An introduction to habitats

Underpinning European policy on nature conservation - Revision of the EUNIS habitat classification

The EUNIS habitat classification is a pan-European, comprehensive and widely accepted classification of all habitat types. The increasing need to support European policy on nature conservation with harmonised habitat descriptions, condition estimates and change assessments underpinned by field data led to the initiation of an extensive review of the classification. This briefing gives an overview of the EUNIS habitat classification and revision process of its terrestrial part through alignment with the European Vegetation units. The focus is on heathland, scrub and tundra habitat types.

- A revision of the current EUNIS habitat classification is underway. Heathland, scrub and tundra are the second group of terrestrial habitats after forests, to undergo this revision.
- The EUNIS habitat classification provides a pan-European set of habitat types and is a solid point of reference for work done by European countries on biodiversity monitoring and reporting.
- The revision of the EUNIS habitat classification and assessments of the status of the habitat types help to improve the knowledge base, leading to better understanding, protection, conservation and enhancement of Europe's natural capital.
- Field data combined with other biodiversity related information form the basis for delineating and parameterising ecosystems and habitats, and further defining their condition.
- An improved knowledge base on habitats across Europe supports the achievement of European policy objectives for nature conservation as it facilitates better management.

Introduction to EUNIS

The European Nature Information System (EUNIS), was conceived in the 1990s as a database containing information on European habitat types, species and protected areas. The EUNIS habitat classification emerged from this and is brought together with other interlinked modules on species and protected areas in the EUNIS web application, which is part of the European Biodiversity Data Centre hosted by the European Environment Agency (EEA).

EUNIS habitat classification is a pan-European, comprehensive and widely accepted classification of all habitat types. Since its creation, it had undergone only modest change, but the increasing need to support European policy on nature conservation with harmonised habitat descriptions, condition estimates and change assessments underpinned by field data led to the initiation of an extensive review of the EUNIS habitat classification in 2012. Forest habitats were the first to undergo revision. This briefing presents the review of EUNIS heathland, scrub and tundra classification. In parallel, EUNIS marine habitat types are revised following a different methodology.

What are heathland, scrub and tundra?
Heathland, scrub and tundra are habitats that are widespread across Europe and are dominated by woody shrubs, often in combination with herbs and sometimes with mosses, liverworts and lichens. Tundra is characterised by the presence of permafrost. With the exception of situations where environmental conditions are extreme, most of these habitats represent temporary stages in the succession from grasslands to forests and are often dependent on grazing, burning or wood harvesting. The abundance and diversity of heath and scrub habitats is uneven across Europe. In the Mediterranean, Macaronesian and Atlantic regions, such habitats occupy a substantial part of the landscape, particularly in hills and mountains, and contribute to plant diversity with several narrowly distributed endemic species.
According to the European Red List of habitats, the percentage of European heathland scrub and tundra habitats under threat is relatively low. The main threats come from the abandonment of traditional management, infrastructure development and afforestation, while climatic warming poses a threat to Arctic and high mountain habitat types. Some heathland and scrub habitats are protected by EU legislation. According to reported data, about half of the EU protected heathland and scrub habitat types are assessed as having inadequate conservation status and approximately a quarter are assessed as having bad conservation status.

A habitat classification overview

The EUNIS habitat classification has helped to harmonise descriptions of habitat types and to facilitate the collection of data across Europe through the use of criteria for habitat identification. In EUNIS, each European habitat type has a specific code and name, and is placed within a hierarchical structure that divides high level, broader types more finely at lower levels. For example, all land with heathland, scrub and tundra habitats is codified with the letter F in the current EUNIS habitat classification and is positioned at level 1. A sequence of habitat types from level 1 to level 3 is F: Heathland, scrub and tundra; F4: Temperate shrub heathland; F4.1: Wet heaths. The EUNIS habitat classification has evolved over time and full documentation of the EUNIS habitats was first provided in 2004 (Davies et. al., 2004). The current version of the EUNIS habitat classification from 2007 can be viewed at the EUNIS web application.

Independently from EUNIS, a bottom up classification of vegetation plot data on plant species composition was developed by plant ecologists from the early 20th century onwards. Vegetation plots (also known as relevés) are plots of varying size that are used as source data for vegetation classification and provide records of the composition of vegetation at a particular time and place (vegetation descriptions). Vegetation units are called ‘syntaxa’ and can be placed in a hierarchical system. The basic unit of this system is the ’association’. Associations can be grouped into larger ecological units called ’alliances’. Similar alliances may be grouped into ’orders’ and orders into vegetation ’classes’.

In parallel with EUNIS, the European Vegetation Survey — a working group of plant ecologists — developed the first overview of European vegetation units in 2002. A substantial revision led to the publication in 2016 of ’Vegetation of Europe’ (Mucina et al., 2016), the first comprehensive and critically revised classification of European vegetation types of vascular plants, bryophytes, lichens and algae. The European Vegetation Survey also developed the European Vegetation Archive (EVA), which is a centralised comprehensive database of the continuously increasing number of European vegetation plots from sources all over Europe.

The European Red List of habitats (Janssen et al., 2016) is based on the EUNIS habitat classification and was finalised in 2016. The Red List reviews the current status of all natural and semi-natural terrestrial, freshwater and marine habitats in the European Union and adjacent regions, and highlights the pressures they face. The Red List provides a fact sheet for every assessed European habitat type.

Revision of the heathland, scrub and tundra habitat types

The revision of the terrestrial EUNIS habitat types could be obtained through alignment with the European Vegetation units via the complex processing of large vegetation data sets.

The first project to update the cross linkages between the vegetation units at the level of alliance

and the EUNIS habitats at level 3 was carried out in 2012 (Schaminee et al., 2012). This prepared the ground for the next step; the underpinning of the EUNIS classification with in situ vegetation plot data from the EVA database. Forest habitats (EEA, 2015) were used to trial the methodology. The second group of habitat types — heathland, scrub and tundra (Schaminée et al., 2015; Schaminée et al., 2016) — was the subject of two EEA funded projects that were carried out between 2014 and 2016. The final proposed classification is a result of coordination and collaboration with the European Red List of habitats, which lead to a good alignment of habitat types between the two. Following public consultation of the proposals via the Eionet network, the final revised classification was concluded. This whole process of EUNIS maintenance and revision was supported by the European Topic Centre on Biological Diversity.

Methodology and products

The EUNIS group for heathland, scrub and tundra (group F), as well as three coastal dune heaths and scrub were taken into account in the revision. The hedgerows and shrub plantation categories of group F were not dealt with at this point.

The revision was based on the 2007 version of EUNIS at level 3 and the 2013 version of the European Vegetation Check List, and submitted to the international Applied Vegetation Science journal, before final revision and publication in 2016. See Figure 1 for a simplified overview of the methodology used.

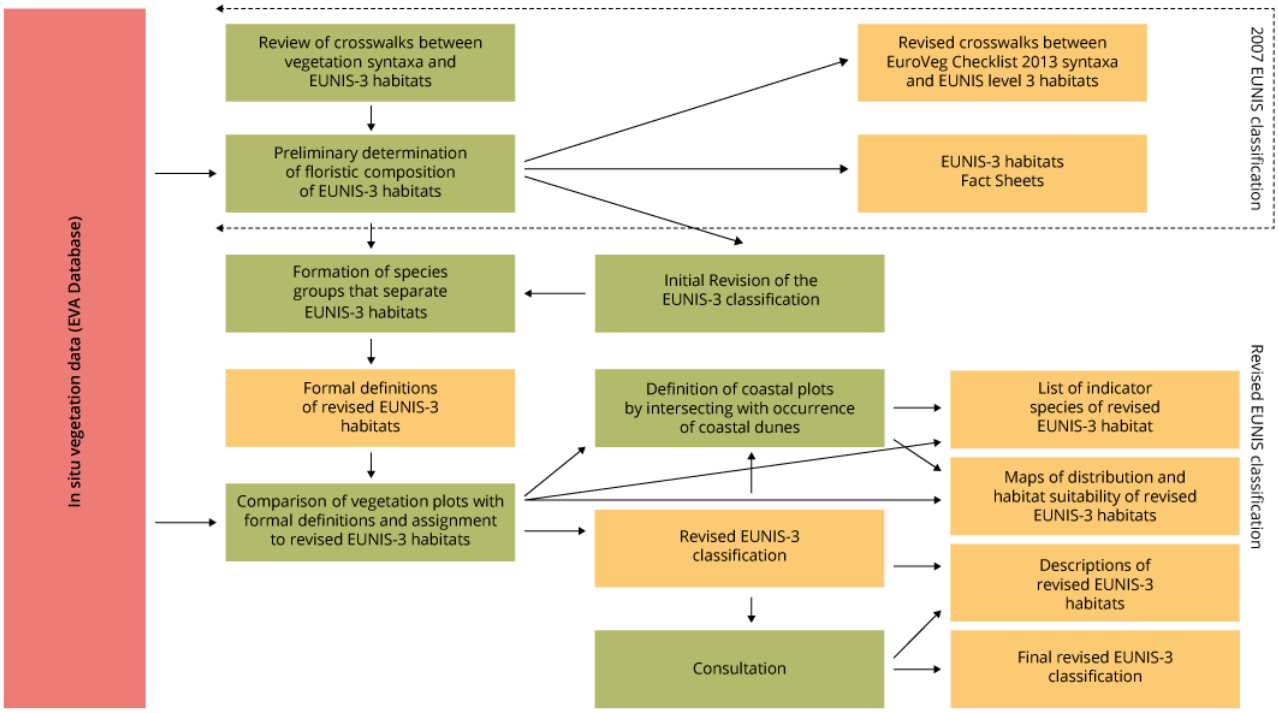


Figure 1. Simplified overview of the methodology for revising EUNIS level 3 for heathland, scrub and tundra
Note: The review steps are in green and final products are in orange. Formal definitions are both a product and a process. In the figure it is shown only as a product for simplicity.

Tailor made software (JUICE) was used to develop formal definitions of heathland, scrub and tundra habitat types based on the groups of vegetation plots assigned to each habitat type. Formal definitions consist of formulas that combine percentage coverages of species and species groups and apply habitat classification consistently across Europe.

The species composition of all vegetation plots was compared with the formal definitions in a procedure that included several checks and adjustments. Finally, the plots were assigned to individual habitats. Coastal habitat types were defined by intersecting the plots with a data set defined by the coastal dune area of the Map of the Natural Vegetation of Europe (Bohn and Neuhäusl, 2000).

Based on the groups of vegetation plots assigned to each habitat type and after removing the effect of geographically unbalanced sampling across Europe, three groups of indicator species were defined for each revised habitat: constant, diagnostic and dominant species.

The groups of vegetation plots assigned to each habitat were used for the production of distribution and suitability maps. Distribution maps simply show the distribution of the assigned vegetation plots. Suitability maps are based on modelling and indicate how suitable, in terms of climate and soil conditions, an area is for the habitat type concerned. Suitability maps were produced with Maxent software using 16 climate and soil layers. Modelling of each habitat followed two different approaches, assuming biased or non-biased data. The selection of the best modelling for each habitat type was based on the expert knowledge of the team members. The model has low prediction capacity in eastern Europe and Scandinavia due to a lack of data for those areas.

Probability maps, which are a further refinement of the suitability maps overlaid and intersected with a variety of land cover data and in some cases abiotic data, will become available at a later stage.

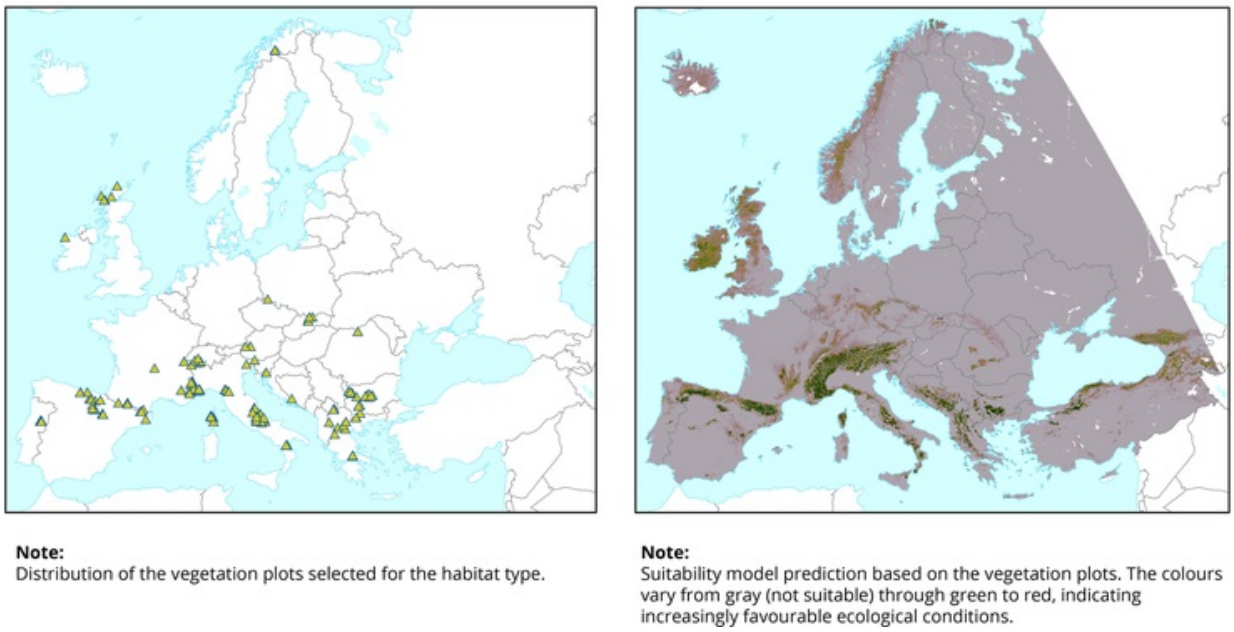
The final version of the EUNIS heathland, scrub and tundra habitat classification (Annex 1) was produced after the analysis and incorporation of comments received during the Eionet consultation. For each habitat type, the revision projects provided descriptions (Annex 2), lists of constant, diagnostic and dominant indicator species (Annex 3), a distribution map showing the location of the vegetation plots from the EVA database assigned to the EUNIS habitat type and a habitat suitability map (Annex 4).

An example of a revised habitat: F2.2b Alpine and subalpine Juniperus scrub

Alpine and subalpineJuniperusscrub (F2.2b) emerged from the splitting of the current Evergreen alpine and subalpine heath and scrub (F2.2) habitat into three distinct types, on the basis of the presence of indicator species. In the final revised EUNIS classification, the code for the habitat type changed to S2-3.

The formal definition of the new habitat in the expert system is: <#TC Arctic-alpine-shrubby-junipers GR50> AND <#TC Arctic-alpine-shrubby-junipers GR #TC Shrubs EXCEPT #TC Arctic-alpine-shrubby-junipers>) NOT <#TC Trees GR05>

Based on the vegetation plots, a distribution map and a suitability map were produced for the habitat type (Map 1).



Note:
Distribution of the vegetation plots selected for the habitat type.

Note:
Suitability model prediction based on the vegetation plots. The colours vary from gray (not suitable) through green to red, indicating increasingly favourable ecological conditions.

Map 1. Example of distribution and suitability maps.
Remarks: Prediction in eastern part of Europe (Caucasus, Turkey) and Scandinavia uncertain due to lack of data for that area.
Data source: Predicted distribution of habitat suitability for EUNIS habitat types

Annex 1 - Overview of the revised heathland, scrub and tundra classification

Annex 2 - Habitat descriptions as provided by the revision projects

Annex 3 - Species lists as provided by the revision projects

Annex 4 - Plot distribution and suitability maps

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