Ceratonia siliqua,*** *Pistacia lentiscus, Myrtus communis*
9320	*Olea* and *Ceratonia* woods

6.6.2.3.3 *Quercus macrolepsis* forests

GHC (BioHab):	FPH/EVR + *Quercus macrolepsis* over 70% + expert knowledge.
Env. Qualifier:	7.3
Distribution:	MDS
Mapping rules:	Greece only + *Quercus macrolepsis.*
Indicators:	***Quercus macrolepsis***
9350	*Quercus macrolepsis* forests

6.6.2.3.4 Macaronesian laurel forests (*Laurus azorica, Ocotea*)

GHC (BioHab):	FPH/EVR
Env. Qualifier:	7.3
Distribution:	-
Mapping rules:	Macaronesia only.
Indicators:	***Laurus azorica,*** *Hedera canariensis, Prunus lusitanica.*
9360	Macaronesian laurel forests (*Laurus, Ocotea*)

6.6.2.4

6.6.2.4.1 Palm groves of *Phoenix* ssp

GHC (BioHab):	FPH/EVR
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	Crete and the Canaries only with distribution of the two species
Indicators:	***Phoenix canariensis, Phoenix theophrasti***
9370	Palm groves of *Phoenix*

6.6.3 FPH/CON

6.6.3.1

6.6.3.1.1 Bog woodland

GHC (BioHab):	FPH/CON +FPH/DEC/CON *Picea* + *Pinus sylvestris* and *Betula* possible also mixed, water saturated acid peat soils + very acid wet species assemblages
Env. Qualifier:	2.2
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+MDM
Mapping rules:	Should also include mixed forests- pure deciduous likely to be much less common and therefore exclude unless good soil information is available. ALN + BOR + NEM + probably exclude ATC + ATN + CON + MDM as rare and fragmented in these zones + Wet acid peat soils.
Indicators:	***Betula pubescens, Picea abies, Pinus sylvestris,*** *Sphagnum spp. Vaccinium uliginosa*
91D0	Bog woodland

6.6.3.2

6.6.3.2.1 Natural forests of primary succession stages of land upheaval coast

GHC (BioHab):	FPH/DEC + FPH/CON + acid wet soils + *Salix/Alnus/Picea* + indicators + local knowledge
Env. Qualifier:	4.2
Distribution:	ALN+BOR+NEM
Mapping rules:	10 km mask on the Baltic coast in BOR / NEM. All CLC forest categories to be included .Consultation required as to the extent of the mask.
Indicators:	***Betula pendula,*** *Molinia caerulea, Vaccinium myrtillus*
9030	Natural forests of primary succession stages of land upheaval coast

6.6.3.3

6.6.3.3.1 Western Taiga

GHC (BioHab):	This class contains a wide range of variation and although the description in the manual implies that only old forests are included recently burnt areas are also covered. Also whilst some broadleaved trees may be preset consultation with general descriptions of taiga suggest that it is mainly coniferous and does not extend into the NEM zone but is in the high mountains of Norway and Sweden. The rules therefore define where the class can potentially occur but whether an individual unit is actually priority habitat status is more difficult to determine. ALN + BOR (western sector) 500-800 + BOR eastern sector throughout (based on distribution map of the biome).
Env. Qualifier:	5.2
Distribution:	ALN+BOR+NEM+CON
Mapping rules:	FPH/CON + *Pinus* and or *Picea* + dry acid soils + definition of old forest + local expert knowledge.
Indicators:	***Pinus sylvestris, Picea abies,*** *Vaccinium vitis-idaea, Deschampsia flexuosa*
9010	Western Taiga, In many ways 9020, 9030, 9050, 9070 are subtypes of this habitat

6.6.3.3.2 Caledonian forest

GHC (BioHab):	FPH/CON + *Pinus sylvestris* over 30% + distribution literature.
Env. Qualifier:	5.2
Distribution:	ATN

Mapping rules:	North of the Highland fault in Scotland only + native distribution of *Pinus sylvestris.*
Indicators:	***Pinus sylvestris,*** *Vaccinium vitis-idaea, Calluna vulgaris, Vaccinium myrtillis*
91 C0	Caledonian forest

6.6.3.3.3 Holy Cross fir forest

GHC (BioHab):	FPH/CON over 30 % + *Abies polonicum*.
Env. Qualifier:	5.2
Distribution:	ALS
Mapping rules:	ALS Poland only + distribution of *Abies polonicum*.
Indicators:	***Abies polonicum***
91 P0	Holy Cross fir forest *(Abietetum polonicum)*

6.6.3.3.4 Acidophilous *Picea* forests of the montane to alpine levels

GHC (BioHab):	FPH/CON over 70% + moist acid soils + rule based system species
Env. Qualifier:	5.2
Distribution:	ALS+CON+MDM
Mapping rules:	ALS+CON 800m-1700 m + MDM but north of Pyrenees only.
Indicators:	***Picea abies,*** *Vaccinium myrtillus, Homogyne alpina, Lycopodium annotinum*
9410	Acidophilous *Picea* forests of the montane to alpine levels (*Vaccinio-Piceetea*)

6.6.3.3.5 Alpine *Larix decidua* and/or *Pinus cembra* forests

GHC (BioHab):	FPH/CON over 70% / + *Larix* or *Pinus cembra* but only native stands + moist acid soils + species indicators.
Env. Qualifier:	5.2
Distribution:	ALS+MDM
Mapping rules:	ALS 1000-1700 m. MDM over 100m but north of Pyrenees only plus native distribution of. *Larix / Pinus cembra*.
Indicators:	***Larix decidua, Pinus cembra****, Vaccinium myrtillus, Deschampsia flexuosa*
9420	Alpine *Larix decidua* and/or *Pinus cembra* forests

6.6.3.4

6.6.3.4.1 Wooded dunes with *Pinus pinea* and/or *Pinus pinaster*

GHC (BioHab):	FPH/CON + *Pinus pinea* 30-100% + *Pinus pinaster* 30-100% + sand dunes
Env. Qualifier:	5.3
Distribution:	LUS+MDS
Mapping rules:	LUS+MDS + coastal mask of 1000 m and / or adjacent to dunes 331 + *Pinus pinea* + *Pinus pinaster.*
Indicators:	***Pinus pinea, /Pinus pinaster***
2270	Wooded dunes with *Pinus pinea* and/or *Pinus pinaster*

6.6.3.4.2 Fennoscandian herb-rich forests with *Picea abies*

GHC (BioHab):	FPH/CON + maybe FPH/DEC present but below 30% DEC present + *Picea abies* over 30% + old forest + brown forest soils + rich ground flora.
Env. Qualifier:	5.3
Distribution:	ALN+BOR+NEM
Mapping rules:	Brown soils ALN + BOR below 300 + NEM + all + Picea abies.
Indicators:	***Picea abies****, Actaea spicata, Geranium sylvaticum, Paris quadrifolia, Matteuccia struthiopteris*
9050	Fennoscandian herb-rich forests with *Picea abies*

6.6.3.4.3 Coniferous forests on, or connected to, glaciofluvial eskers

GHC (BioHab):	FPH/CON + FPH/DEC/CON + *Pinus sylvestris* 30-100 and or *Picea abies* 30-100 + moist freely drained neutral soils + rich herb layer + indicator species.
Env. Qualifier:	5.3
Distribution:	BOR+NEM
Mapping rules:	Find if there is a map of eskers BOR below 300 NEM all.
Indicators:	*Antennaria dioica, Pteridium aquilinum,* ***Pinus sylvestris***
9060	Coniferous forests on, or connected to, glaciofluvial eskers

6.6.3.4.4 *Taxus baccata* woods of the British Isles

GHC (BioHab):	FPH/CON+ *Taxus* over 70%
Env. Qualifier:	5.3
Distribution:	ATC
Mapping rules:	ATC + Too rare to predict but only in GB lowlands below 200
Indicators:	***Taxus baccata***
91J0	*Taxus baccata* woods of the British Isles

6.6.3.4.5 Southern Apennine *Abies alba* forests **9510**

GHC (BioHab):	FPH/CON over70% + *Abies alba* + further expert knowledge and indicators.
Env. Qualifier:	5.3
Distribution:	MDM
Mapping rules:	Southern Apennines only. Over 800m? Abies alba.
Indicators:	***Abies alba,*** *Fagus sylvestris*
9510	Southern Apennine *Abies alba* forests

6.6.3.4.6 Mediterranean *Taxus baccata* woods **9580**

GHC (BioHab):	FPH/CON over 70% + *Taxus baccata* and sometimes Ilex aquifolium
Env. Qualifier:	5.3
Distribution:	LUS+MDM+MDN
Mapping rules:	Too fragmented and rare to predict. But present in MDM over 700m.
Indicators:	***Taxus baccata,*** *Ilex aquifolium*
9580	Mediterranean *Taxus baccata* woods

6.6.3.5

6.6.3.5.1 Subalpine and montane *Pinus uncinata* forests

GHC (BioHab):	FPH/CON over 70% + *Pinus uncinata* over 70% + variable soils but Priority habitat if gypsum or limestone + indicator species.
Env. Qualifier:	5.4
Distribution:	ALS+MDM
Mapping rules:	ALS 100 m-1700 m? Variable soil type but priority if limestone or gypsum. *Pinus uncinata*.
Indicators:	***Pinus uncinata****, Lycopodium annotinum, Huperzia selago, Arctostaphylos alpina, Rhododendron ferrugineum*
9430	Subalpine and montane *Pinus uncinata* forests (* if on gypsum or limestone)

6.6.3.5.2 Sub-) Mediterranean pine forests with endemic black pines

GHC (BioHab):	FPH/CON over 70% + *Pinus laricio* or *Pinus nigra* + dolomite and limestone rock + expert knowledge of species distribution and character of native forest.
Env. Qualifier:	5.4
Distribution:	ALS+MDM+MDN
Mapping rules:	MDM over 900m? + MDN over 1000m? + maybe ALS in Balkans over 1000m
Indicators:	***Pinus nigra, Pinus laricio, Pinus salzmannii, Pinus pallasiana***
9530	(Sub-) Mediterranean pine forests with endemic black pines

6.6.3.6

6.6.3.6.1 Western Taiga

GHC (BioHab):	This class contains a wide range of variation and although the description in the manual implies that only old forests are included recently burnt areas are also covered. Also whilst some broadleaved trees may be preset consultation with general descriptions of taiga suggest that it is mainly coniferous and does not extend into the NEM zone but is in the high mountains of Norway and Sweden. The rules therefore define where the class can potentially occur but whether an individual unit is actually priority habitat status is more difficult to determine. ALN + BOR (western sector) 500-800 + BOR eastern sector throughout (based on distribution map of the biome).
Env. Qualifier:	6.2
Distribution:	ALN+BOR+NEM+CON

Mapping rules:	FPH/CON + *Pinus* and or *Picea* + dry acid soils + definition of old forest + local expert knowledge.
Indicators:	***Pinus sylvestris,*** *Picea abies, Vaccinium vitis-idaea*
9010	Western Taiga

6.6.3.6.2 Central European lichen Scots pine forests

GHC (BioHab):	FPH/CON over 70% + *Pinus sylvestris* + sandy podsols + lichen.
Env. Qualifier:	6.2
Distribution:	CON
Mapping rules:	CON, Northeast + central + below 800m + plus sandy acid soils + *Pinus sylvestris*.
Indicators:	***Pinus sylvestris,*** *Juniperus communis, Cladoniassp., Ptilidium ciliare*
91T0	Central European lichen Scots pine forests

6.6.3.6.3 Sarmatic steppe pine forest

GHC (BioHab):	FPH/CON over 70% + *Pinus sylvestris* + expert knowledge and rule based system species.
Env. Qualifier:	6.2
Distribution:	CON
Mapping rules:	PAN 300m + Eastern CON below 300m but indicative only. *Pinus sylvestris.*
Indicators:	***Pinus sylvestris,*** *Vaccinium myrtillus, Pyrola minor, Globularia punctata*
91U0	Sarmatic steppe pine forest

6.6.3.7

6.6.3.7.1 Moesian silver fir forests

GHC (BioHab):	FPH/CON + FPH/DEC/CON + *Fagus sylvatica* + *Abies alba or Picea abies* or *Pinus sylvestris*
Env. Qualifier:	6.3
Distribution:	ALS+MDN
Mapping rules:	ALS+MDN over 500m, under 1200m. Central-south Balkans.
Indicators:	***Fagus sylvatica, Abies alba,*** *Picea abies, Pinus sylvestris*
91BA	Moesian silver fir forests

6.6.3.7.2 Rhodopian and Balkan Scots pine forest

GHC (BioHab):	FPH/CON + *Pinus sylvestris* over 70% + dry soils + indicators
Env. Qualifier:	6.3
Distribution:	CON+MDN
Mapping rules:	CON over 600m. + MDN over 800m. + coniferous forest
Indicators:	***Pinus sylvestris****, Brachypodium pinnatum, Sesleria latifolia, Luzula sylvatica*
91CA	Rhodopide and Balkan Range Scots pine forests

6.6.3.7.3 Mediterranean pine forests with endemic Mesogean pines

GHC (BioHab):	FPH/CON over 70% + thermophilic scrub species-long established plantations included but artificial plantations not.
Env. Qualifier:	6.3
Distribution:	LUS+MDM+MDN+MDS
Mapping rules:	Below 800 m.
Indicators:	***Pinus pinaster ssp. pinaster, Pinus halepensis****, P. pithyusa, Pinus stankewiczii, Pinus eldarica, Pinus brutia*
9540	Mediterranean pine forests with endemic Mesogean pines

6.6.3.7.4 Endemic Canarian pine forests

GHC (BioHab):	FPH/CON
Env. Qualifier:	6.3
Distribution:	MAC
Mapping rules:	Canaries only.
Indicators:	***Pinus canariensis***
9550	Canarian endemic pine forests

6.6.3.7.5 *Cedrus brevifolia* forests

GHC (BioHab):	FPH/CON + *Cedrus brevifolia* + mountain summits + expert knowledge.
Env. Qualifier:	6.3
Distribution:	-
Mapping rules:	Troodos mountains.
Indicators:	***Cedrus brevifolia***
9590	*Cedrus brevifolia* forests (*Cedrosetum brevifoliae*)

6.6.3.7.6 High oro-Mediterranean pine forests

GHC (BioHab):	FPH/CON + *Pinus heldreichii or Pinus peuce* + dry soils + indicators + expert knowledge
Env. Qualifier:	6.3
Distribution:	MDN+MDS+MDM
Mapping rules:	MDN+MDS+MDM over 500 m southern Balkans, Greece and southern Italy + coniferous forests + Pinus species
Indicators:	***Pinus heldreichii, Pinus peuce****, Festuca penzesii, Luzula sylvatica*
95A0	High oro-Mediterranean pine forests

6.6.3.8

6.6.3.8.1 Western Carpathian calcicolous *Pinus sylvestris* forests

GHC (BioHab):	FPH/CON + *Pinus sylvestris* over 70% + dry calcareous soils + distinctive ground layer.
Env. Qualifier:	6.4
Distribution:	ALS+CON
Mapping rules:	ALS and CON (eastern only) over 1200m, Western Carpathians only + Calcareous soils + *Pinus sylvestris.*
Indicators:	***Pinus sylvestris,*** *Carex humilis, Primula auricular, Campanula carpatica*
91Q0	Western Carpathian calcicolous *Pinus sylvestris* forests

6.6.3.8.2 Dinaric dolomite Scots pine forests (*Genisto januensis-Pinetum*)

GHC (BioHab):	FPH/CON over70% + *Pinus sylvestris* + dolomite rendzina soils + expert knowledge + rule based system CON species.
Env. Qualifier:	6.4
Distribution:	ALS+CON
Mapping rules:	ALS 900 m-1200m, Balkans only + Dolomite limestone + *Pinus sylvestris*. Related to 91KO and higher than 9530.
Indicators:	***Pinus sylvestris, Genista januensis,*** *Teucrium chamaedrys, Hepatica nobilis,*
91R0	Dinaric dolomite Scots pine forests (*Genisto januensis-Pinetum*)

6.6.3.9

6.6.3.9.1 *Cupressus* forests (*Acero-Cupression*)

GHC (BioHab):	FPH/CON over 70% + *Cupressus* species over 30% + further expert knowledge.
Env. Qualifier:	7.3
Distribution:	MDS
Mapping rules:	*Cupressus* species alone + MDM over1000 m + Balkans only.
Indicators:	***Cupressus atlantica, Cupressus sempervirens***
9290	*Cupressus* forests (*Acero-Cupression*)

6.6.3.10

6.6.3.10.1 *Abies pinsapo* forests

GHC (BioHab):	Probably not 30% tree cover of *Abies pinsapo* but include under forest, remainder of cover is various scrub categories.
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	MDS but *Abies pinsapo* only.
Indicators:	***Abies pinsapo***
9520	*Abies pinsapo* forests

6.6.3.10.2 *Tetraclinis articulata* forests

GHC (BioHab):	FPH/CON although tree cover maybe under 30% surrounded by pre-desert scrub (Thermo mediterranean 5330) + *Tetraclinis articulata* + *xeric soils*
Env. Qualifier:	8.3
Distribution:	MDS
Mapping rules:	MDS (South Spain in Cartagena and Malta)
Indicators:	***Tetraclinis articulata,*** *Asparagus albus, Chamaerops humilis, Periploca laevigata*
9570	*Tetraclinis articulata* forests

6.6.4 FPH/DEC/CON

6.6.4.1

6.6.4.1.1 Bog woodland

GHC (BioHab):	FPH/CON + FPH/DEC/CON + *Picea* + *Pinus sylvestris* + *Betula* possible also mixed, water saturated acid peat soils + very acid wet species assemblages
Env. Qualifier:	2.2
Distribution:	ALN+BOR+NEM+ATN+ALS+CON+ATC+MDM
Mapping rules:	Should also include mixed forests- pure deciduous likely to be much less common and therefore exclude unless good soil information is available. ALN + BOR + NEM probably exclude ATC + ATN + CON + MDM as rare and fragmented in these zones + Wet acid peat soils.
Indicators:	***Betula pubescens, Picea abies, Pinus sylvestris,*** *Sphagnum spp. Vaccinium uliginosa*
91D0	Bog woodland

6.6.4.2

6.6.4.2.1 Natural forests of primary succession stages of land upheaval coast **9030**

GHC (BioHab):	FPH/DEC/CON + acid wet soils + *Salix/Alnus/Picea* + indicators + local knowledge
Env. Qualifier:	4.2
Distribution:	BOR+NEM
Mapping rules:	10 km mask on the Baltic coast in BOR / NEM. All CLC forest categories to be included .Consultation required as to the extent of the mask.
Indicators:	***Betula pendula,*** *Molinia caerulea, Vaccinium myrtillus*
9030	Natural forests of primary succession stages of land upheaval coast

6.6.4.3

6.6.4.3.1 Coniferous forests on, or connected to, glaciofluvial eskers **9060**

GHC (BioHab):	FPH/CON + FPH/DEC/CON + *Pinus sylvestris* 30-100 and or *Picea abies* 30-100 + moist freely drained neutral soils + rich herb layer + indicator species.
Env. Qualifier:	5.3
Distribution:	BOR+NEM
Mapping rules:	Find if there is a map of eskers BOR below 300 NEM all.
Indicators:	*Antennaria dioica, Pteridium aquilinum,* ***Pinus sylvestris***
9060	Coniferous forests on, or connected to, glaciofluvial eskers

6.6.4.3.2 Fennoscandian wooded pastures **9070**

GHC (BioHab):	FPH/DEC/CON + mixtures of *Fraxinus / Tilia / Betula* with at least 30% cover *Pinus* and *Picea* may also be present + evidence of domestic stock grazing or former use.
Env. Qualifier:	5.3
Distribution:	ALN+BOR+NEM+CON
Mapping rules:	Brown soils + ALN + BOR + NEM up to 700m.
Indicators:	***Quercus robur, Fraxinus excelsior,*** *Fragaria vesca, geranium sylvaticum*
9070	Fennoscandian wooded pastures

6.6.4.3.3 Apennine beech forests with *Taxus* and *Ilex* **9210**

GHC (BioHab):	FPH/DEC + *Fagus* over 70% + *Taxus/Ilex*
Env. Qualifier:	5.3
Distribution:	MDM+MDN
Mapping rules:	Apennines only 700-900 + Fagus.
Indicators:	***Fagus sylvatica,*** *Taxus baccata, Ilex aquifolium*
9210	Apennine beech forests with *Taxus* and *Ilex*

6.6.4.3.4 Apennine beech forests with *Abies alba* and beech forests with *Abies nebrodensis*

GHC (BioHab):	FPH/DEC/CON + *Fagus* over 30% and *Abies* over 30% + expert knowledge.
Env. Qualifier:	5.3
Distribution:	MDM+MDN
Mapping rules:	Apennines 800-1000 m Also found in Sicily *Fagus/Abies alba/Abies nebrodensis*.
Indicators:	***Fagus sylvatica, Abies alba, Abies nebrodensis****, Daphne laureola*
9220	Apennine beech forests with *Abies alba* and beech forests with *Abies nebrodensis*

6.6.4.4

6.6.4.4.1 Pannonic inland sand dune thicket (*Junipero-Populetum albae*)

GHC (BioHab):	FPH/DEC/CON over 30% but below 70% + mixed conifer / deciduous + *Juniperus* and *Populus* + sand or dunes.
Env. Qualifier:	6.3
Distribution:	PAN
Mapping rules:	Below 500m + sands.
Indicators:	***Populus alba, Juniperus communis****, Berberis vulgaris, Festuca vaginata*
91N0	Pannonic inland sand dune thicket (*Junipero-Populetum albae*)

6.6.4.4.2 Moesian silver fir forests

GHC (BioHab):	FPH/CON + FPH/DEC/CON + *Fagus sylvatica* + *Abies alba or Picea abies* or *Pinus sylvestris*
Env. Qualifier:	6.3
Distribution:	ALS+MDN
Mapping rules:	ALS+MDN over 500m under 1200m. Central-south Balkans.
Indicators:	***Fagus sylvatica, Abies alba****, Picea abies, Pinus sylvestris*
91BA	Moesian silver fir forests

6.6.4.4.3 Hellenic beech forests with *Abies borisii-regis*

GHC (BioHab):	FPH/DEC/CON + *Fagus* over 30 and *Abies* over 10 + expert knowledge + endemic species.
Env. Qualifier:	6.3
Distribution:	MDM
Mapping rules:	Over 700m? Greece only. *Fagus / Abies borisii-regis.*
Indicators:	***Fagus sylvatica, Abies borisii-regis***
9270	Hellenic beech forests with *Abies borisii-regis*

6.6.4.5

6.6.4.5.1 Western Carpathian calcicolous *Pinus sylvestris* forests

GHC (BioHab):	FPH/CON + *Pinus sylvestris* over 70% + dry calcareous soils + distinctive ground layer.
Env. Qualifier:	6.4
Distribution:	ALS+CON
Mapping rules:	Eastern only over 1200m, Western Carpathians only + Calcareous soils + *Pinus sylvestris.*
Indicators:	***Pinus sylvestris,*** *Carex humilis, Primula auricular, Campanula carpatica*
91Q0	Western Carpathian calcicolous *Pinus sylvestris* forests

5 Conclusions

A rule based system for Annex I habitats has been produced and field tested but further expert knowledge needs to be incorporated. Further field testing is required when the system has been incorporated on a field computer. This will be carried out in 2010. The system needs understanding of the rules and methodology provided for field mapping in the EBONE Field Handbook (Bunce et al 2010).

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7 References

Bensettiti F. et M. Barbéro 2009. Les frênaies thermophiles à Fraxinus angustifolia, un habitat d'intérêt communautaire (UE 91B0) du sud de la France. Présentation et synthèse à l'échelle du domaine méditerranéen. Rapport SPN 2009/06, MNHN-DEGBSPN, Paris, 48 p.

http://inpn.mnhn.fr/docs/91B0%20FT%20v291009.pdfBunce, R.G.H., Groom, G.B., Jongman R.H.G., Padoa Schioppa, E.(Eds) 2005. *Handbook for Surveillance and Monitoring of European Habitats.* Alterra Report 1219, EU FP project EVK CT-2002-20018, pp107

Bunce, R.H.G., M.J. Metzger, R.H.G. Jongman, J. Brandt, G. de Blust, R. Elena Rossello, G. B. Groom, L. Halada, G. Hofer, D.C. Howard, P. Kovář, C. A. Mücher, E. Padoa-Schioppa, D. Paelinx, A. Palo, M. Perez-Soba, I. L. Ramos, P. Roche, H. Skånes, T. Wrbka, 2008. A Standardized Procedure for Surveillance and Monitoring European Habitats and provision of spatial data. Landscape Ecology, 23:11-25

Bunce, R.H.G., P.Roche, M.M. B. Bogers, M.Walczak, G. de Blust, I. Geijzendorffer and R.H.G. Jongman 2010. EBONE-BioBio Handbook for Surveillance and Monitoring of Habitats. In prep.

Commission of the European Communities 2003 Council directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. As amended by the Accession Act of Austria, Finland and Sweden (1995) ; Accession Act of the Czech Republic, the Republic of Estonia, the Republic of Cyprus, the Republic of Latvia, the Republic of Lithuania, the Republic of Hungary, the Republic of Malta, the Republic of Poland, the Republic of Slovenia and the Slovak Republic (2003) and Council Directive 2006/105/EC 20 November 2006 adapting Directives 73/239/EEC, 74/557/EEC and 2002/83/EC in the field of environment, by reason of the accession of Bulgaria and Romania. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1992L0043:20070101:EN:HTM

Commission of the European Communities 2007 Interpretation manual of European Union habitats-EUR 27. DG Environment, Brussels. Commission of the European Communities.

Devillers, P. & J. Devillers-Terschuren (1996) A classification of Palaearctic habitats. Nature and environment, No 78, Council of Europe, Strasbourg:. 194 p

Evans, D. 2006. The habitats of the European Union Habitats Directive. Biology and Environment: Proceedings of the Royal Irish Academy, 106b (3):167-173.

Evans, D. (in press) *Interpreting the habitats of Annex I – Past, present and future*. Acta Botanica Gallica.

Evans, D., MacSharry, B. & Opermanis, O. in press Current status of the Habitats Directive marine Special Areas of Conservation network. Progress in Marine Conservation in Europe 2009 BfN Skripten series.

Halada, L. D. Evans, C. Romaõ & J. E. Petersen Which habitats of European Importance depend on agricultural practices? submitted to Biodiversity and Conservation

Ostermann, O.P (1998) *The need for management of nature conservation sites designated under Natura 2000*. Journal of Applied Ecology 35: 968-973


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