PEENHAB: Methodology development
European Habitat Mapping

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Background

- Due to increased human pressures the quality and the extent of *habitats decreases dramatically* across Europe.
- Need to adapt current nature conservation policies towards national and **Pan-European Ecological Networks** (**PEEN**) to improve the spatial coherence to maintain sustainable populations.
- Natura2000 network (Habitat and Bird Directive) is a good example of protecting primary nature conservation areas, but it does not guarantee the preservation of *biodiversity* in the wider *countryside*.
- Biodiversity of the countryside is important because a lot of species also depend on the countryside outside protected areas e.g. during migration, dispersion, foraging (G. de Blust).
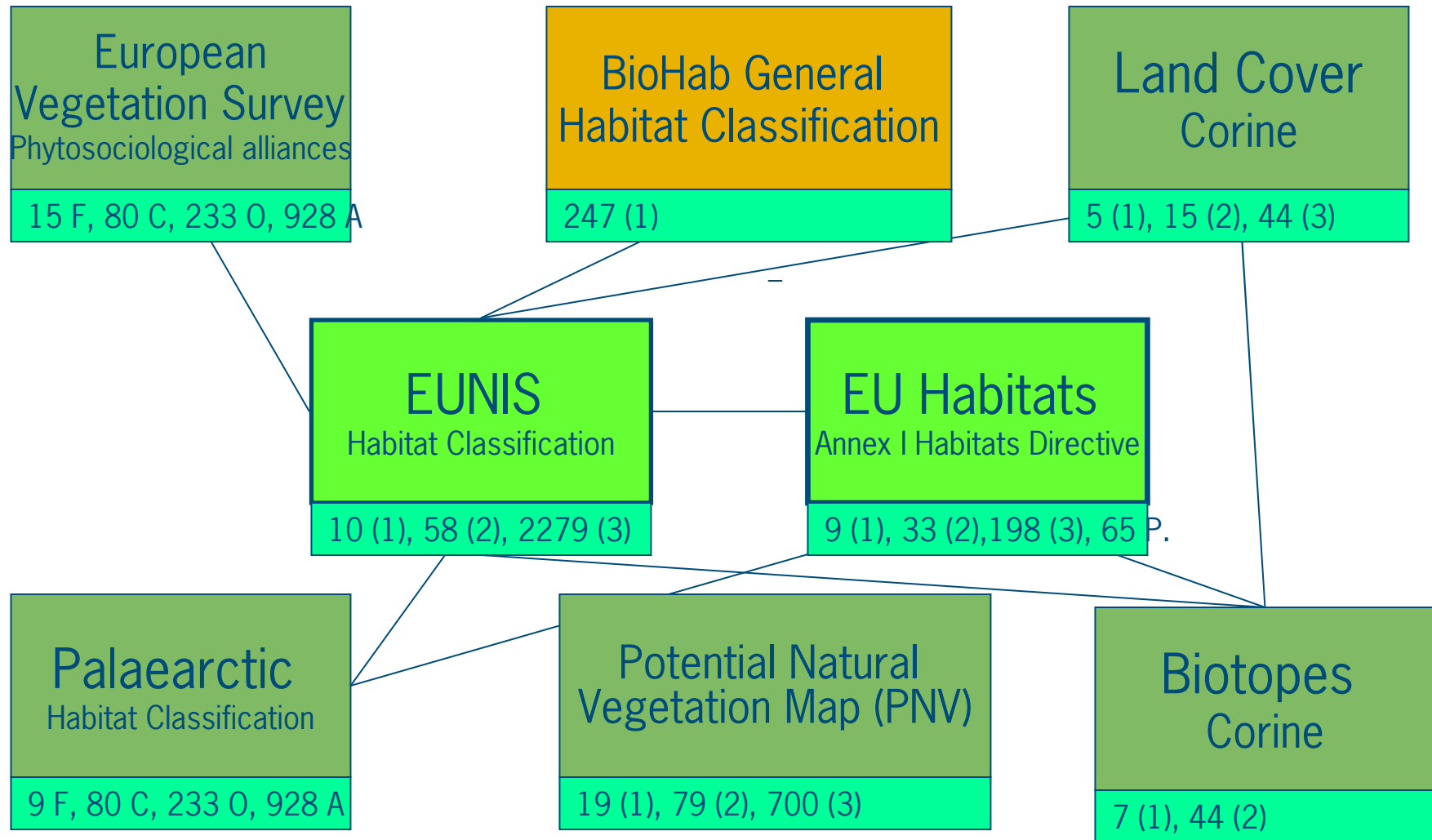
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Background

- As a result, there is a need to develop *appropriate policy instruments for nature conservation outside protected areas*, equally with those applied for the protected areas.

- A major limitation now is to provide *European figures on the extent of habitats and biodiversity* (BioHab, G. de Blust).

- In this case a **European Habitat Map** would be a major step forward to provide such figures.

- It will also constitute a primary layer for the development of a Pan-European Ecological Network (PEEN).

- This research is being implemented within the framework of PEEN (co-ordinated by EC-LNV) and is financed in 2002-2003 by the RS and GIS programme (DWK programme 358)

Objectives

- The overall objective is to develop a methodology to identify spatially all major habitats in Europe according to the Annex I of the Habitat Directive (198 habitats).

- This should result in a European Habitat Map with a spatial scale of ~ 1: 2,5M.

- To map all major habitats a flexible spatial data infrastructure needs to be developed in which existing and new spatial data sets are exploited and the (ecological) knowledge rules are explicitly defined.

Current habitat classifications & databases

European Vegetation Survey
Phytosociological alliances

15 F, 80 C, 233 O, 928 A

BioHab General Habitat Classification

247 (1)

Land Cover Corine

5 (1), 15 (2), 44 (3)

EUNIS
Habitat Classification

10 (1), 58 (2), 2279 (3)

EU Habitats
Annex I Habitats Directive

9 (1), 33 (2),198 (3), 65 P.

Palaearctic
Habitat Classification

9 F, 80 C, 233 O, 928 A

Potential Natural Vegetation Map (PNV)

19 (1), 79 (2), 700 (3)

Biotopes Corine

7 (1), 44 (2)

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# EU Habitat Directive (Annex I)

- The EU Habitats Directive is a Community legislative instrument in the field of nature conservation that establishes a common framework for the conservation of wild animal and plant species and natural habitats of Community importance.

- It creates a network of Special Areas of Conservation (SAC's), called **Natura 2000**.

- Annex I lists today **198 European natural habitat types**, including **65 priority habitats**.

- Annex I is based on the CORINE Biotopes project.

- In 1993 the Annex I was extended from EU12 to EU15. In total there are now 6 biogeographic regions distinguished: B*oreal, Atlantic, Alpine, Continental, Mediterranean and Macaronesian.*

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Level 1 of the Annex I Habitat Directive

1. COASTAL AND HALOPHYTIC HABITATS

2. COASTAL DUNES AND INLAND DUNES

3. FRESHWATER HABITATS

4. TEMPERATE HEATH AND SCRUB

5. SCLEROPHYLLOUS VEGETATION

6. NATURAL AND SEMI-NATURAL GRASSLANDS

7. RAISED BOGS AND FENS

8. ROCKY HABITATS AND CAVES

9. FORESTS

Methodology

- To achieve a European Habitat Map a methodology has to be developed that enables the spatial identification of individual habitats using specific expert knowledge / decision rules on basis of:

  - their description in the Annex I of the Habitat Directive

  - available spatial data sets, e.g.:
    - CORINE land cover database,
    - Biogeographic regions
    - Plant species distribution maps
    - Digital elevation models
    - Soil databases
    - Other geographic and topographic data
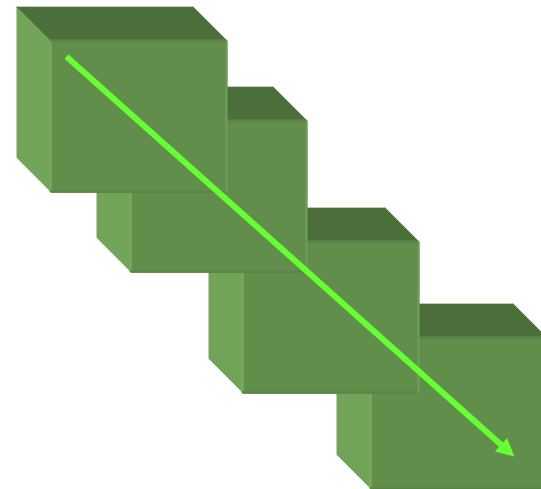
Final delineation habitat

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ECOTOPE CONCEPT

ABIOTIC component

Soil information

Physiotope

Altitude

Vegetation structure

	Calcareous	Acid	
Grassland			
Forest			

BIOTIC component

Annex 1 Habitat (9150)
Calcareous beech forest

Land cover

Plant species

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Methodology

Land use

Species distribution

Site conditions
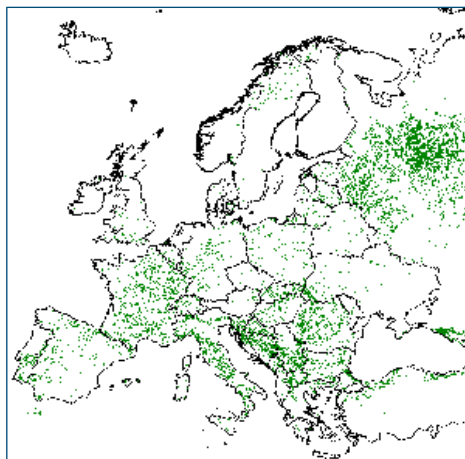
Result

Habitat Kaart (Annex I)
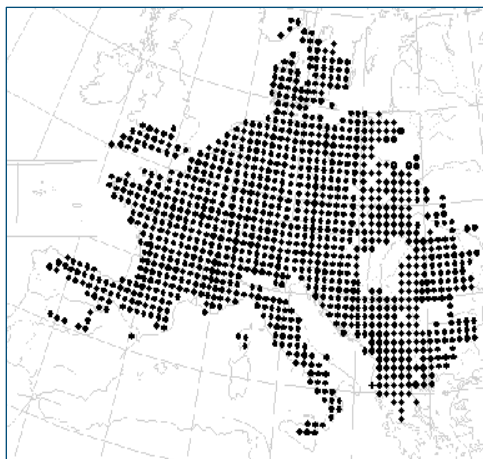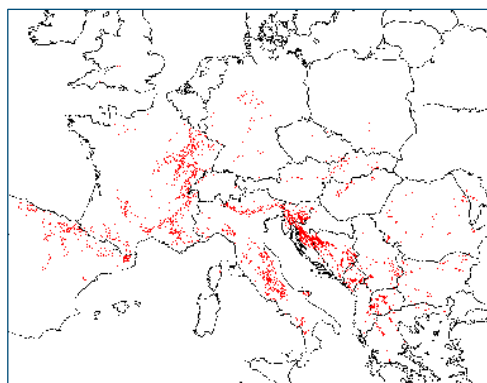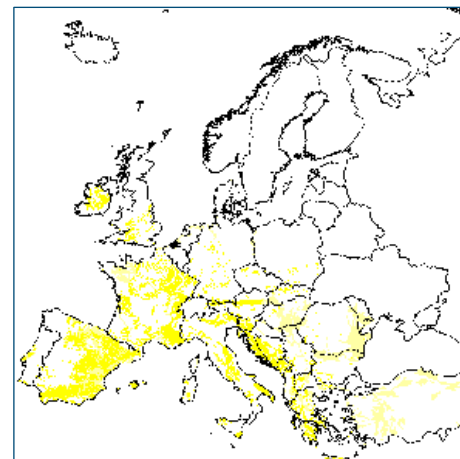
Calcareous beech forests (9150)

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Opbouw beslissingsregels
filters per habitat

	Mapping possibility	Remark	LC	S	BRME	AFE indicator species
1110 Sandbanks which are slightly covered by sea water all the time	+-	with species	523	0		
1120 * Posidonia beds (Posidonion oceanicae)	+-	with species	523	0		
1130 Estuaries	+-	with species	522	0		
1140 Mudflats and sandflats not covered by seawater at low tide	+-	with lc	423	0		
1150 *Coastal lagoons	+-	with species	521	0		
1160 Large shallow inlets and bays	-	with species	421	0		
1170 Reefs	--	not possible		0		
1180 Submarine structures made by leaking gases	--	not possible		0		
1210 Annual vegetation of drift lines	+-	with species+clifs	331	1		1
1220 Perennial vegetation of stony banks	+-	with species	331	0		
1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts	+-	with species+clifs	331	1	2	1
1240 Vegetated sea cliffs of the Mediterranean coasts with endemic	+-	with species+clifs	331	0	6	
1250 Vegetated sea cliffs with endemic flora of the Macaronesian coa	+	clifs+macaronesia	331	0	5	
1310 Salicornia and other annuals colonizing mud and sand	+-	with mudflats+species	421	1		1
1320 Spartina swards (Spartinion maritimae)	+	S. townsendii expanding	421	0		
1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	++		421	1	2	1
1340 * Inland salt meadows	+		411	1		1
1410 Mediterranean salt meadows (Juncetalia maritimi)	+	with EnC	421	0	6	
1420 Mediterranean and thermo-Atlantic halophilous scrubs (Sarcoc	+	with EnC	421	0	6	
1430 Halo-nitrophilous scrubs (Pegano-Salsoletea)	+		322	1		1
1510 * Mediterranean salt steppes (Limonietalia)	+	with species	321	0	6	
1520 * Iberian gypsum vegetation (Gypsophiletalia)	+		322	1		1
1530 * Pannonic salt steppes and salt marshes	+	with species	321	0	7	
1610 Baltic esker islands with sandy, rocky and shingle beach vegeta	+-	with boreal baltic+lc	331	1	9	1
1620 Boreal Baltic islets and small islands	+-			1	9	1
1630 * Boreal Baltic coastal meadows	+-		231	1	9	1

European land cover database

data sources
- CORINE
- GLC2000
- PELCOM

Total area 10,8 M km2
CORINE 36%
PELCOM 17%
GLC2000 45%

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Sander Mucher, 14-1-2004,

Data sources: CORINE land cover (EEA), PELCOM (Alterra) and GLC2000 (JRC)

1:13,000,000

Legend

- Continuous urban fabric
- Non-irrigated arable land
- Permanently irrigated land
- Vineyards
- Fruit trees and berry plantations
- Olive groves
- Pastures
- Annual cops associated with permanent crops
- Complex cultvation patterns
- Land principally occupied by agriculture
- Agro-forestry areas
- Broad-leaved forest
- Coniferous forest
- Natural grasslands
- Moors and heath lands
- Sclerophyllous vegetation
- Transitional woodland-scrub
- Beaches, dunes, sands
- Bare rocks
- Sparsely vegetated areas
- Burnt areas
- Glaciers and perpetual snow
- Inland marshes
- Peatbogs
- Salt marshes
- Salines
- Intertidal flats
- Water courses
- Water bodies
- Coastal lagoons
- Estuaries
- Sea and Ocean

European Habitat Map - Annex I - Level 1

Legend Annex I level 1

- 1. Coastal and halophytic habitats
- 2. Coastal and inland sand dunes
- 3. Freshwater habitats
- 4. Temperate heath and scrub
- 5. Sclerophyllous scrub (matorral)
- 6. Natural and semi-natural grassland
- 7. Raised bogs, mires and fens
- 8. Rocky habitats and caves
- 9. Forests

1:13,000,000

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Sander Mucher, 09-09-2004, Alterra

Atlas Florae Europaeae

New AFE grid cell locations
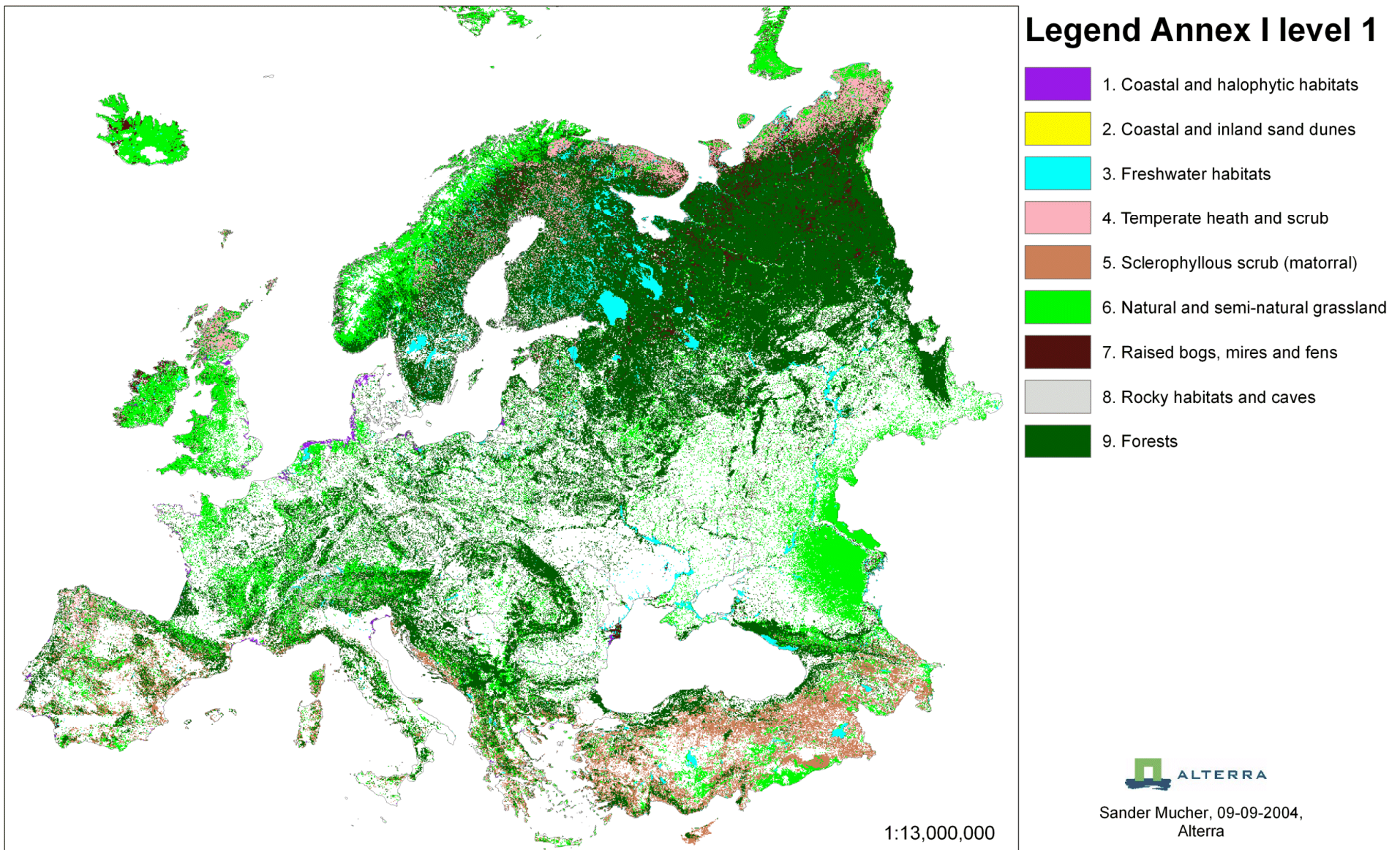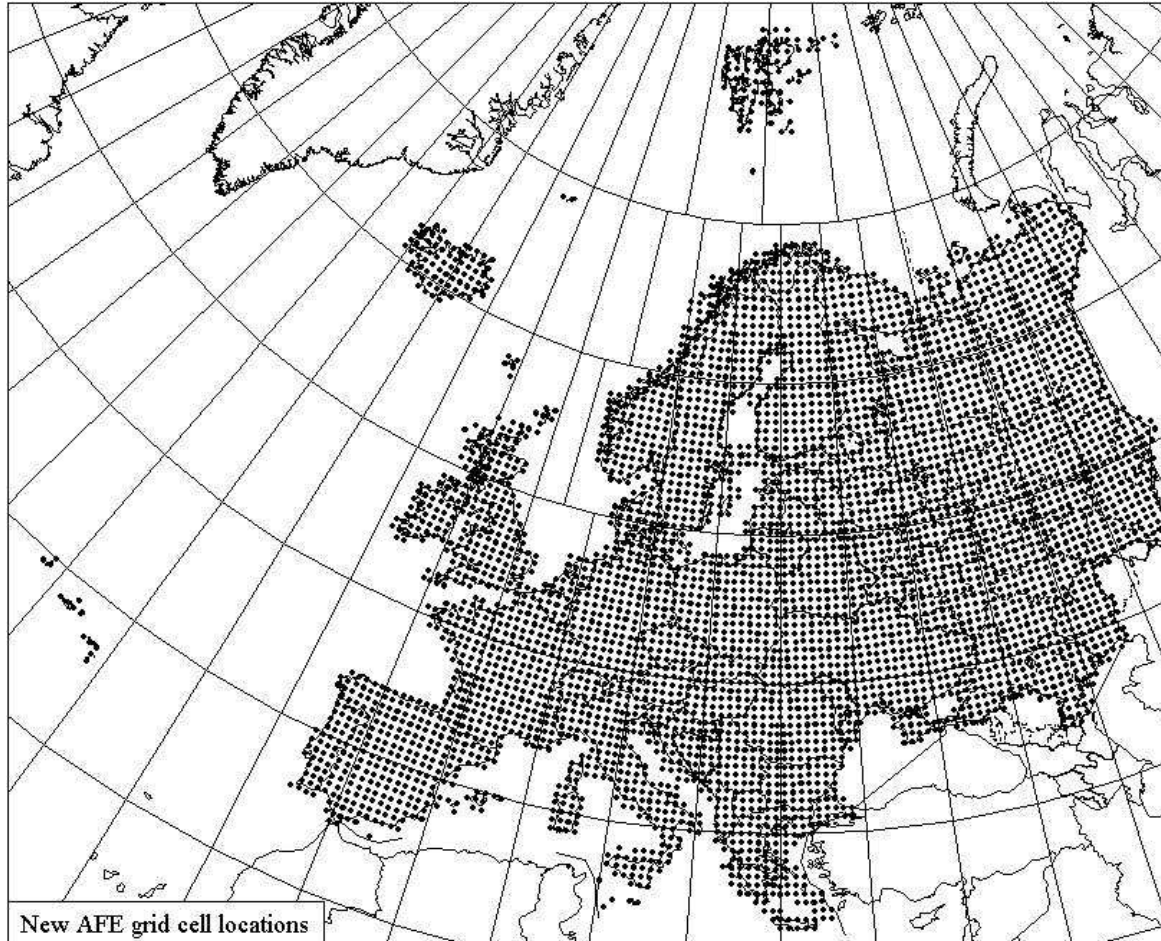
In the period 1972-present 12 volumes of the atlas has been published with 3270 plant distribution maps (50km grids).

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SynBioSys Europe

Screen shot of SynBioSys Europe showing the the hierarchical organisation of Natura2000 habitat types. At the lowest level the tree is opened at type 9150 showing a list of plant species that are considered to be characteristic for 'Medio-European limestone beach forest of the Cephalanthero-Fagion'. On the right site the threshold for the minimum number of speciesto be found in a mapping unit with in the European Vegetation Map is set to '2'.

SynBioSys Europe is an initiative of the European Vegetation Survey.

It is an information system for the evaluation and management of biodiversity among **plant species,vegetation types and landscapes**.

The project is co-ordinated by Alterra and will function as a network of distributed databases related through a webserver.

GIS webmapping tools will be used for the visualisation of layers of information on plant species, vegetation and landscape level

**Website:
www.synbiosys.alterra.nl/eu/**

Example Result SynBioSys

Rough estimation of the distribution of Habitat 9150 'Medio-European limestone beach forest of the Cephalanthero-Fagion' Europe based on the Map of the Natural vegetation of Europe.
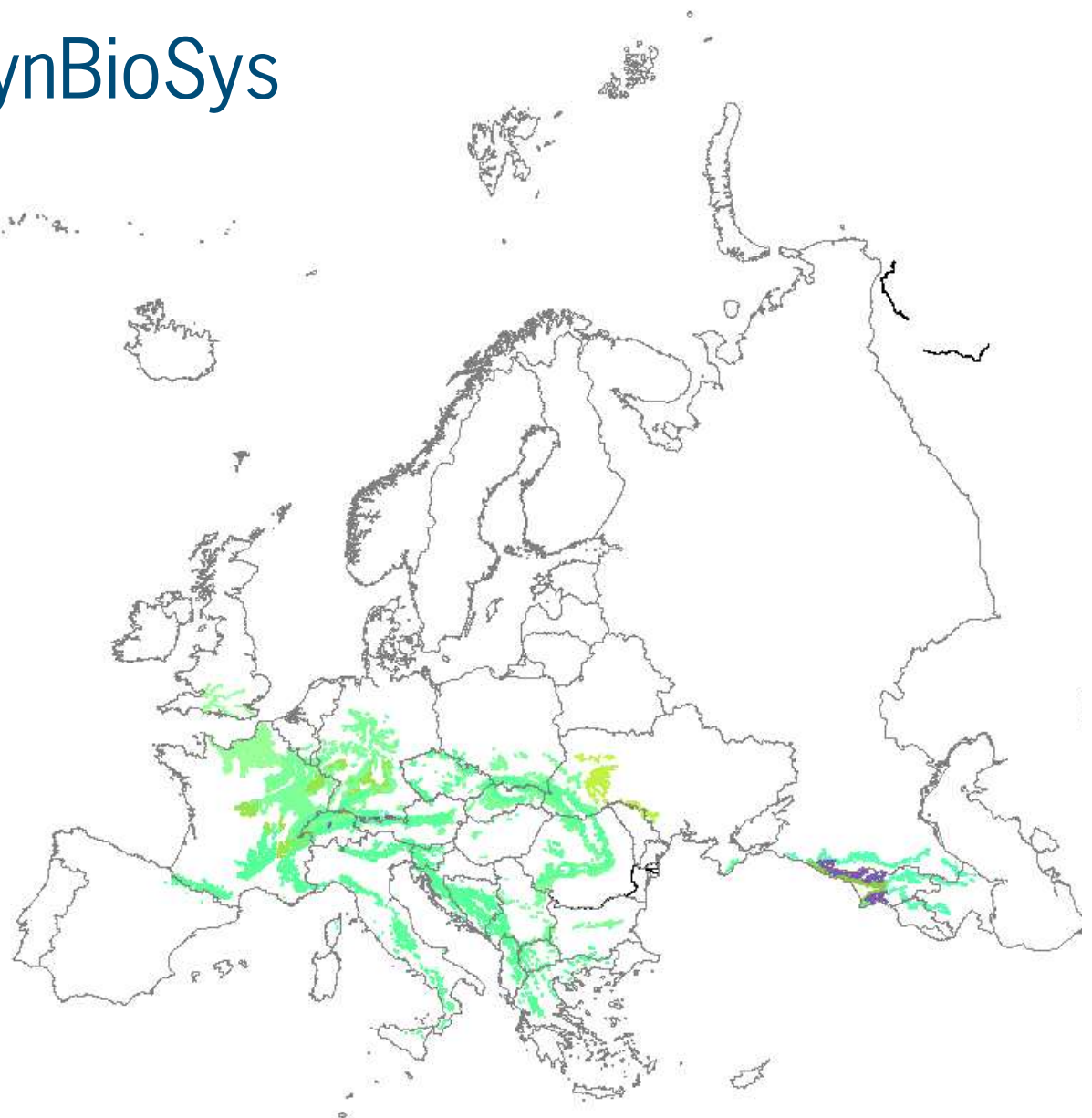
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Scale 1 : 27.393.235

Abiotic datasets

FAO- UNESCO Soil Map 1:5M
- Hydromorphic soils
- Organic Soils
- Salinisations
- Calcaric soils

Country borders

FAO- UNESCO Soil Map 1:5M
- poor
- marginal
- intermediate
- good

Country borders

- 0 – 100 meters
- 100 – 200
- 200 – 300
- 300 – 500
- 500 – 700
- 700 – 900
- 900 – 1100
- 1100 – 1500
- 1500 – 2000
- 2000 – 2500
- 2500 – 3000
- 3000 – 5000

Biogeographic regions (EMERALD)
- Alpine
- Anatolian
- Artic
- Atlantic
- Black sea
- Boreal
- Continental
- Macaronesia
- Mediterranean
- Pannonian
- Steppic

Biogeographic zones

Legend

envzone.img
Class_Names

- Alpine north
- Alpine South
- Annotolian
- Atlantic central
- Atlantic North
- Boreal
- Continental
- Lusitanian
- Mediterranean mountains
- Mediterranean north
- Mediterranean south
- Nemoral
- Pannonian
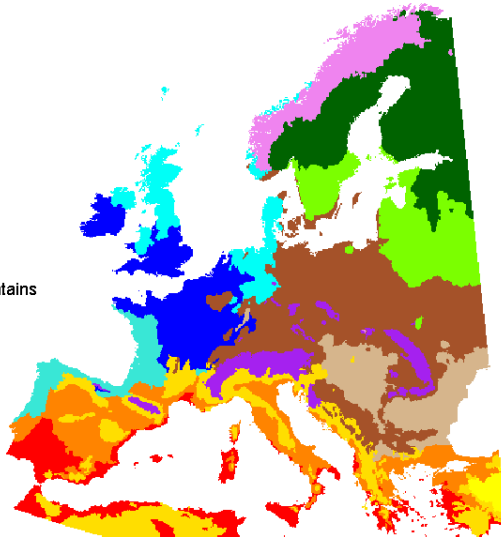
Legend

brme_revised_recoded2.img
Class_Names

- Alpine North
- Alpine South
- Annatolian
- Arctic
- Atlantic
- Boreal
- Continental
- Macoronesian
- Mediterranean South
- Pannonian
- Steppic
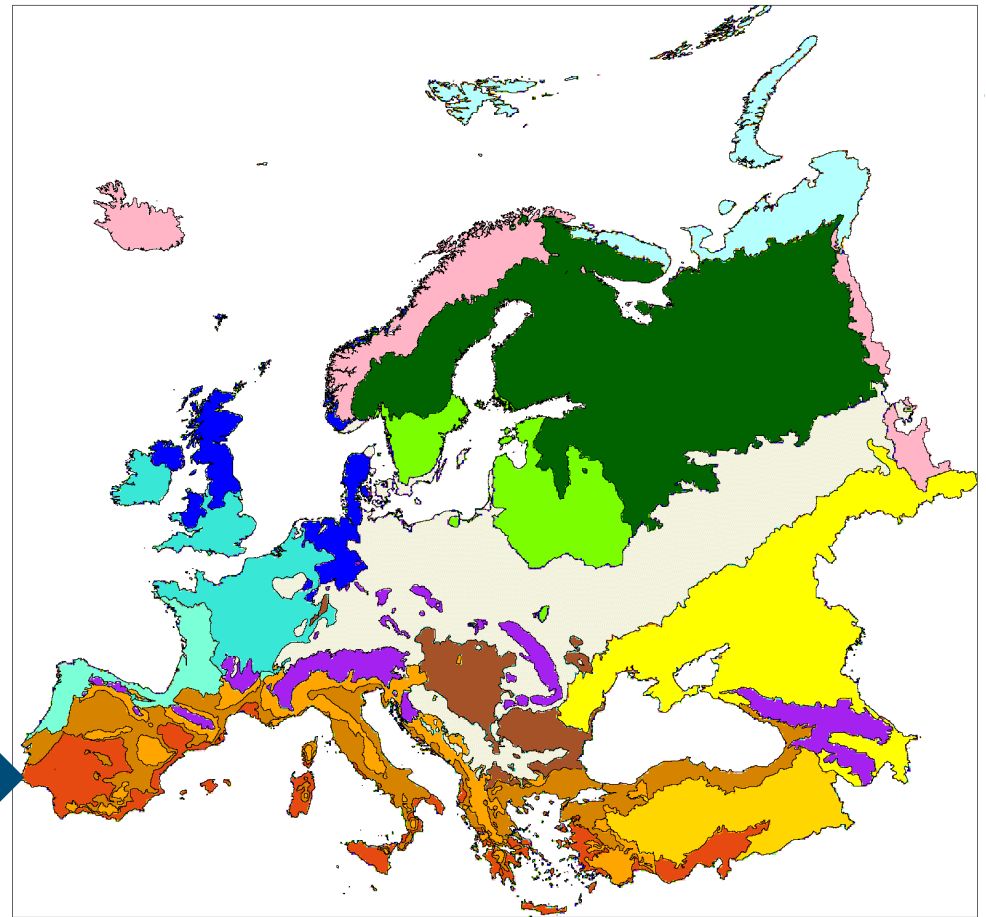
Legend (bioclimatic)

- No data
- 1.Alpine North (Z)
- 2.Boreal (B)
- 3.Nemoral (B)
- 4.Atlantic North (A)
- 5.Alpine South (Z)
- 6.Continental (C)
- 7.Atlantic Central (A)
- 8.Pannonian (C)
- 9.Lusitanian (A)
- 10.Anatlolian (T)
- 11.Mediterranean Mountains (M)
- 12.Mediterranean North (M)
- 13.Mediterranean South (M)
- 14.Arctic (K)
- 15.Steppic (S)
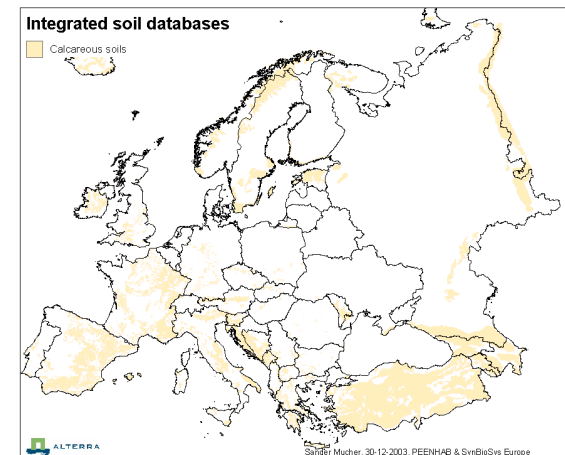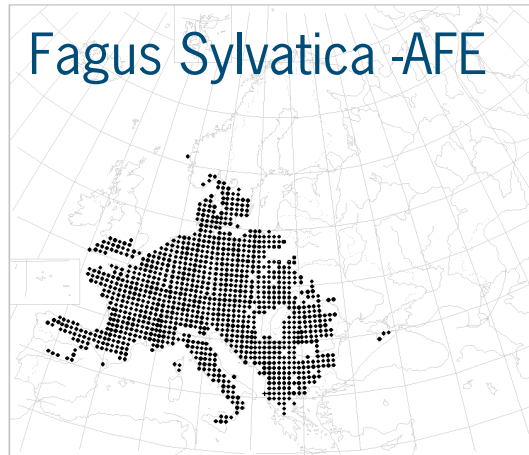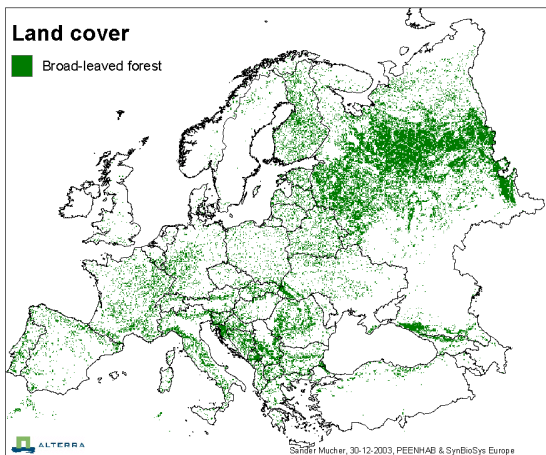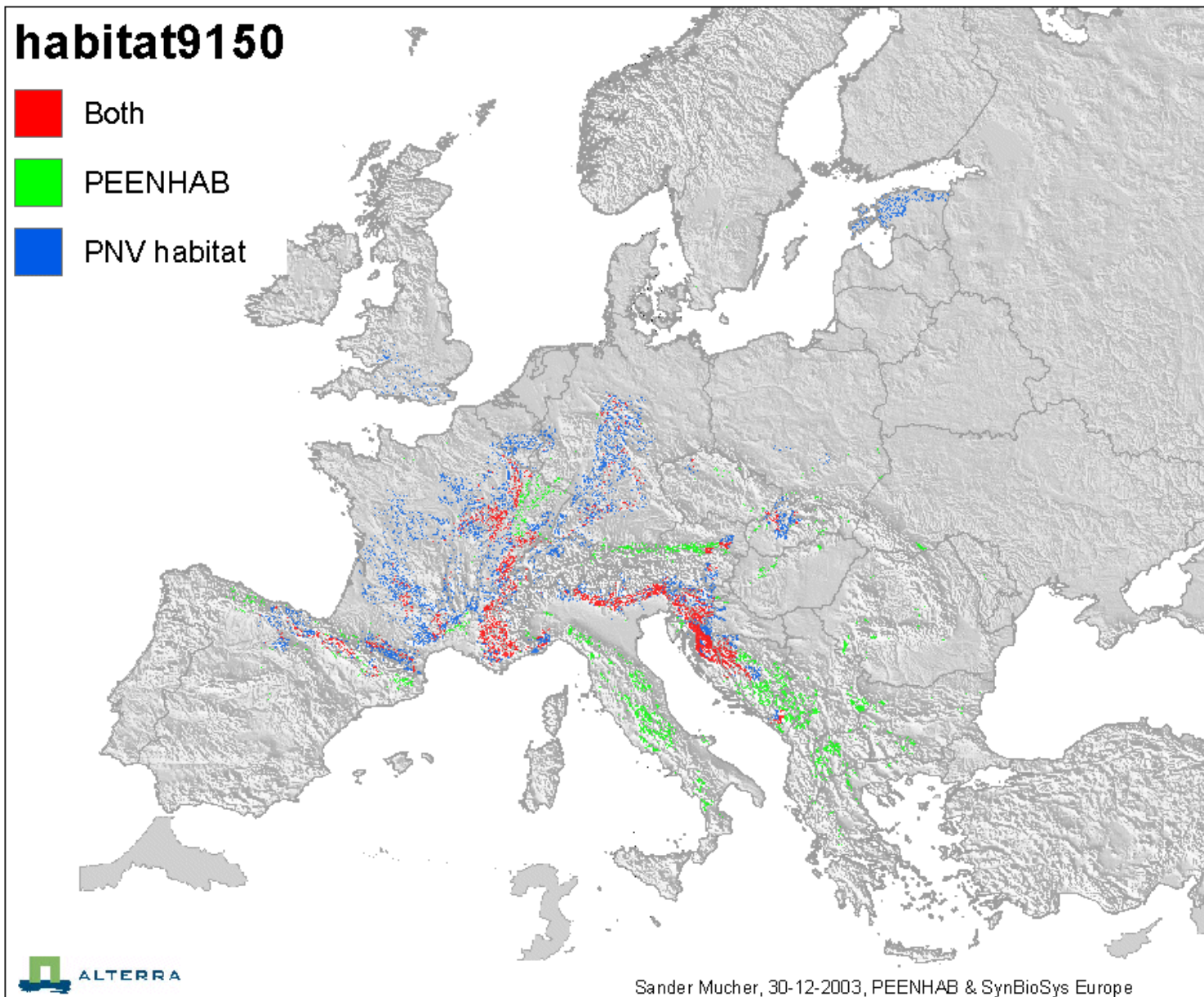
Annex 1: Calcareous beech forest (Annex I, 9150, Cephalanthero-Fagion, [41.16])

9150	Calcareous beech forests (Cephalanthero-Fagion) (41.16)

Description

Xero-thermophile [**Fagus sylvatica**] forests developed on **calcareous, often superficial, soils**, usually of **steep slopes**, of the **medio-European** and **Atlantic domaines** of Western Europe and of central and northern Central Europe, with a generally abundant herb and shrub undergrowth, characterized by sedges ([Carex digitata, Carex flacca, Carex montana, Carex alba]), grasses ([Sesleria albicans, Brachypodium pinnatum]), orchids ([**Cephalanthera**] spp., [Neottia nidus-avis, Epipactis leptochila, Epipactis microphylla]) and thermophile species, transgressive of the [Quercetalia pubescenti-petraeae]. The bush-layer includes several calcicolous species ([Ligustrum vulgare, Berberis vulgaris]) and [Buxus sempervirens] can dominate.

The following sub-types are included:
Pal., 41.161 Middle European dry-slope limestone beech forests

Middle European sedge and orchid beech woods of slopes with reduced water availability.
Pal., 41.162 North-western Iberian xerophile beech woods

[Fagus sylvatica] forests of relatively low precipitation zones of the southern ranges of the Pais Vasco and of superficially dry calcareous soils of the Cordillera Cantabrica, with [Brachypodium pinnatum ssp. rupestre, Sesleria argentea ssp. hispanica, Carex brevicollis, Carex ornithopoda, Carex sempervirens, Carex caudata, Cephalanthera damasonium, Cephalanthera longifolia, Epipactis helleborine, Epipactis microphylla, Neottia nidus-avis].

Distribution

Austria, Belgium, Denmark, France, Germany, Greece, Luxemburg, Spain, Sweden.

Plants

[**Fagus sylvatica**, Carex digitata, Carex flacca, Carex montana, Carex alba, Sesleria albicans, Brachypodium pinnatum, **Cephalanthera**] spp., [Neottia nidus-avis, Epipactis leptochila, Epipactis microphylla, Buxus sempervirens].

Relationship to EUNIS classification

<	G1.6	[Fagus] woodland
=	G1.66	Medio-European limestone [Fagus] forests

Relationship to other classifications

Nordic classification 1994

?	2.2.2.3	[Fagus sylvatica-Mercurialis perennis-Allium ursinum] -typ

Palaearctic classification 1996

?	41.16	Medio-European limestone beech forests
?	41.161	Middle European dry-slope limestone beech forests
?	41.1611	Medio-European dry slope sedge beech forests
?	41.1612	Medio-European steep slope yew beech forests
?	41.1613	Medio-European blue moorgrass beech forests
?	41.1614	Medio-European naked basiphile beech forests
?	41.1615	Pannonic limestone beech forests
?	41.162	North-western Iberian xerophile beech woods

Habitat names in different languages

Danish	Bøgeskove på kalkrig bund (Cephalanthero-Fagion)
German	Orchideen-Buchenwald (Cephalanthero-Fagion)
English	Medio-European limestone beech forests ([Cephalanthero-Fagion])
Spanish	Hayedos calcícolas (Cephalanthero-Fagion)
French	Hêtraies calcicoles (Cephalanthero-Fagion)
Italian	Faggeti calcicoli(Cephalanthero-Fagion)
Dutch	Kalkminnende beukenbossen (Cephalanthero-Fagion)
Portuguese	Faiais calcícolas(Cephalenthero-Fagion)

INPUT layers

Land cover
- Broad-leaved forest

Fagus Sylvatica -AFE

Integrated soil databases
- Calcareous soils

SynBioSys Europe
- habitat 9150
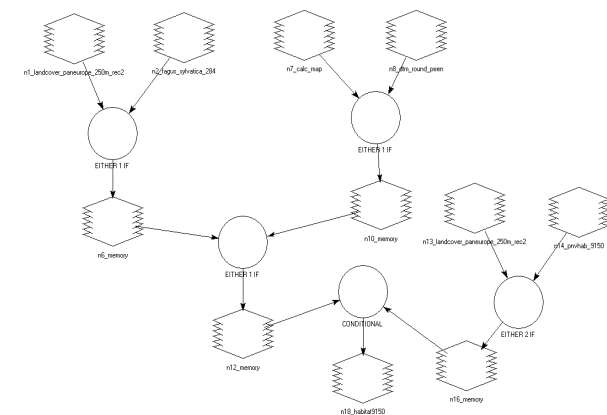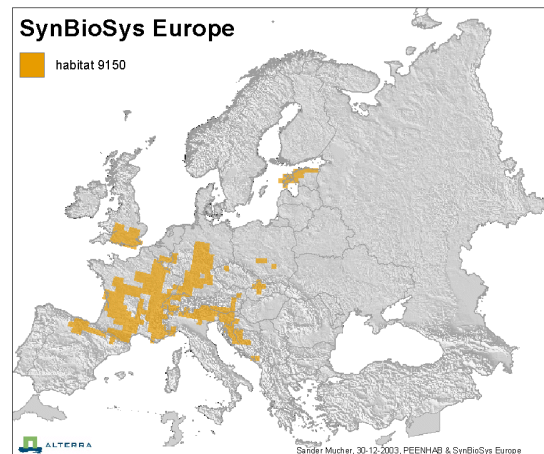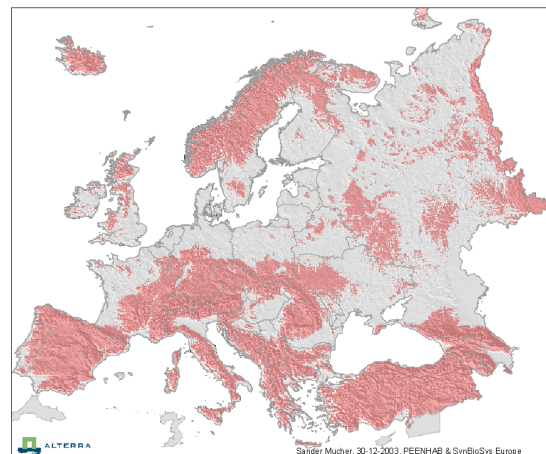
Resultaat: Habitatkaart 9150

Validation

- CORINE Biotopes

- Natura2000 sites

- Expert judgement

- Releves SynBioSys Europe

Validatie

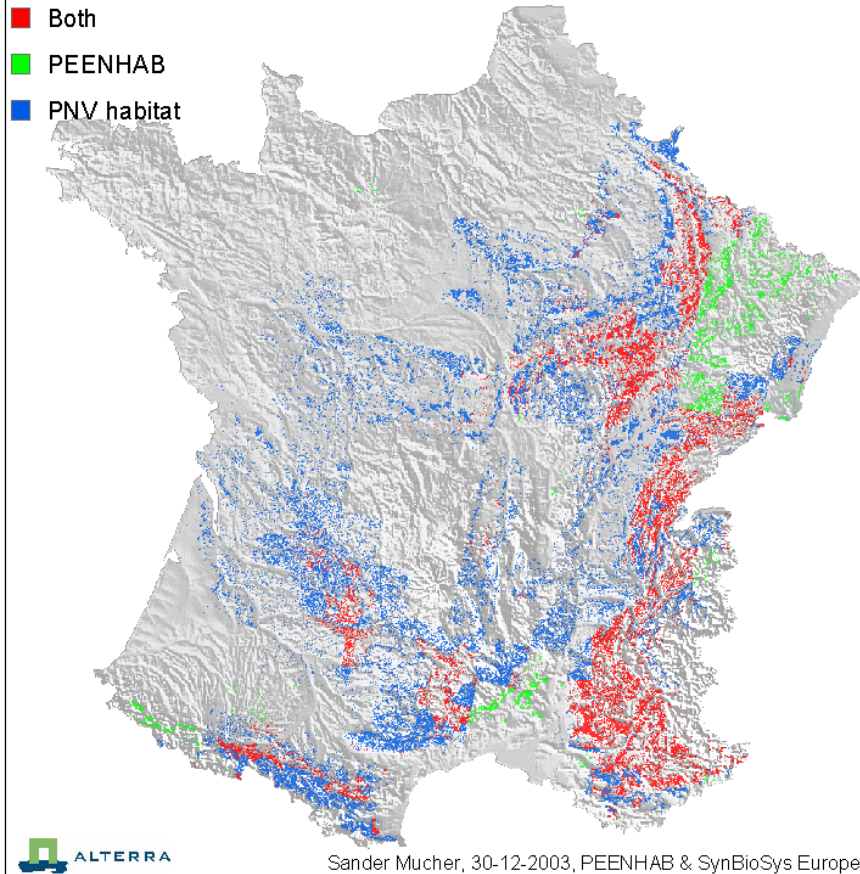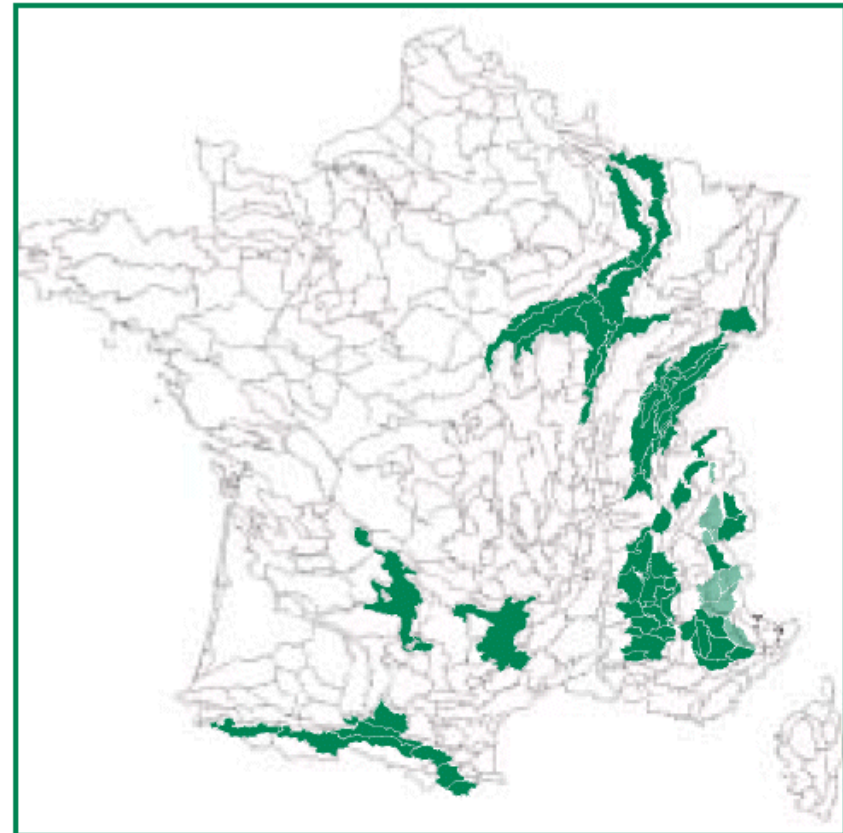**habitat9150**
- Both
- PEENHAB
- PNV habitat

Sander Mucher, 30-12-2003, PEENHAB & SynBioSys Europe

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Source : D'après RAMEAU et al., 2000 - Gestion forestière et diversité biologique. Tomes Atlantique et Continental.

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Conclusies & perspectieven

- Joop Schaminee and Bob Bunce reviewed 17 established European Habitat Maps and concluded:
  - For very site-specific or local habitats the SynBioSys (PNV) approach give better results. This is due to the fact that are very specific and characteristic species are considered in the PNV database.
  - For more broader habitat types that have a wider distribution over Europe the PEENHAB land cover approach is better.
  - Although some results were better using PNV or PEENHAB habitats maps alone the most frequently successful was the intersection of PEENHAB and PNV, which theoretically should have the strengths of both.

Conclusies & perspectieven

- Because the description of the Annex I habitat type is sometimes very weak, any evaluation is also difficult due to the fact that the definition of the habitat type is not clear.
- Much discussion started already over the first habitat map 6230 "Species-rich Nardus grasslands .." because Nardus grassland are in principle species-poor and are the Nardus grasslands in England considered as species-rich?,
- Schaminee indicated that most countries have a different interpretation of the Annex I habitat type, resulting in many differences which are all approved by Brussels.
- Our goals is to map the habitat types for the whole of Europe as good as possible using a consistent methodology and transparent criteria that fit the Annex I definition as good as possible.

- **Actions 2005**: External evaluations, revise habitat maps, increase number of habitat maps, production interactive CDrom,
- Validation by field visits, vegetations maps, releves

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The End

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