Structure and content of the Vegetation Map of Europe (scale 1 : 2.5 m) with reference to its possible relevance to the project entitled "European Vegetation Survey"

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INTRODUCTION

The purpose of this paper is to inform contributors to the project "European Vegetation Survey" on the current position, content and utilisation possibilities of the international European Vegetation Mapping Project. This will hopefully stimulate closer cooperation and an exchange of views to the mutual benefit of both, as well as avoid duplication of effort.

As the map illustrates the structure and distribution of the potential natural vegetation it shows primarily information on the units of natural plant communities in Europe. The variety of vegetation arising from anthropogenic influences (substitute communities) is only described in the accompanying text.

The natural or near-natural vegetation gives an indication of the fundamental elements of the plant cover in Europe. This ultimately provides the basis and framework of reference for the actual vegetation and forms the basis for phytosociological research. The vegetation map and accompanying explanatory text provide the following information regarding the natural or near-natural vegetation:

- A complete overview of the most important and extensive naturally occurring plant communities as well as their systematic and hierarchical structure.
- An outline of their natural/potential distribution and spatial arrangement.
- The characteristic species composition, ecological and geographical modifications, site conditions, conservation status, representative stands, and the most important substitute communities.

Aims of the international mapping project

The aim of the project was to construct a map of the potential natural vegetation of Europe on the basis of a unified concept and existing knowledge

through close international cooperation of geobotanical experts from nearly all European countries.

The final results of the work will comprise: 15 map sheets at the scale of 1 : 2.5 million; the entire legend, containing c. 650 mapping units; an outline map of the main zonal and azonal Formations at a scale of 1 : 10 million; and a comprehensive explanatory text in German and English.

Cooperating members and coordinators

At present c 60 geobotanists from 36 institutions in 30 European countries are cooperating in the project (fig. 1). The main coordination centres are: the Komarov Botanical Institute of the Russian Academy of Sciences, Dept for Vegetation Geography and Cartography, in St. Petersburg (T.K. Yurkovskaja); the Botanical Institute of the Czech Academy of Sciences in Průhonice near Prague (Z. Neuhäuslová) and the Federal Agency for Nature Conservation in Bonn (U. Bohn). U. Bohn has been the principal coordinator of the project since 1991, succeeding the late R. Neuhäusl.

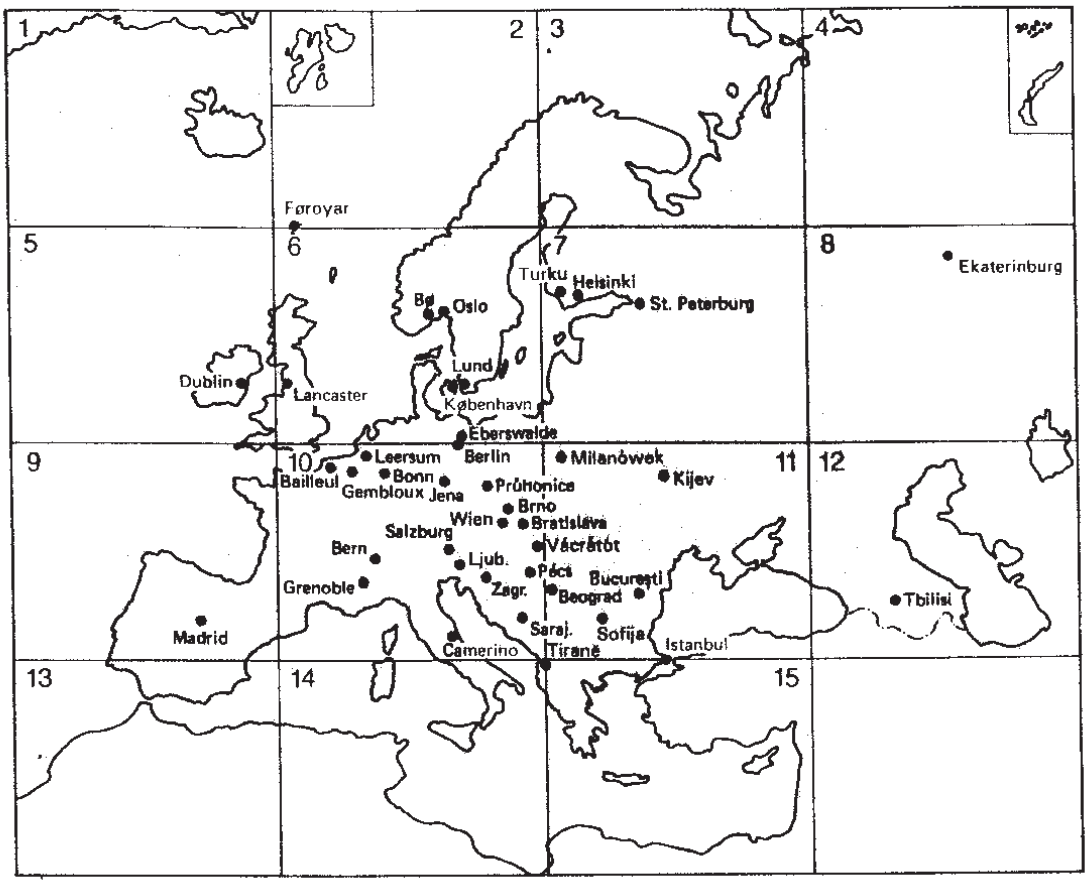
Content of the Vegetation Map

The map presents the distribution of the main natural plant communities corresponding to the actual climatic and edaphic conditions, excluding — as far as possible — human impact. It seeks to show the most important features of latitudinal (i.e. vegetation zones and subzones), longitudinal (oceanic/continental gradients) and altitudinal variations (vegetation belts). In addition the main azonal vegetation types and their differentiation, as well as the floristic variations of the natural vegetation units resulting from different edaphic, florogenetic and climatic conditions are depicted.

Because of the great diversity of available vegetation maps the most important task at the international meetings was the establishment of an appropriate concept that would integrate all existing mapping methods of the different schools and countries in Europe and unify the various methods of construction and mapping of the potential natural vegetation.

As a result the experts proposed a classification system that combines the principles of different schools of vegetation science. It consists of an hierarchic system which takes into account vegetation-specific criteria at different ranks based on

- structure and physiognomy of the plant cover (Formations and Formation complexes) at the highest level,
- dominant species and
- species combination and floristic differentiation at lower levels.



State 1994 • Seats of the Cooperating Members

Fig. 1. Map of Natural Vegetation of Europe: mapping area, division into map sheets and seats of the cooperating members

Structure of the entire legend

All basic mapping units which had to be established and outlined using the same methods in all European countries had to be inserted into the framework of the entire legend of the vegetation map which was given a consequential and clear hierarchic structure.

The highest units of classification are formed by 19 vegetation Formations and Formation complexes based on physiognomic-ecological features of the natural plant cover. They are designated by capital letters A-U. 14 of these main units (A-O) represent the predominant zonal Formations characterized by the prevailing life forms. They correspond to the main macroclimatic zones and belts in a sequence following the gradient from a cold and wet (north/northwest, high altitude) to a warm and dry (south/southeast) climate. Tundra and alpine vegetation types, as an example, are placed together in one Formation group because of the structural and, partly, floristic similarity.

Main Formations

Differentiation according to physiognomy and environmental conditions

Zonal and extrazonal vegetation (depending primarily on climate)

A Polar deserts and subnival vegetation of high mountains (5 units)
B Tundras and alpine vegetation (58 units)
C Subarctic, boreal und nemoral-montane birch woodlands and subalpine vegetation (50 units)
D Mesophytic and hygromesophytic coniferous and broad-leaved-coniferous forests (65 units)
E Atlantic dwarf shrub heaths (16 units)
F Mesophytic deciduous broad-leaved and mixed coniferous-broad-leaved forests (177 units)
G Thermophilous deciduous broad-leaved forests and mixed coniferous broad-leaved forests (58 units)
H Hygro-thermophylous mixed broad-leaved forests (2 units)
J Mediterranean sclerophyllous forests and scrub (50 units)
K Xerophytic coniferous forests and scrub (34 units)
L Forest steppes (meadow steppes, alternating with deciduous broad-leaved forests) (15 units)
M Steppes (21 units)
N Oroxerophytic vegetation (thorn-cushion communities, tomillares, mountain steppes, partly scrub) (8 units)
O Deserts (10 units)

Azonal vegetation (depending on soil and hydrological conditions)

P Coastal vegetation and inland halophytic vegetation (35 units)
R Reed and sedge swamps (3 units)
S Mires (27 units)
T Swamp and fen forests (6 units)
U Vegetation of flood-plains, estuaries and fresh water polders (38 units)

Each Formation unit is subdivided according to its most important features such as the prevailing life forms, dominant species and species groups. Using the example of the highly varied nemoral forest Formation F, which covers a large area and comprises the most units (177 altogether), the principles of further subdivision are explained:

Within the mesophytic deciduous broad-leaved and mixed coniferous-broad-leaved forests 7 subgroups have been distinguished which are characterized by the dominance of different tree species. They represent different edaphic, climatic and phytogeographical conditions and correspond closely to the higher ranking units of the phytosociological system such as the *Quercion robori-petraeae, Fraxino-Carpinion* and *Fagion sylvaticae*. The groups 1, 3 and 5 contain the greatest number of mapping units within the entire legend.

First subdivision of the main Formations

F Mesophytic deciduous broad-leaved and mixed coniferous-broad-leaved forests (177 units)

1 Acidophilous oak and mixed oak forests, poor in species *(Quercus robur, Q. petraea, Q. pyrenaica, Pinus sylvestris, Betula pendula, B. pubescens, B. celtiberica)* (27 units)
2 Mixed oak-ash forests *(Fraxinus excelsior, F. angustifolia, Quercus robur, Ulmus glabra, Quercus petraea)* (8 units)
3 Mixed oak-hornbeam forests *(Carpinus betulus, Quercus robur, Q. petraea, Tilia cordata)* (36 units)
4 Lime-pedunculate oak forests *(Quercus robur, Tilia cordata)* (5 units)
5 Beech and mixed beech forests *(Fagus sylvatica,* partly *F. moesiaca, Abies alba)* (89 units)
6 Oriental beech forests *(Fagus orientalis)* and hornbeam-Oriental beech forests *(Fagus orientalis, Carpinus betulus, C. caucasica)* (5 units)
7 Mixed Caucasian hornbeam-oak forests *(Quercus robur, Q. petraea, Carpinus caucasica* etc.*)* (7 units)

The sequence of these 7 Formations goes more or less from west to east.

The further (second) division of beech forests (F5) reflects the great structural and floristic differences between oligotrophic and eutrophic beech forest communities. Both groups differ, especially with regard to their species composition, species number and spectrum of life forms.

The third division of the two edaphically differentiated groups of beech forests is based on altitudinal differentiation of the floristic composition (its differential species being mentioned in the legend).

The final division of beech forests within each altitudinal belt (acido-phil-ous and eutrophic units) into mapping units is done by differentiation into geographical races and ecological variants.

Accompanying explanatory manual to the vegetation map

In the explanatory manual currently in course of preparation all Formations, their subdivisions and the mapping units will be described in detail. The Formation descriptions have been compiled by various co-workers, who have attempted to characterize and describe the subdivisions. Together with the more detailed explanations of the mapping units they form the core of the text. The information on the individual units, obtained from a standardized questionnaire, covers details of the structure, floristics and habitats of the units as well as information on the natural associated vegetation, land use and substitute vegetation, natural distribution, importance for nature conservation (remnants of natural vegetation, threats, necessary protection/restoration

measures), loci typici of near-natural stands, substitute vegetation worthy of conservation and a selection of the most important literature.

State and advance of the project

The all-European mapping project started in 1979 in Czechoslovakia and should be finished by the end of 1996. The final version of the cartographical work is being done in St. Petersburg and Bonn with the aid of financial support from the European Commission (DG XI) in Brussels. Subsequently, digitizing of the maps and preparation for printing and completion of the explanatory text is planned. The European Environment Agency and its partners have major interest in the results and recorded data as a baseline for pan-European nature conservation policy.

Results

The map of the natural vegetation of Europe (at a scale of 1 : 2.5 m) with its hierarchically structured legend and accompanying explanatory text provides a solid and versatile basis for the project "European Vegetation Survey":

1. It offers an internationally agreed and generally comprehensible classification of European vegetation, based on the natural climate and habitat conditions.

2. The hierarchical system allows the (systematic) arrangement, at various levels, of the syntaxa commonly used in various countries today. At the same time it facilitates comparison over an extensive area.

It examines above all the appropriateness (and consequence) of the systems commonly used in various countries up to Association and Community levels.

Considered on a European-wide basis it raises the question as to how regional Associations and geographical vicariants are to be defined and whether communities bearing different names in different regions are in fact floristically, structurally and ecologically distinct.

3. The classification system used provides the all-embracing coarse structure in which Associations and Communities can be refined at regional level according to geographical and habitat variations.

4. This classification principle can certainly also be used to a considerable extent for substitute communities. Otherwise the natural vegetation units, characterized according to habitat, provide an ideal basis of reference for the present day substitute communities. At the same time they form the link between genetically and spatially associated "vegetation series".

5. It should, above all, stimulate attempts to close existing gaps in our knowledge and promote more intensive cooperative ecological/phytosociological research into individual Formations.

6. In a digitized format it makes possible varied analyses and evaluation by the overlaying of biotic and abiotic data (eg species distribution) as well as of information on land use and actual plant cover. In this respect it forms an important information, assessment and planning basis for solving nature and environmental protection problems at a European level.

Basically the two pan-European vegetation projects can mutually stimulate and compliment each other. Therefore they should not deviate significantly from one another in the fundamental concepts and contents i.e. the classification, contents and nomenclature of the principal units. In order to avoid major discrepancies there must be close coordination in working out the Formations and Classes for the two projects. The tabular representation and detailed differentiation of the vegetation units would therefore be best considered as a task for the "Vegetation Survey" project.

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