

## European forest classifications

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### Phytosociology

Phytosociology is a rather young discipline which started in Europe in the early decades of the last century with the Swiss botanist and ecologist Josias Braun-Blanquet<sup>1</sup>. This discipline is focused on describing plant communities through a multi-purpose approach, taking into consideration different parameters such as species composition, frequency, cover, structure (tree, shrub, herb, moss layers), spatial distribution (the so-called **sociability**; i.e. causal, clumped, etc.). The aim of phytosociology is to provide effective synthetic information about plant communities in order to assign them to different and recognisable units called syntaxa. Syntaxa are then grouped hierarchically within a classification system which is ruled by the ICPN (International Code of Phytosociological Nomenclature)<sup>2</sup>. Phytosociologists usually collect data through vegetation **relevés** recording the species occurrences within selected plot areas using a semi-quantitative cover-abundance scale. Collected data are then analysed looking for similarities and dissimilarities in order to detect distinct vegetation types. More recently several numerical models have been developed, which help to identify dominant and diagnostic species, to evaluate species-richness and species-evenness, and which can lead to a more objective classification of vegetation units<sup>3</sup>.

The hierarchical classification foresees, as the botanical one, different ranks. The association is the basic vegetation unit: it represents a plant community defined by a particular and uniform floristic composition and habitat structure, where a relative constancy or abundance of characteristic species is recognisable (called also diagnostic or dominant), which can describe the community and its ecology. The upper units are a group of lower ones, which share one or more diagnostic and dominant species<sup>4</sup>. Each unit is assigned a scientific name and is defined with compound names formed by one or two scientific names of the dominant and diagnostic plant species with a different suffix for each rank<sup>2</sup>.

The sector of phytosociology which deals with vegetation dynamics and aims at detecting successional series is known as symphytosociology. The vegetation series (or sigmetum) is a group of spatially and/or temporally interconnected vegetation units that may co-occur in different succession stages or steps within the same place. Progressive succession is the natural dynamic process from pioneer to mature and stable communities (the so-called 'climax' or head series), while regressive succession is a disruptive process from more complex communities to open and less developed plant assemblages; the latter mostly issues from intense and/or frequent anthropogenic disturbance.

In the last century a very large body of phytosociological literature has been published, and a variety of schools with different approaches formed, especially in southern and eastern Europe, while this approach found no or little consensus in the United Kingdom and in north European countries. Recently the European Vegetation Survey, a working group established in 1992, joined European phytosociologists in order to develop common standards, organize scientific meetings and survey programmes, and to produce shared protocols and publications<sup>5</sup>.<sup>6</sup>(<http://euroveg.org>). In the first overview of vegetation units, 80 classes, 233 orders and 928 alliances have been detected all over Europe<sup>7</sup>.

### EUNIS Habitat Classification

The European Topic Centre on Biological Diversity (ETC/BC), an international consortium working with the European Environment Agency (EEA), developed the European nature information

system (EUNIS), available at <http://eunis.eea.europa.eu>. This database provides information about European habitat classification, data sheets on species, habitats and designed protected sites compiled in the framework of Natura 2000<sup>8</sup>, and species mentioned in relevant international conventions and in the IUCN Red Lists. The EUNIS habitat classification is a hierarchical classification of the terrestrial, freshwater and marine habitats for the whole of Europe<sup>9</sup>. Up to now this classification provides a pan-European reference set of units for meeting requirements in policy objectives and in supporting applications that relate to biodiversity monitoring and reporting. A crosswalk from the EUNIS habitats at level 3 to the European phytosociological syntaxa and vice-versa is also available<sup>10</sup>.

### European Forest Types

The European Forest Types (EFTs) scheme has been developed by an international consortium of experts with the aim to create a user-friendly classification system. It is, in fact, able to facilitate understanding, interpretation and communication of data on indicators describing the status and trends of forests, and forest management in Europe. The EFTs is a hierarchical classification consisting of 14 categories, including 78 forest types<sup>11-13</sup>. The 14 categories represent groups of ecologically distinct forest communities dominated by specific assemblages of trees, including introduced tree species, while the types correspond to a finer level of division of the category in terms of tree species composition. The EFTs is, therefore, a flexible system to compare forest information on ecologically similar forests, unlike other classification systems that present an

RANK	SUFFIX	EXAMPLE	DESCRIPTION
Class	-etea	<i>Quercetea ilicis</i>	All the evergreen woody plant communities of the Mediterranean basin.
Order	-etalia	<i>Quercetalia ilicis</i>	All the Mediterranean forests dominated by evergreen broadleaved trees.
Alliance	-ion	<i>Quercion ilicis</i>	All the Mediterranean forests dominated by holm oak ( <i>Quercus ilex</i> ).
Association	-etum	<i>Aceri campestris-Quercetum ilicis</i>	Mixed wood dominated by holm oak ( <i>Quercus ilex</i> ) and several deciduous broadleaved species typical of the North-Western Sicilian calcareous mountains in the meso- and supra-Mediterranean bioclimatic belts.

Table 1: Example of the hierarchical classification of a forest dominated by holm oak according to the nomenclature used in phytosociology.



Subalpine larch-arolla pine forest near Morgex (Valle d'Aosta, North-West Italy). (Copyright Giovanni Caudullo: CC-BY)



Fluvial forest in Záhorie Protected Landscape Area along the Morava River (West Slovakia).  
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Spruce-birch boreal forest in Norra Kvill National Park (Kalmar County, South Sweden).  
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Atlantic lowland beech forest in the New Forest National Park (Hampshire, South England).  
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impractical number of classes: e.g. the EUNIS classification at level 3<sup>9</sup> counts more than 700 forest units, while the European phytosociological communities, defined by Rodwell and colleagues<sup>7</sup>, count 110 alliances and do not cover plantations and anthropogenic forests. So far, the EFTs have been applied in several EU level forest monitoring initiatives as a reference framework to report data on biodiversity<sup>14, 15</sup> and sustainable forest management indicators for Forest Europe (Ministerial Conference on the Protection of Forests in Europe: MCPFE)<sup>11, 12</sup>.



Evergreen sclerophyllous scrub forest near Faro (Algarve, South Portugal).  
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Dwarf pine forest in Ordesa y Monte Perdido National Park (Pyrenees of Huesca, North Spain).  
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## References

- [1] J. Braun-Blanquet, *Pflanzensoziologie: Grundzüge der Vegetationskunde* (Springer-Verlag, Berlin, 1964).
- [2] H. E. Weber, J. Moravec, J. P. Theurillat, *Journal of Vegetation Science* **11**, 739 (2000).
- [3] L. Mucina, E. van der Maarel, *Vegetatio* **81**, 1 (1989).
- [4] M. D. Jennings, D. Faber-Langendoen, O. L. Loucks, R. K. Peet, D. Roberts, *Ecological Monographs* **79**, 173 (2009).
- [5] L. Mucina, et al., *Lazarus* **30**, 267 (2009).
- [6] M. Chytrý, et al., *Applied Vegetation Science* **19**, 173 (2015).
- [7] J. S. Rodwell, et al., *The diversity of European vegetation - An overview of phytosociological alliances and their relationships to EUNIS habitats* (National Reference Centre for Agriculture, Nature and Fisheries, Wageningen, 2002).
- [8] Council of the European Union, *Official Journal of the European Union* **35**, 7 (1992).
- [9] C. E. Davies, D. Moss, M. O. Hill, EUNIS habitat classification - revised, *Tech. rep.*, European Environment Agency, European Topic Centre on Nature Protection and Biodiversity, Paris (2004).
- [10] J. H. J. Schaminée, et al., Development of vegetation syntaxa crosswalks to EUNIS habitat classification and related data sets, *Tech. rep.*, Alterra, Wageningen, NL (2014).
- [11] A. Barbati, P. Corona, M. Marchetti, *Plant Biosystems - An International Journal Dealing with all Aspects of Plant Biology* **141**, 93 (2007).
- [12] A. Barbati, P. Corona, M. Marchetti, *European forest types: Categories and types for sustainable forest management reporting and policy* (European Environment Agency, Copenhagen, 2007), second edn.
- [13] A. Barbati, M. Marchetti, G. Chirici, P. Corona, *Forest Ecology and Management* **321**, 145 (2014).
- [14] T. Houston Durrant, J. San-Miguel-Ayanz, E. Schulte, A. Suarez Meyer, *Evaluation of BioSoil Demonstration Project: Forest biodiversity - Analysis of biodiversity module, vol. 24777 of EUR - Scientific and Technical Research* (Publications Office of the European Union, 2011).
- [15] R. McRoberts, et al., *National Forest Inventories: Contributions to Forest Biodiversity Assessments*, G. Chirici, S. Winter, R. E. McRoberts, eds. (Springer Netherlands, 2011), vol. 20 of *Managing Forest Ecosystems*, pp. 41-97.

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