



Database of Relevant Resources for Honey Bees

Deliverable D3.1

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B-GOOD

Giving Beekeeping Guidance by cOmputatiOnal-assisted Decision making



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Preface

This Deliverable (D3.1) focuses on the identification of the main plant species that are relevant food (floral) resources for honey bees, considering primarily nectar and pollen, that are present in each EUNIS habitat type in Europe. The end product of deliverable D3.1 is a “Database of major crop, forest and wild species that compose each landscape element type and that are a relevant resource for honey bees”. This deliverable has a double function, being simultaneously a Report and a Database. These two standalone components (the **Report** and the **Database**) that can be consulted independently or together for further contextualization and details. The **Report** is the present document, where the methodology and an overview of the relevant resources for honey bees are described. The **Database** is currently deposited in the B-GOOD data portal (<https://beehealthdata.org/>) and follows the structure described in section 2.6. The **Database** has the full details about plant species occurrence, average plant species cover and habitat plant species composition, together with the information about the bee-friendliness value of each plant (considering its characteristics independent of the habitat) but also the bee-friendliness of each plant species when considering its occurrence and cover within each habitat. The methods applied for this deliverable are presented and described in the Methodology section (section 2). After that section, an overview of the main resources for honey bees present in each habitat is shown (section 3). To contextualise the Deliverable described here, the integration of Task 3.1 within the entire WP3 strategy is initially explained in a comprehensive workflow diagram of WP3 in the Introduction section (section 1).

Summary

The main objective of WP3 is to develop a dynamic landscape model across the EU capturing the major floral resources for bees (flower resource model) considered a key driver of bee health status. To achieve this major goal, in task 3.1 the main landscape elements important for bees across Europe were identified and classified in terms of plant composition. In future tasks 3.2 and 3.3 the value in terms of pollen and nectar and phenology will be attributed. To identify the main landscape elements and their composition in terms of plant communities, several data sources and tools were used following the methodology presented in this report. It includes different procedures and data sources aiming to identify the plant composition of each landscape habitat, and to produce a database of major crop, forest and wild species that compose each landscape element type and that are a relevant resource for honey bees. This report and the associated database are the major outputs of task 3.1, and contain the identification and the ranking of plant species and habitats in terms of important resources for honey bees.

1. Introduction

1.1. Short description of WP3 workflow

WP3 “Ecology and environmental drivers” aims to develop a dynamic landscape model, capturing the major floral resources for bees, and to construct landscape suitability maps for honey bees across Europe. To achieve these general aims, this WP is divided into four tasks, with different sub-tasks, that have specific aims and links between them, as represented in the WP workflow (Figure 1).

In task 3.1, the landscape elements important to bees are determined through the compilation of different layers of spatial and phytosociological information, with the purpose of determining the value, in terms of pollen and nectar, of each of the relevant landscape types identified at the European scale. This task enables the identification of the most relevant plant species at the European scale and, based on literature information, databases on plant traits and plant-pollinator interactions, beekeeper plant catalogues and bee expert advice (via a questionnaire sent to all B-GOOD members), to determine which of them are the most important bee-friendly species across the EU. The list of the bee-friendly species, together with the map and database of the major landscape elements at EU level, serve as input for task 3.2, and to construct the landscape suitability maps in sub-task 3.4.2.

The construction of the phenology models for the most relevant bee friendly species across Europe is the main aim of the task 3.2. To complete this task, the first step consisted in the creation of a database of the floral resources (sub-task 3.2.1 – Deliverable 3.2), including bee friendly species, considering both crops and wild plants. For each plant species, information regarding the amount of sugar/pollen produced by 1 flower per 1 day, number of flowers per m², single flower lifetime, and flowering start and end dates were compiled. The databases of major landscape elements and of flower resources will be used in sub-task 3.2.2 to develop the phenology models that will be incorporated within the ALMaSS modelling framework (WP5). Considering the European scale, the phenology models will be up-scaled from single plant species to plant associations identified in task 3.1 level, using an automated recalculation of the floral resources in an external R/Python program based on the database (sub-task 3.2.1).

The plant species composition of each landscape element and the phenology models are derived both from estimations from phytosociological associations and from the literature, respectively. Validation is needed to assess the veracity of the values predicted from the models. The validation of the plant communities and phenology models (task 3.3) is being performed in three selected countries (Portugal, Belgium and United Kingdom) following specific field protocols developed by the WP3 team. The field protocols developed for this purpose will be integrated in the deliverable D3.4: Model validation and sensitivity analysis of phenology of floral resource model (Month 36). Furthermore, task 3.3 also includes the construction of spatial-temporal dynamic landscape windows in Portugal, Belgium and the United Kingdom, and the assessment and quantification of the floral resources in those landscape windows, that will be incorporated into the ALMaSS platform. The integration of the floral resource models within the ALMaSS platform to run together with the ApisRAM model will be the main goal of sub-task 3.4.1, which will be done after model validation (task 3.3).

In the sub-task 3.4.2, the main goal is to build landscape suitability maps using geospatial data sources at the pan-European scale, namely land cover maps (from task 3.1), plant species distribution, weather data, digital elevation models and topographic data, and remote sensing to construct detailed spatio-temporal dynamic landscapes maps at the EU scale. Combining this geospatial information with nutritional values from the database of floral resources (sub-task 3.2.1) and phenology models (sub-task 3.2.2) provides spatio-temporal information about

the main resources available for bees. Together with other environmental drivers, these data will be modelled using multi-criteria decision-making analysis or a fuzzy logic approach to generate landscape suitability maps (Month 48).

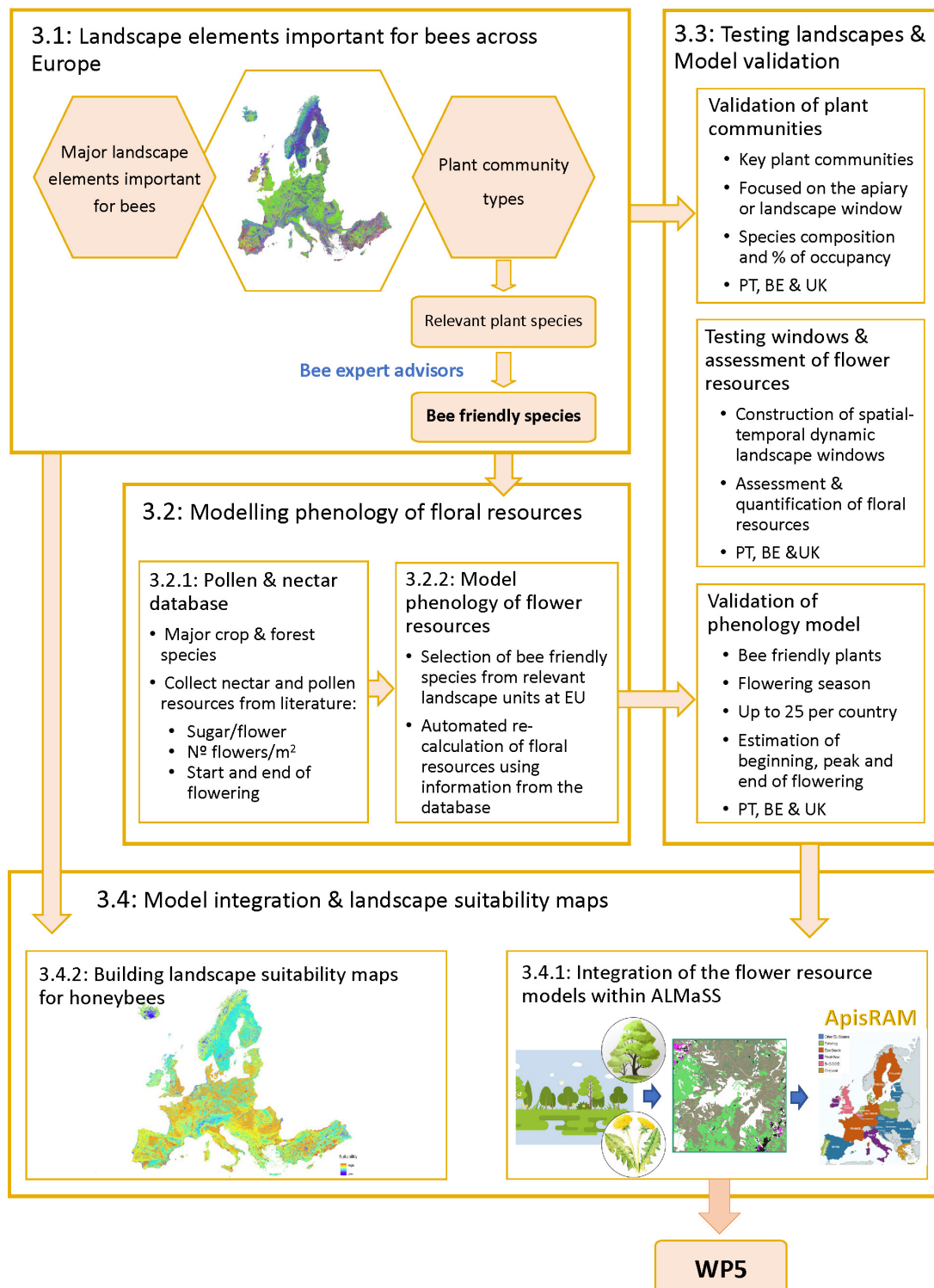


Figure 1: Diagram of the workflow of the work package 3, showing the major links between tasks and sub-tasks. With this report (D3.1 “Database of major crop forest and wild species that compose each landscape element type and that are a relevant resource for honey bees”) we identify the major resources for bees in Europe, i.e. the “bee friendly species”.

2. Methodology

This section describes the methodology used to identify the major resources for bees in Europe, and to produce the end-product of deliverable D3.1, i.e. the “Database of major crop forest and wild species that compose each landscape element type and that are a relevant resource for honey bees”.

The methodology focuses on three main points:

- (i) finding and choosing the right habitat classification scheme and level of detail (section 2.1),
- (ii) finding the vegetation composition of each habitat type (section 2.2) and,
- (iii) classify each plant species in terms of bee-friendliness (**BF Value**, section 2.3).

Additionally, we calculate the rank of the plant species in terms of bee-friendliness within each habitat (**BF Index**, section 2.4) and a global bee-friendliness habitat score (**BF Habitat score**) value for each habitat (section 2.5).

The structure of the database is described in section 2.6. In section 3, for each EUNIS terrestrial Level 2 habitat, a map of its probable presence/occurrence is presented, plus the habitat description, and a list of the 30 bee-friendly plant species present in that habitat with the highest bee-friendliness index (BF Index). For each of these 30 plant species listed, the following metrics are also presented: the percentage occurrence frequency (Occurrence), the average cover (Average cover) and the bee-friendliness value (BF Value). The overall bee-friendliness score for each habitat (BF Habitat score) is also presented. A summary of the BF Habitat scores is presented in section 3.10.

2.1. Habitat classification and typology: EUNIS Level 2

For our output to be relevant at the EU scale and usable in the other tasks of WP3, as well as giving greater potential for it to be implemented in other projects (increasing its exploitation potential), we decided to choose a habitat classification that is very well described, documented and implemented across Europe, i.e. the European Nature Information System ([EUNIS](#)).

The EUNIS is a reference information system primarily used in ecology and conservation. It is widely used to assist the implementation of the Natura 2000 process and coordinated with the EMERALD Network of the Bern Convention. It is also used in the development of the core set indicators by the EEA (European Environment Agency) and for the environmental reporting of activities connected to EEA. The EUNIS incorporate data from different databases and organisations, and is organized in three interlinked modules on sites, species, and habitat types. In our methodology we use the EUNIS habitat classification as the main habitat classification scheme.

The EUNIS habitat classification is a pan-European hierarchical system that covers all types of habitat from natural to artificial areas, from terrestrial to freshwater and marine environments. The EUNIS habitat classification is a very detailed hierarchical system organized from Level 1 to Level 8, and across the different levels there are a total of 5284 different habitat types. Each habitat is identified with a specific and unique code, a name, and a description. For the purposed of this work we only use the terrestrial EUNIS habitats.

It is noteworthy that one extra advantage of using the EUNIS habitat classification system is the existence of different crosswalks defined between the EUNIS habitat classification and other hierarchies like the habitat types from the Habitats Directive Annex I, the Corine land

cover classes, the MAES (Mapping and Assessment of Ecosystems and their Services) ecosystem types and phytosociological alliances.

By definition and nature, EUNIS habitats are not spatially explicitly defined. However, and since there are other tasks of the project, namely Tasks 3.2 and 3.4, that would benefit from a spatial explicit EUNIS habitats, in this report we used the [Ecosystems types of Europe](#), namely the [Ecosystem Type Map \(ETM\) v3.1](#) (Weiss and Banko, 2018). The ETM was developed with the aim of contributing to a better biological characterization of terrestrial and marine ecosystems across Europe (EEA-39) so as to achieve a spatially explicit representation of EUNIS habitats. The ETM uses the Copernicus land service portfolio combined with marine bathymetry, seabed information and ice cover with the non-spatial EUNIS habitat classification to produce probability maps of EUNIS habitat presence in terrestrial, freshwater and marine ecosystems. The ETM supports the MAES, Action 5 of Target 2 the EU Biodiversity Strategy 2020, established to achieve the Aichi targets of the Convention of Biological Diversity (CBD). The ETM focuses on Levels 1 and 2 of the EUNIS habitat classification that have a direct connection established in the MAES ecosystems types.

In our methodology, we use the information from the EUNIS Level 2 habitats present in the terrestrial ecosystem mapping of the ETM. In task 3.4.2 we attempt to improve and fine-tune the ETM maps of the EUNIS Level 2 terrestrial habitats, aiming to enhance the current version, making use of the most current Copernicus land service portfolio in trying to increase the accuracy and level of detail of the original ETM.

2.2. Plant species composition of EUNIS Level 2 habitats

As the EUNIS Level 2 terrestrial habitat classification is the focus of the current methodology, there is the need to characterize each one of the EUNIS Level 2 terrestrial habitats in terms of vegetation composition. To construct the vegetation composition of each one of these habitats, we base our methodology on the work of Chytrý et al. (2020), “EUNIS Habitat Classification: Expert system, characteristic species combinations and distribution maps of European habitats”.

Chytrý et al. (2020) developed a classification expert system (EUNIS-ESy) that formally defines each individual EUNIS Level 3 habitat as a formula in a computational language that combines numerical and set-theoretical concepts with formal logical operators based on EUNIS plant species composition and geographic location. The EUNIS-ESy enables the automatic classification of European vegetation plots to habitat types of the EUNIS habitat classification. Based on that classified dataset, they were able to compile statistically derived characteristic species combinations for each habitat that allows determination of the diagnostic, constant and dominant species for each habitat by calculating species-to-habitat fidelity and constancy (occurrence frequency). In summary, they produce the probabilistic plant species composition of each EUNIS terrestrial Level 3 habitat.

In our methodology, we use the data from Chytrý et al. (2020), that was produced at the EUNIS Level 3 level as source of information, and grouped and compiled it to the EUNIS Level 2 level. This allows us to have the species composition at the same level of the spatial information with the probable occurrence of each EUNIS habitat, i.e. EUNIS Level 2 terrestrial habitats. For each EUNIS Level 2 habitat, we calculate the percentage occurrence frequency (Occurrence) as the number of occurrences relative to the total number of plots assigned to each Level 2 habitat and the average cover (Average cover) as the percentage cover averaged across all the plots assigned to the habitat, including the plots where a particular species was absent.

In task 3.4.2, a proof of concept is being developed with the objective of generating a methodology for making the composition of vegetation more spatially representative through a process of regionalization of the available spatial information, and by using the plant composition present in the georeferenced plots of the European Vegetation Archive (EVA) database. If this methodology proves successful, it will make it possible to obtain the vegetation composition for each typology that is not only spatially explicit but that also achieves a higher accuracy of local representation.

2.3. Bee-friendliness plant species value - BF Value

2.3.1. Data sources for classification of bee-friendliness

The bee-friendliness classification was attributed to a total of 8029 plant species. In most cases, this was done at the species level but for others, where information was scarce or non-existent, the BF Value was attributed following a “generalization process” at genus or family levels. The overall species list was obtained from a dataset of 233,352 vegetation plots from the European Vegetation Archive (version 2020-05-16) classified by the EUNIS-ESy expert system (version 2020-06-08) and resampled in geographical grid cells from Chytrý et al. (2020). The [Euro+Med PlantBase](#) was used for nomenclatural standardisation. The bee-friendliness value was calculated by combining information from different data sources. Because of the different level of detail and quality of the data sources, an index of robustness for the derived BF Value was also calculated.

Direct information sources:

1. Apicultural related literature from five European countries (Germany, the Netherlands, France, Denmark, and Spain) containing beekeepers' expert opinions on the usefulness of plant species for honey bees based on nectar, pollen and, less often, honeydew (Maurizio and Grafl 1982, Carrasco Claver and Montero Ruiz 1990, Danmarks Biavlerforenin 2013, ASTREDHOR et al. 2017, Koster 2019, Imkerpedia.nl). The evaluation of apicultural interest was provided on different scales (from 0-3 to 0-5) but it was standardized between 0-3.
2. Attractiveness of agricultural crops to pollinators in the USA (USDA 2017) contains an evaluation for pollen and nectar of some European crops on the level of family, genus, and species. Attractiveness classification has three levels: not attractive, very little attractive, and important. These levels were translated as 0, 1, and 3 to be comparable with the Apicultural interest scale.
3. The pollinator spectrum dataset (Janovský 2020) from the PLADIAS database (Pladias - Database of the Czech Flora and Vegetation. www.pladias.cz), based on 162,000 recorded pollinator-plant interactions from 52 studies. The information has three levels: honey bees are not mentioned in pollinator spectrum dataset, honey bees made less than 10% of the visits to the plant, and the honey bees are important flower visitors of the plant.
4. TRY database (Kattge et al. 2020), where the following species traits were considered: Pollinator Syndrome and type of reward, and Pollination.
5. BeelInfo.cz (<https://beelinfo.cz/vcelarsky-vyznamne-rostliny>).

Indirect information sources:

1. TRY database (Kattge et al. 2020), specifically the traits: flower colour, and Pollination syndrome.
2. Database on Nectar & Pollen Production (Filipiak et al. 2020 – Deliverable D3.2 EU Horizon 2020 B-GOOD Project), specifically containing information on pollen, nectar and honey.
3. The pollination syndrome from the PLADIAS database gives general information about insect pollination. This information was used if the pollinator spectrum was not available.

2.3.2. Calculation of bee-friendliness value (BF value)

Apicultural interest scores were attributed to a maximum value of 6 (sum of pollen and nectar values, scored from 0 to 3 each). For species with no evaluation of direct apicultural interest but with known values for species from the same genus, a genus generalization was made. If species values from the genus differed, a random value from a normal distribution given by the mean and range of values in the genus was used.

A significant correlation was found between the Apicultural interest value for pollen and the first PCA (Principal Component Analysis) axis of honey measurements present in the Database on Nectar & Pollen Production (Filipiak et al. 2020). This relationship was used for predicting apicultural interest scores for 21 species with known honey measurements but lacking apicultural interest evidence.

Information from PLADIAS was transformed into a score of 3 if honey bees were the major visitor, and a score of 1 if honey bees were responsible for less than 10 % of visits. If only information about insect pollination was available, the plant species were scored as 0.1.

Other direct information from the TRY and Apicultural interest datasets were scored between 0.1 and 0.5.

Attractiveness of agricultural crops to pollinators in the USA (USDA 2017) was used for species not evaluated by Apicultural interest sources. In this case, the maximum score was 6.

Considering the available knowledge, the following families were classified as non-useful (nonvascular plants) or potentially non-useful (species mostly wind-pollinated) for honey bees: *Aspleniaceae*, *Athyriaceae*, *Blechnaceae*, *Cupressaceae*, *Cyperaceae*, *Cystopteridaceae*, *Davalliaceae*, *Dryopteridaceae*, *Equisetaceae*, *Hymenophyllaceae*, *Isoetaceae*, *Juncaceae*, *Lycopodiaceae*, *Marsileaceae*, *Onocleaceae*, *Ophioglossaceae*, *Osmundaceae*, *Pinaceae*, *Poaceae*, *Polypodiaceae*, *Potamogetonaceae*, *Pteridaceae*, *Salviniaceae*, *Selaginellaceae*, *Taxaceae*, *Thelypteridaceae*. If there was no previous species or genus-specific evaluation, species from non-useful and potentially non-useful families were scored as 0.

Species from families with no previous evaluation were searched individually on Google Scholar using the combination of the following keywords: '(searched plant name)' AND '*Apis mellifera*' or '(searched plant genus)' AND '*Apis mellifera*' or '(searched plant family)' AND '*Apis mellifera*' or '(searched plant name)' AND 'pollination' or '(searched plant genus)' AND 'pollination' or '(searched plant family)' AND 'pollination'. If there were no results found or the evidence of honey bee visits and pollination was poor, the plant was scored as 0. If evidence was found, the plant was scored from 0.1 for a specific species evidence to 0.01 for family evidence.

The bee-friendliness value (BF Value) is the sum of all values retrieved from the data sources previously mention for specific plant species (Table 1). The bee-friendliness value ranges from 0 to 11.5.

2.3.3. Calculation of bee-friendliness value robustness

The robustness (Robustness) of the calculated bee-friendliness value was assessed using the following rationale:

- Independent literature sources directly referring to the specific plant species and honey bee (*Apis mellifera*) were evaluated as 1;
- Independent literature sources referring to the plant-specific genus were evaluated as 0.25;
- Values calculated by generalization on the plant genus level were evaluated as 0.25.
- Values calculated by generalization on the plant family level were evaluated maximally as 0.25 based on the number of genera and variance of the bee-friendliness value within the family;
- TRY database information referring to bees with flower traits known to be attractive for honey bees was evaluated as 0.5;
- TRY database information referring to non-specific bee-pollination was evaluated as 0.1;
- Value predictions based on plant species traits were evaluated as 0.1;
- Predicted values based on genus or family generalization were evaluated as 0.01;
- Non-useful and potentially non-useful plant species with no other information were evaluated as 0;
- Individually searched species with no retrievable evidence about honey bee visits were evaluated as 0.

The robustness of the bee-friendliness value was calculated as the sum of the value attributed to each data source used for a specific plant species (Table 1). The bee-friendliness robustness value ranges from 0 to 14.5.

Table 1. Calculation of plant species bee-friendliness value (BF Value) and associated robustness (Robustness).

Source		Cumulative number of evaluated species	Maximum BF Value	Maximum Robustness
Apicultural interest¹	Direct			10
	Generalized by original authors	1981	6	2.5
	Generated genus level	2468		0.25
(if not yet evaluated)				
Regression based on honey and pollen contents		2489	3	0.1
PLADIAS²	Honey bee as major pollinator		+3	+2
	Honey bee as minor pollinator		+1	
	General insect pollination	3163	+0.1	+0.1
TRY³ long tongued bees			+0.5	+0.5
TRY³ bees, tong < 7 mm			+0.5	+0.5
TRY³ Non-specific bee-pollination			+0.1	+0.1
Honeydew from Apicultural interest¹ or BeelInfo.cz⁴			+0.5	+0.5
Agricultural crops⁵	Without <i>Poaceae</i> , <i>Cyperaceae</i> , <i>Juncaceae</i>	3180	+1.2 (max 6 for species not yet evaluated)	+1
	<i>Poaceae</i> , <i>Cyperaceae</i> , <i>Juncaceae</i>	3454	+0.1	+0.25
(if not yet evaluated)				
Apicultural interest¹ generalized on family level		6244	6	Max. 0.25
(if not yet evaluated) TRY¹ and PLADIAS²: traits linked with not honey bee pollinated + personal opinion and field experience	pollination syndrome water or wind only			1
	green flower	6434	0	0.1
Non-vascular		7275	0	0
(if not yet evaluated)				
Other non-useful		8001	0	0
(if not yet evaluated) Individual search on Google Scholar	Species-level			1
	Genus or family level	8029	0.1	0.1

¹Maurizio and Grafl 1982, Carrasco Claver and Montero Ruiz 1990, Danmarks Biavlerforenin 2013, ASTREDHOR el al. 2017, Koster 2019, Imkerpedia.nl; ²Janovský 2020, PLADIAS; ³Kattge et al. 2020; ⁴BeelInfo.cz; ⁵USDA 2017.

2.4. Bee-friendliness index - BF Index

To evaluate the contribution of each plant species in terms of bee-friendliness within a particular habitat, we developed and calculated the bee-friendliness index (BF Index). To determine the BF Index of each plant species within each EUNIS terrestrial Level 2 habitat, we use an approach analogous to the methods used in the analysis of functional traits and community composition (see e.g., Vandewalle et al. 2010). In that sense, we consider the BF Value to be a “functional trait” of each plant species, i.e. we can view the BF Value as a mean trait value of the species. The BF Index was calculated using a trait community-weighted mean (CWM) approach, where the mean trait values from each species are weighted by the species abundances. The product of the occurrence and the average cover was used as a proxy of the plant species abundance and as a measure of representation of the species within the habitat. The BF index was then calculated as the multiplication of the BF Value by the occurrence and by the average cover, i.e. $BF\ Index = BF\ Value \times Occurrence \times Average\ cover$.

The higher the BF index, the greater the contribution of the plant species in terms of bee-friendliness within that particular habitat. However, we must emphasize that the BF Index reflects the theoretical potential contribution in terms of bee-friendliness of a particular plant species within a particular habitat. The BF Index, since it incorporates the BF Value in its calculation, mostly reflects the contribution of a particular plant species as a food resource for honey bees, primarily as nectar, pollen and honeydew, within that particular habitat. Therefore, the BF Index, being a habitat dependent value, must always be interpreted carefully and with proper contextualization.

2.5. Bee-friendliness habitat score - BF Habitat score

To evaluate the overall value of the habitat in terms of bee-friendliness we developed and calculated the bee-friendliness habitat score (BF Habitat score). To determine BF Habitat score of each EUNIS terrestrial Level 2 habitat we sum up all the individual BF Indexes from each plant species present in a particular habitat. The higher the BF Habitat score, the greater the value of bee-friendliness of that habitat. However, we must stress that the BF Habitat score represents the potential value of the habitat to be bee-friendly, reflecting primarily the potential presence of food resources for honey bees in that habitat. In no way can the BF Habitat score be read without its correct contextualization (see 2.4 above). Moreover, it should always be considered to be the theoretical potential of bee-friendliness of the habitat regarding only resources.

Therefore, the BF Habitat score cannot be interpreted as an index of suitability of the habitat for honey bees since it only reflects the potential bee-friendliness in terms of food resources, and does not take into account any intrinsic characteristics of the habitat or any environmental variables (e.g. temperature, rain, wind, solar radiation). The BF Habitat score will be used in sub-task 3.4.2, where it will be further refined and developed, and it will be incorporated into the algorithm that is being developed to calculate the habitat suitability and to construct the

landscapes suitability maps incorporating not only resource availability in space and time but also other factors impacting honey bee colonies.

2.6. Database structure and storage

The Database is currently deposited in the B-GOOD data portal (<https://beehealthdata.org/>) in Microsoft Excel Office Open XML Spreadsheet format (xlsx file). The B-GOOD data portal is hosted and maintained by the BEEP Foundation. The portal was designed by BEEP and developed by Pensoft, with back-end technical work by BEEP (Milestone MS36 Website Portal Phase 1, April 2021). The B-GOOD data portal is the EU-wide bee health data web portal and its main purpose is to store raw and pre-processed data generated in the B GOOD project. The data portal is in full alignment with the B-GOOD publication and data sharing policy, namely: "External parties can request access to raw data for research and use in publication. The Intention to Publish form needs to be used for such requests. Such data requests from external parties will always be dealt with by the GA." and "Data will be made "as open as possible, as closed as necessary" during the project. The project intends to make all the data open in accordance to article 29.3 of the Grant Agreement.". More information can also be found on the Data Management Plan. The datasets available in the data portal are to be used for research purposes only. The datasets can be uploaded and retrieved depending on the access rights, and access can be requested at any time.

The database is organized in five sheets:

1. Metadata
2. Species BF Value
3. Species Occurrence EUNIS L2
4. Species Average Cover EUNIS L2
5. BF Index EUNIS L2

The Metadata sheet contains the objective and summary of the database (as given above), a brief overview of the methodology applied, the references of the databases used as sources of information to calculate the BF Value and the structure of the database.

The Species BF Value sheet contains the bee-friendliness plant species value (BF Value) that corresponds to the bee-friendliness of each plant species for honey bees and the robustness (Robustness) value associated with it (see section 3.2 on Methodology for further details). It is organized as a full list of 8029 plant species and their taxonomic groups, namely family and genus. The list of species present in this sheet is based on a dataset of 233,352 vegetation plots from the European Vegetation Archive (version 2020-05-16), classified by the EUNIS-ESy expert system (version 2020-06-08) and resampled in geographical grid cells from Chytrý et al. (2020).

The Species Occurrence EUNIS L2 sheet contains the percentage occurrence frequency (Occurrence) that was calculated as the number of occurrences relative to the total number of plots assigned to each Level 2 habitat. This sheet has 8029 plant species (like the Species BF Value sheet) present at each EUNIS terrestrial Level 2 habitat. It is organized so the rows correspond to the plant species and the columns represent each EUNIS terrestrial Level 2 habitat that is spatially explicitly defined at the EU scale in the Ecosystem Type Map (ETM) v3.1 (Weiss and Banko, 2018) and that is defined in terms of vegetation composition.

The Species Average Cover EUNIS L2 sheet contains the average cover (Average cover) that was calculated as the percentage cover averaged across all the plots assigned to the habitat, including the plots where a species was absent. This sheet has 8029 plant species (like the Species BF Value sheet) present at each EUNIS terrestrial Level 2 habitat. It is organized so the rows correspond to the plant species and the columns represent each EUNIS terrestrial Level 2 habitat that is spatially explicitly defined at the EU scale in the Ecosystem Type Map (ETM) v3.1 (Weiss and Banko, 2018) and that is defined in terms of vegetation composition.

The BF Index EUNIS L2 sheet contains the bee-friendliness index (BF Index) that corresponds to the contribution of each plant species in terms of bee-friendliness within a particular habitat (see section 2.4 of Methodology for further details). The BF index was calculated as the multiplication of the BF Value by occurrence and by average cover, i.e. $BF\ Index = BF\ Value \times Occurrence \times Average\ cover$. The higher the BF index, the greater the contribution of a plant species in terms of bee-friendliness within the habitat. This sheet has 8029 plant species (like the Species BF Value sheet) present at each EUNIS terrestrial Level 2 habitat. It is organized so the rows correspond to the plant species and the columns represent each EUNIS terrestrial Level 2 habitat that is spatially explicitly defined at the EU scale in the Ecosystem Type Map (ETM) v3.1 (Weiss and Banko, 2018) and that is defined in terms of vegetation composition.

3. Bee-friendly plant species present in EUNIS terrestrial Level 2 habitats

In this section information for the 45 EUNIS terrestrial Level 2 habitats, which are grouped in 9 main EUNIS terrestrial Level 1 habitats, are presented. The probability of presence of each one of the EUNIS Level 2 habitats across Europe is shown in Figure 2. A general overview of the main EUNIS habitats present in the EU together with the area occupied is summarized in Table 2.

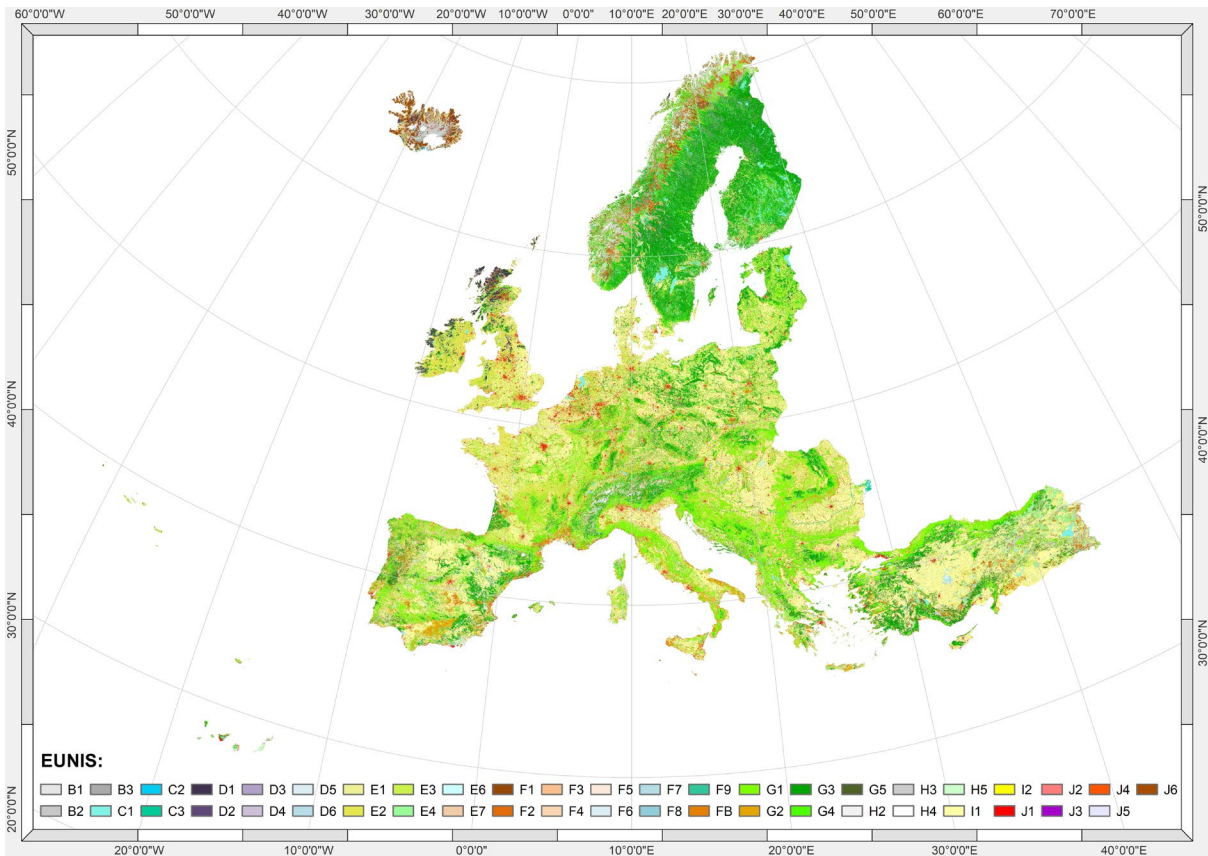


Figure 2. Map of EUNIS terrestrial Level 2 habitats. Adapted from Weiss and Banko, ETC/BD, 2018.

Table 2. Main EUNIS terrestrial Level 1 and Level 2 habitats present in the EU.

EUNIS - Level 1	EUNIS - Level 2	Area (ha)	Percentage
B - Coastal habitats	B1 - Coastal dunes and sandy shores	291067	0.05
	B2 - Coastal shingle	5734	0.00
	B3 - Rock cliffs, ledges and shores, including the supralittoral	63874	0.01
C - Inland surface waters	C1 - Surface standing waters**	13299120	2.28
	C2 - Surface running waters**	1416325	0.24
	C3 - Littoral zone of inland surface waterbodies**	259052	0.04
D - Mires, bogs and fens	D1 - Raised and blanket bogs	4616854	0.79
	D2 - Valley mires, poor fens and transition mires	215478	0.04
	D3 - Aapa, palsa and polygon mires	5131042	0.88
	D4 - Base-rich fens and calcareous spring mires	48808	0.01
	D5 - Sedge and reedbeds, normally without free-standing water	781436	0.13
	D6 - Inland saline and brackish marshes and reedbeds*	207418	0.04
E - Grasslands and land dominated by forbs, mosses or lichens	E1 - Dry grasslands	19234970	3.30
	E2 - Mesic grasslands	60001543	10.28
	E3 - Seasonally wet and wet grasslands	7865623	1.35
	E4 - Alpine and subalpine grasslands	8692364	1.49
	E6 - Inland salt steppes	490156	0.08
	E7 - Sparsely wooded grasslands*	1514361	0.26
F - Heathland, scrub and tundra	F1 - Tundra	7810607	1.34
	F2 - Arctic, alpine and subalpine scrub	8550877	1.47
	F3 - Temperate and mediterranean-montane scrub	5448621	0.93
	F4 - Temperate shrub heathland	411768	0.07
	F5 - Maquis, arborescent matorral and thermo-Mediterr. brushes	4996471	0.86
	F6 - Garrigue	1070059	0.18
	F7 - Spiny Mediterranean heaths (phrygana, hedgehog-heaths and related coastal cliff vegetation)	1791083	0.31
	F8 - Thermo-Atlantic xerophytic scrub	95399	0.02
	F9 - Riverine and fen scrubs	10687	0.00
	FB - Shrub plantations*	6371004	1.09
G - Woodland, forest and other wooded land	G1 - Broadleaved deciduous woodland	89905083	15.41
	G2 - Broadleaved evergreen woodland	5662642	0.97
	G3 - Coniferous woodland	86981984	14.91
	G4 - Mixed deciduous and coniferous woodland*	29625478	5.08
	G5 - Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice*	16047958	2.75
H - Inland unvegetated or sparsely vegetated habitats	H2 - Scree	633236	0.11
	H3 - Inland cliffs, rock pavements and outcrops	10317376	1.77
	H4 - Snow or ice-dominated habitats	1595002	0.27
	H5 - Miscellaneous inland habitats with very sparse or no vegetation	9286254	1.59
I - Arable land and market gardens	I1 - Arable land and market gardens	144022001	24.68
	I2 - Cultivated areas of gardens and parks*	1999613	0.34
J - constructed, industrial and other artificial habitats	J1 - Buildings of cities, towns and villages**	12246388	2.10
	J2 - Low density buildings**	11223328	1.92
	J3 - Extractive industrial sites**	940955	0.16
	J4 - Transport networks and other constructed hard-surfaced areas**	2037001	0.35
	J5 - Highly artificial man-made waters and associated structures**	229759	0.04
	J6 - Waste deposits**	48124	0.01

* Not defined in terms of vegetation composition. ** Non vegetation habitat.

3.1.B - Coastal habitats

Description: *“Coastal habitats are those above spring high tide limit (or above mean water level in non-tidal waters) occupying coastal features and characterised by their proximity to the sea, including coastal dunes and wooded coastal dunes, beaches and cliffs. Includes free-draining supralittoral habitats adjacent to marine habitats which are normally only affected by spray or splash, strandlines characterised by terrestrial invertebrates and moist and wet coastal dune slacks and dune-slack pools. Excludes supralittoral rock pools and habitats adjacent to the sea which are not characterised by salt spray, wave or sea-ice erosion.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

3.1.1. B1 - Coastal dunes and sandy shores

Description: *“Sand-covered shorelines of the oceans, their connected seas and associated coastal lagoons, fashioned by the action of wind or waves. They include gently sloping beaches and beach-ridges, formed by sands brought by waves, longshore drift and storm waves, as well as dunes, formed by aeolian deposits, though sometimes re-fashioned by waves.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*



Figure 3. B1 - Coastal dunes and sandy shores. Adapted from Weiss and Banko, ETC/BD, 2018.

Table 3. List of bee-friendly plant species potentially present at B1 - Coastal dunes and sandy shores. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Eryngium maritimum</i>	24	1.2	5.2	149.8
<i>Cakile maritima</i>	25	2.0	2.2	110.0
<i>Medicago marina</i>	13	1.1	3.3	46.9
<i>Calluna vulgaris</i>	4	1.4	7.8	43.7
<i>Euphorbia paralias</i>	12	0.7	4.0	33.6
<i>Pancratium maritimum</i>	12	0.6	4.4	32.0
<i>Salix repens</i>	5	0.9	5.1	22.9
<i>Achillea maritima</i>	7	0.8	2.0	11.2
<i>Crucianella maritima</i>	5	0.9	2.1	9.6
<i>Rubus caesius</i>	3	0.4	6.2	7.4
<i>Medicago littoralis</i>	5	0.3	4.4	6.6
<i>Echinophora spinosa</i>	7	0.3	3.1	6.5
<i>Lotus cytisoides</i>	4	0.4	3.9	6.2
<i>Sedum acre</i>	4	0.3	4.2	5.0
<i>Helichrysum stoechas</i>	4	0.6	2.0	4.8
<i>Hippophae rhamnoides</i>	3	0.8	2.0	4.8
<i>Trifolium repens</i>	3	0.2	8.0	4.8
<i>Lotus corniculatus</i>	5	0.2	4.6	4.6
<i>Erica cinerea</i>	2	0.5	4.3	4.3
<i>Lotus creticus</i>	4	0.3	3.6	4.3
<i>Euphorbia peplis</i>	5	0.2	4.0	4.0
<i>Jasione montana</i>	5	0.1	7.3	3.7
<i>Polygonum maritimum</i>	6	0.2	3.0	3.6
<i>Rubus fruticosus</i> aggr.	2	0.3	6.0	3.6
<i>Xanthium orientale</i>	6	0.2	3.0	3.6
<i>Hypochaeris radicata</i>	7	0.2	2.1	2.9
<i>Plantago lanceolata</i>	5	0.2	2.8	2.8
<i>Sonchus bulbosus</i>	4	0.2	3.4	2.7
<i>Crataegus monogyna</i>	2	0.2	6.4	2.6
<i>Galium verum</i>	4	0.3	2.2	2.6
				(...)
BF Habitat score				644.9

3.1.2. B2 - Coastal shingle

Description: *“Beaches of the oceans, of their connected seas and of their associated coastal lagoons, covered by pebbles, or sometimes boulders, usually formed by wave action.”*
[Devillers, P., Devillers-Terschuren, J. and Vander Linden, C., 2001]



Figure 4. B2 - Coastal shingle.

Table 4. List of bee-friendly plant species potentially present at B2 - Coastal shingle.

Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Beta vulgaris</i> subsp. <i>maritima</i>	28	4.9	3.1	425.3
<i>Argentina anserina</i>	22	5.6	3.4	420.9
<i>Tripleurospermum maritimum</i> aggr.	37	6.0	1.1	244.2
<i>Lathyrus japonicus</i>	13	4.4	3.7	210.1
<i>Rumex crispus</i>	30	1.6	2.1	100.8
<i>Crambe maritima</i>	11	2.1	4.2	97.0
<i>Crithmum maritimum</i>	10	2.0	3.1	62.1
<i>Atriplex prostrata</i>	38	6.2	0.2	47.1
<i>Angelica archangelica</i>	5	2.1	4.2	44.1
<i>Eryngium maritimum</i>	14	0.4	5.2	29.1
<i>Sonchus arvensis</i>	15	0.4	4.2	25.2
<i>Honckenya peploides</i>	33	7.2	0.1	23.8
<i>Cirsium arvense</i>	10	0.3	6.8	20.3
<i>Cakile maritima</i>	14	0.3	2.2	9.2
<i>Stellaria media</i>	7	0.3	4.2	8.8
<i>Atriplex praecox</i>	5	0.7	2.0	7.0
<i>Galium aparine</i>	8	0.4	2.2	7.0
<i>Glaucium flavum</i>	11	0.5	1.2	6.6
<i>Raphanus raphanistrum</i>	5	0.2	5.5	5.5
<i>Trifolium repens</i>	3	0.2	8.0	4.8
<i>Calystegia sepium</i>	5	0.3	3.0	4.5
<i>Plantago lanceolata</i>	5	0.3	2.8	4.3
<i>Tripolium pannonicum</i>	7	0.2	3.0	4.2
<i>Cochlearia officinalis</i>	5	0.2	4.1	4.1
<i>Salsola kali</i> aggr.	11	1.7	0.2	3.7
<i>Solanum dulcamara</i>	3	0.2	6.2	3.7
<i>Atriplex littoralis</i>	14	2.6	0.1	3.6
<i>Polygonum maritimum</i>	6	0.2	3.0	3.6
<i>Euphorbia paralias</i>	4	0.2	4.0	3.2
<i>Sonchus oleraceus</i>	7	0.2	2.2	3.1
				(...)
BF Habitat score				1892.3

3.1.3. B3 - Rock cliffs, ledges and shores, including the supralittoral

Description: *“Rock exposures adjacent to the oceans, their connected seas and associated coastal lagoons, or separated from them by a narrow shoreline. The faces, ledges and caves of sea-cliffs and the expanses of rocky shore are important as reproduction, resting and feeding sites for seabirds, sea-mammals and a few groups of terrestrial birds. Sea-cliffs may also harbour highly distinctive, specialised salt-tolerant vegetation with associated terrestrial fauna.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*



Figure 5. B3 - Rock cliffs, ledges and shores, including the supralittoral.

Table 5. List of bee-friendly plant species potentially present at B3 - Rock cliffs, ledges and shores, including the supralittoral. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Crithmum maritimum</i>	37	6.9	3.1	793.3
<i>Armeria maritima</i>	28	4.4	2.6	320.3
<i>Plantago coronopus</i> aggr.	30	4.8	1.1	158.4
<i>Daucus carota</i>	18	0.9	4.3	69.7
<i>Plantago maritima</i>	18	3.0	1.2	64.8
<i>Lotus cytisoides</i>	14	0.9	3.9	48.7
<i>Silene uniflora</i>	11	1.8	2.0	39.6
<i>Cochlearia danica</i>	8	1.2	4.1	39.4
<i>Spergularia rupicola</i>	12	0.9	2.2	23.6
<i>Glycyrrhiza glabra</i>	4	1.5	3.2	19.1
<i>Limbarda crithmoides</i>	7	0.9	3.0	18.9
<i>Limonium graecum</i>	4	0.8	5.0	16.0
<i>Anthyllis vulneraria</i>	5	0.6	5.0	15.0
<i>Limonium binervosum</i>	5	0.5	5.0	12.5
<i>Beta vulgaris</i> subsp. <i>maritima</i>	6	0.6	3.1	11.2
<i>Reichardia picroides</i>	12	0.3	3.0	10.8
<i>Thymbra capitata</i>	3	1.3	2.7	10.7
<i>Sedum acre</i>	4	0.6	4.2	10.1
<i>Limonium meyeri</i>	5	0.4	5.0	10.0
<i>Festuca rubra</i> aggr.	30	3.3	0.1	9.9
<i>Dactylis glomerata</i>	16	0.5	1.2	9.6
<i>Limonium ovalifolium</i>	3	0.6	5.0	9.0
<i>Cochlearia officinalis</i>	7	0.3	4.1	8.6
<i>Plantago lanceolata</i>	6	0.4	2.8	6.8
<i>Artemisia santonicum</i>	5	0.4	3.0	6.0
<i>Jacobaea maritima</i>	6	0.5	2.0	6.0
<i>Lotus corniculatus</i>	6	0.2	4.6	5.5
<i>Halimione verrucifera</i>	3	0.9	2.0	5.4
<i>Helichrysum litoreum</i>	3	0.8	2.0	4.8
<i>Camphorosma monspeliaca</i>	3	0.7	2.0	4.2
				(...)
BF Habitat score				1836.8

3.2.C - Inland surface waters

Description: *"Inland surface waters are non-coastal above-ground open fresh or brackish waterbodies (e.g. rivers, streams, lakes and pools, springs), including their littoral zones. Includes constructed inland freshwater, brackish or saline waterbodies (such as canals, ponds, etc) which support a semi-natural community of both plants and animals; seasonal waterbodies which may dry out for part of the year (temporary or intermittent rivers and lakes and their littoral zones). Freshwater littoral zones include those parts of banks or shores that are sufficiently frequently inundated to prevent the formation of closed terrestrial vegetation. Excludes permanent snow and ice. Note that habitats that intimately combine waterlogged mires and vegetation rafts with pools of open water are considered as complexes."* [Hill, M.O., Moss, D. & Davies, C.E., 2004b]

Vegetation: The EUNIS Level 1 C - Inland surface waters habitats are waterbodies/waters surfaces that occur inland. These habitats are not defined in terms of vegetation composition since they are primarily water surfaces. Therefore, these habitats do not represent a direct food resource for honey bees although they can be used as a source of water. For these reasons no vegetation composition is presented.

3.2.1. C1 - Surface standing waters

Description: *"Lakes, ponds and pools of natural origin containing fresh (i.e. nonsaline), brackish or salt water. Manmade freshwater bodies, including artificially created lakes, reservoirs and canals, provided that they contain seminatural aquatic communities."* [Hill, M.O., Moss, D. & Davies, C.E., 2004a]



Figure 6. C1 - Surface standing waters.

3.2.2. C2 - Surface running waters

Description: *“Running waters, including springs, streams and temporary water courses.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*



Figure 7. C2 - Surface running waters.

3.2.3. C3 - Littoral zone of inland surface waterbodies

Description: *“Reedbeds and other water-fringing vegetation by lakes, rivers and streams; exposed bottoms of dried up rivers and lakes; rocks, gravel, sand and mud beside or in the bed of rivers and lakes.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*



Figure 8. C3 - Littoral zone of inland surface waterbodies.

3.3.D - Mires, bogs and fens

Description: *“Wetlands, with the water table at or above ground level for at least half of the year, dominated by herbaceous or ericoid vegetation. Includes inland saltmarshes and waterlogged habitats where the groundwater is frozen. Excludes the water body and rock structure of springs (C2.1) and waterlogged habitats dominated by trees or large shrubs (F9.2, G1.4, G1.5, G3.D, G3.E). Note that habitats that intimately combine waterlogged mires and vegetation rafts with pools of open water are considered as complexes.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

3.3.1. D1 - Raised and blanket bogs

Description: *“Peatlands formed by ombrotrophic acid peat, which is (or was while actively growing) capable of growth fed by rainfall rather than by the inflow of water from higher ground in the vicinity.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*



Figure 9. D1 - Raised and blanket bogs.

Table 6. List of bee-friendly plant species potentially present at D1 - Raised and blanket bogs. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Calluna vulgaris</i>	52	10.3	7.8	4177.7
<i>Vaccinium oxycoccos</i>	53	3.7	4.4	857.8
<i>Rubus chamaemorus</i>	35	4.1	5.8	826.5
<i>Vaccinium uliginosum</i>	44	4.3	4.3	807.3
<i>Andromeda polifolia</i>	54	3.5	2.7	510.3
<i>Vaccinium myrtillus</i>	30	2.5	5.9	445.0
<i>Chamaedaphne calyculata</i>	20	3.2	3.9	250.6
<i>Rhododendron tomentosum</i>	28	2.3	3.1	199.6
<i>Vaccinium vitis-idaea</i>	25	1.2	5.6	168.0
<i>Erica tetralix</i>	13	1.2	7.7	120.1
<i>Betula nana</i>	28	1.1	2.0	61.6
<i>Vaccinium microcarpum</i>	27	0.7	2.9	54.9
<i>Empetrum nigrum</i> aggr.	44	5.8	0.2	51.0
<i>Pinus sylvestris</i>	31	1.1	1.0	34.1
<i>Potentilla erecta</i>	16	0.7	1.2	13.4
<i>Betula pubescens</i>	15	0.4	2.2	13.0
<i>Drosera rotundifolia</i>	39	1.0	0.2	7.8
<i>Erica cinerea</i>	5	0.3	4.3	6.5
<i>Picea abies</i>	11	0.2	2.0	4.4
<i>Melampyrum pratense</i>	8	0.2	1.1	1.8
<i>Frangula alnus</i>	3	0.1	4.1	1.2
<i>Narthecium ossifragum</i>	7	0.8	0.2	1.1
<i>Draba verna</i> aggr.	1	0.3	3.4	1.0
<i>Betula pendula</i>	4	0.1	1.8	0.7
<i>Cardamine pratensis</i>	1	0.1	6.1	0.6
<i>Salix caprea</i>	1	0.1	5.1	0.5
<i>Salix repens</i>	1	0.1	5.1	0.5
<i>Myrica gale</i>	2	0.1	1.5	0.3
<i>Pinus uncinata</i>	2	0.1	1.6	0.3
<i>Ranunculus flammula</i>	1	0.1	3.2	0.3
				(...)
BF Habitat score				8618.8

3.3.2. D2 - Valley mires, poor fens, and transition mires

Description: *“Weakly to strongly acid peatlands, flushes and vegetated rafts formed in situations where they receive water from the surrounding landscape or are intermediate between land and water. Included are quaking bogs and vegetated non-calcareous springs. Excluded are calcareous fens (D4), and reedbeds (C3, D5).” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*



Figure 10. D2 - Valley mires, poor fens, and transition mires.

Table 7. List of bee-friendly plant species potentially present at D2 - Valley mires, poor ferns, and transition mires. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Erica tetralix</i>	16	2.0	7.7	246.4
<i>Calluna vulgaris</i>	14	1.8	7.8	196.6
<i>Vaccinium oxycoccos</i>	20	1.7	4.4	148.7
<i>Potentilla erecta</i>	26	1.4	1.2	43.7
<i>Viola palustris</i>	19	1.1	2.0	42.0
<i>Epilobium palustre</i>	11	0.3	6.1	20.1
<i>Andromeda polifolia</i>	14	0.5	2.7	18.9
<i>Caltha palustris</i>	8	0.3	7.4	17.8
<i>Galium palustre</i> aggr.	13	0.5	2.2	14.3
<i>Menyanthes trifoliata</i>	20	2.5	0.2	10.0
<i>Cirsium palustre</i>	7	0.2	5.8	8.1
<i>Ranunculus flammula</i>	8	0.3	3.2	7.7
<i>Comarum palustre</i>	19	1.8	0.2	6.8
<i>Succisa pratensis</i>	7	0.3	3.1	6.5
<i>Lysimachia vulgaris</i>	9	0.3	2.2	5.9
<i>Drosera rotundifolia</i>	25	1.1	0.2	5.5
<i>Vaccinium myrtillus</i>	4	0.2	5.9	4.7
<i>Agrostis canina</i>	23	1.8	0.1	4.1
<i>Hypericum elodes</i>	2	0.5	4.1	4.1
<i>Valeriana dioica</i>	6	0.3	2.2	4.0
<i>Narthecium ossifragum</i>	12	1.6	0.2	3.8
<i>Lotus pedunculatus</i>	4	0.2	4.3	3.4
<i>Lythrum salicaria</i>	4	0.1	8.3	3.3
<i>Betula pubescens</i>	7	0.2	2.2	3.0
<i>Cardamine pratensis</i>	5	0.1	6.1	3.0
<i>Salix aurita</i>	3	0.1	9.1	2.7
<i>Galium uliginosum</i>	6	0.2	2.2	2.6
<i>Filipendula ulmaria</i>	4	0.1	5.4	2.2
<i>Lysimachia thyrsiflora</i>	5	0.2	2.2	2.2
<i>Carum verticillatum</i>	3	0.1	6.1	1.8
				(...)
BF Habitat score				880.3

3.3.3. D3 - Aapa, palsa and polygon mires

Description: “*Patterned mire complexes of the arctic, subarctic and northern boreal zones.*”
[Hill, M.O., Moss, D. & Davies, C.E., 2004a]



Figure 11. D3 - Aapa, palsa and polygon mires.

Table 8. List of bee-friendly plant species potentially present at D3 - Aapa, palsa and polygon mires. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Rubus chamaemorus</i>	100	14.3	5.8	8235.9
<i>Rhododendron tomentosum</i>	68	10.3	3.1	2171.2
<i>Vaccinium vitis-idaea</i>	85	3.9	5.6	1856.4
<i>Vaccinium uliginosum</i>	59	1.8	4.3	453.1
<i>Andromeda polifolia</i>	68	2.2	2.7	403.9
<i>Betula nana</i>	71	1.6	2.0	227.2
<i>Empetrum nigrum</i> aggr.	95	7.8	0.2	148.2
<i>Vaccinium myrtillus</i>	8	0.4	5.9	19.0
<i>Vaccinium microcarpum</i>	14	0.3	2.9	12.2
<i>Salix glauca</i>	5	0.1	6.0	3.0
<i>Salix polaris</i>	5	0.1	6.0	3.0
<i>Cornus suecica</i>	3	0.2	2.4	1.5
<i>Chamaedaphne calyculata</i>	3	0.1	3.9	1.2
<i>Saxifraga foliolosa</i>	3	0.1	3.3	1.0
<i>Loiseleuria procumbens</i>	5	0.3	0.1	0.2
<i>Arctostaphylos alpinus</i>	10	0.1	0.1	0.1
<i>Poa arctica</i>	7	0.1	0.1	0.1
<i>Tephroses integrifolia</i>	7	0.1	0.1	0.1
<i>Trientalis europaea</i>	5	0.1	0.2	0.1
<i>Abies alba</i>	0	0.0	0.5	0.0
<i>Abies borisii-regis</i>	0	0.0	1.6	0.0
<i>Abies cephalonica</i>	0	0.0	1.6	0.0
<i>Abies cilicica</i>	0	0.0	1.6	0.0
<i>Abies grandis</i>	0	0.0	1.6	0.0
<i>Abies nordmanniana</i>	0	0.0	1.6	0.0
<i>Abies pinsapo</i>	0	0.0	1.6	0.0
<i>Abies sibirica</i>	0	0.0	1.6	0.0
<i>Abietinella abietina</i>	0	0.0	0.0	0.0
<i>Abutilon theophrasti</i>	0	0.0	0.1	0.0
<i>Acacia dealbata</i>	0	0.0	2.0	0.0
				(...)
BF Habitat score				13537.4

3.3.4. D4 - Base-rich fens and calcareous spring mires

Description: *“Peatlands, flushes and vegetated springs with calcareous or eutrophic ground water, within river valleys, alluvial plains, or on hillsides. As in poor fens, the water level is at or near the surface of the substratum and peat formation depends on a permanently high watertable. Excluded are reedbeds (C3, D5).” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*



Figure 12. D4 - Base-rich fens and calcareous spring mires.

Table 9. List of bee-friendly plant species potentially present at D4 - Base-rich ferns and calcareous spring mires. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Potentilla erecta</i>	44	2.0	1.2	105.6
<i>Succisa pratensis</i>	22	0.9	3.1	61.4
<i>Valeriana dioica</i>	21	1.2	2.2	55.4
<i>Caltha palustris</i>	12	0.4	7.4	35.7
<i>Cirsium palustre</i>	16	0.3	5.8	27.7
<i>Epipactis palustris</i>	15	0.6	2.7	24.3
<i>Primula farinosa</i>	17	0.8	1.6	21.8
<i>Menyanthes trifoliata</i>	27	3.4	0.2	18.4
<i>Vaccinium oxycoccos</i>	9	0.4	4.4	15.7
<i>Salix repens</i>	9	0.3	5.1	13.8
<i>Mentha aquatica</i>	9	0.3	4.8	12.8
<i>Epilobium palustre</i>	8	0.2	6.1	9.8
<i>Prunella vulgaris</i>	9	0.2	5.0	9.0
<i>Filipendula ulmaria</i>	8	0.2	5.4	8.7
<i>Galium uliginosum</i>	13	0.3	2.2	8.6
<i>Linum catharticum</i>	12	0.3	2.2	7.9
<i>Andromeda polifolia</i>	9	0.3	2.7	7.3
<i>Saxifraga aizoides</i>	6	0.3	4.0	7.2
<i>Lythrum salicaria</i>	7	0.1	8.3	5.8
<i>Pinguicula vulgaris</i>	24	0.8	0.3	5.8
<i>Ranunculus acris</i> aggr.	8	0.2	3.6	5.8
<i>Leontodon hispidus</i>	7	0.2	4.1	5.7
<i>Bellidiastrum michelii</i>	6	0.3	3.0	5.4
<i>Viola palustris</i>	9	0.3	2.0	5.4
<i>Crepis paludosa</i>	11	0.4	1.2	5.3
<i>Eupatorium cannabinum</i>	6	0.2	4.1	4.9
<i>Galium palustre</i> aggr.	11	0.2	2.2	4.8
<i>Erica tetralix</i>	3	0.2	7.7	4.6
<i>Utricularia minor</i>	7	0.3	2.0	4.2
<i>Dactylorhiza majalis</i>	9	0.2	2.2	4.0
				(...)
BF Habitat score				597.1

3.3.5. D5 - Sedge and reedbeds, normally without free-standing water

Description: “Sedge and reedbeds forming terrestrial mire habitats, not closely associated with open water. Excluded are reedbeds and sedges where they form emergent or fringing vegetation beside water bodies (C3.2).” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]



Figure13. D5 - Sedge and reedbeds, normally without free-standing water.

Table 10. List of bee-friendly plant species potentially present at D5 - Sedge and reedbeds, normally without free-standing water. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Lythrum salicaria</i>	25	0.7	8.3	146.1
<i>Mentha aquatica</i>	18	1.2	4.8	102.6
<i>Typha latifolia</i>	13	3.4	2.0	88.4
<i>Galium palustre</i> aggr.	30	1.3	2.2	85.8
<i>Iris pseudacorus</i>	17	1.3	2.1	46.4
<i>Ranunculus repens</i>	16	0.7	3.1	34.7
<i>Alisma plantago-aquatica</i>	17	0.9	2.2	33.7
<i>Lysimachia vulgaris</i>	18	0.8	2.2	31.7
<i>Persicaria amphibia</i>	13	1.1	2.2	31.5
<i>Typha angustifolia</i>	8	1.9	2.0	30.4
<i>Rorippa amphibia</i>	8	0.9	4.2	30.2
<i>Caltha palustris</i>	10	0.4	7.4	29.7
<i>Lycopus europaeus</i>	19	0.6	2.1	23.9
<i>Solanum dulcamara</i>	7	0.4	6.2	17.4
<i>Myosotis scorpioides</i> aggr.	16	0.6	1.6	15.4
<i>Ranunculus flammula</i>	9	0.5	3.2	14.4
<i>Filipendula ulmaria</i>	7	0.3	5.4	11.4
<i>Helosciadium nodiflorum</i>	4	0.8	3.1	9.9
<i>Oenanthe aquatica</i>	7	0.7	2.0	9.8
<i>Veronica beccabunga</i>	5	0.5	3.2	8.0
<i>Calystegia sepium</i>	7	0.3	3.0	6.3
<i>Epilobium hirsutum</i>	5	0.2	5.2	5.2
<i>Butomus umbellatus</i>	4	0.3	4.2	5.0
<i>Rumex hydrolapathum</i>	8	0.3	2.1	5.0
<i>Cardamine pratensis</i>	6	0.1	6.1	3.7
<i>Oenanthe crocata</i>	2	0.5	3.1	3.1
<i>Epilobium palustre</i>	5	0.1	6.1	3.0
<i>Sparganium erectum</i> aggr.	10	1.4	0.2	2.8
<i>Cirsium arvense</i>	4	0.1	6.8	2.7
<i>Lemna minor</i>	15	1.8	0.1	2.7
				(...)
BF Habitat score				901.5

3.3.6. D6 - Inland saline and brackish marshes and reedbeds

Description: *“Saline wetlands, with closed or open vegetation, which are the non-coastal analogue of coastal saltmarshes and saline reedbeds (A2.5). Drier saline habitats are classified as inland salt steppe (E6) or saline scrubland (F6.8).” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

Vegetation: For the D6 - Inland saline and brackish marshes and reedbeds habitat there is no vegetation composition defined.



Figure 14. D6 - Inland saline and brackish marshes and reedbeds.

3.4.E - Grasslands and land dominated by forbs, mosses or lichens

Description: *“Non-coastal land which is dry or only seasonally wet (with the water table at or above ground level for less than half of the year) with greater than 30% vegetation cover. The vegetation is dominated by grasses and other non-woody plants, including mosses, macrolichens, ferns, sedges and herbs. Includes semiarid steppes with scattered [Artemisia] scrub. Includes successional weedy vegetation and managed grasslands such as recreation fields and lawns. Excludes regularly tilled habitats (I1) dominated by cultivated herbaceous vegetation such as arable fields.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

3.4.1. E1 - Dry grasslands

Description: *“Well-drained or dry lands dominated by grass or herbs, mostly not fertilized and with low productivity. Included are [Artemisia] steppes. Excluded are dry mediterranean lands with shrubs of other genera where the shrub cover exceeds 10%; these are listed as garrigue (F6).” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

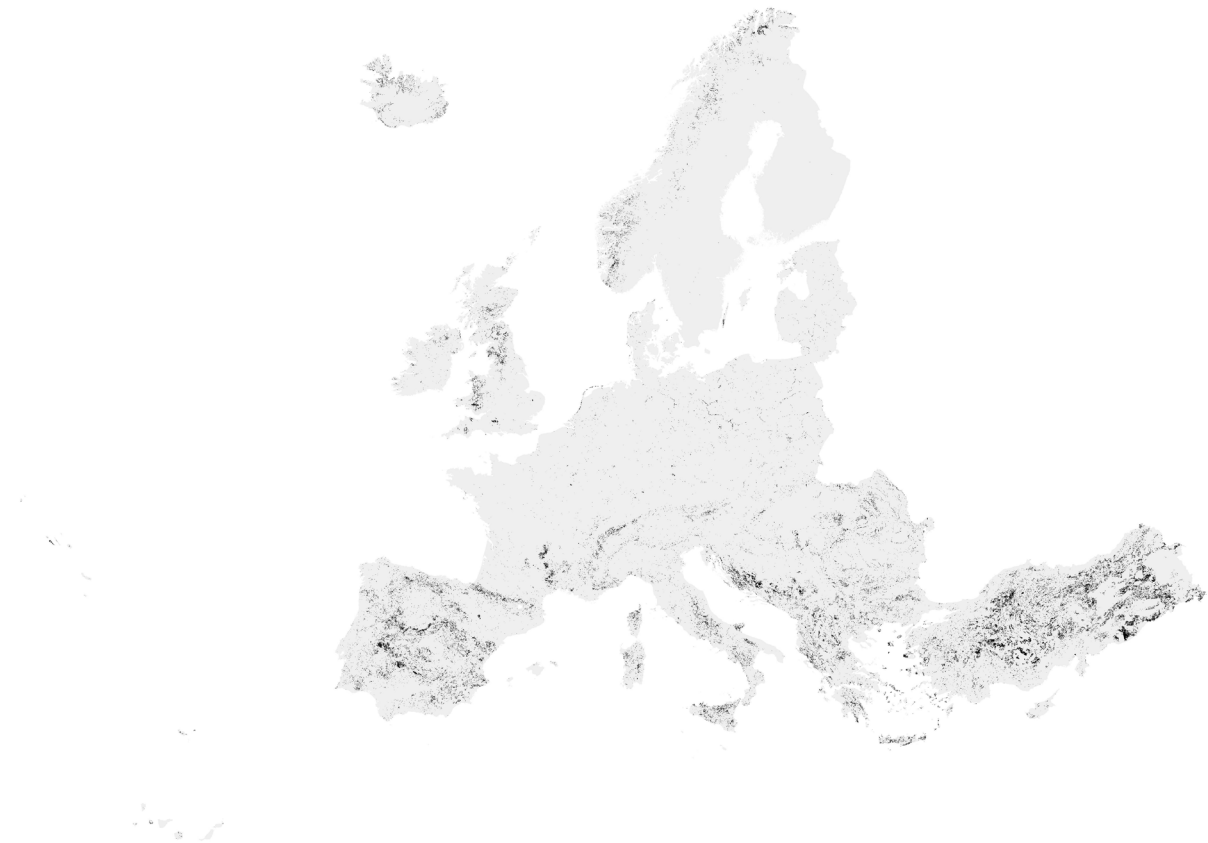


Figure 15. E1 - Dry grasslands.

Table 11. List of bee-friendly plant species potentially present at E1 - Dry grasslands. Occurrence is the percentage of occurrence frequency, Average cover is the average cover of the plant species at the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Pilosella officinarum</i>	22	1.2	5.1	134.6
<i>Sanguisorba minor</i> aggr.	25	0.9	4.1	92.2
<i>Lotus corniculatus</i>	23	0.7	4.6	74.1
<i>Euphorbia cyparissias</i>	23	0.7	4.1	66.0
<i>Teucrium chamaedrys</i>	20	1.0	3.1	62.0
<i>Helianthemum nummularium</i>	15	0.8	4.6	55.2
<i>Galium verum</i>	24	0.8	2.2	42.2
<i>Plantago lanceolata</i>	24	0.6	2.8	41.0
<i>Plantago media</i>	16	0.5	5.1	40.8
<i>Thymus pulegioides</i>	15	0.6	4.2	37.8
<i>Anthyllis vulneraria</i>	13	0.5	5.0	32.5
<i>Achillea millefolium</i> aggr.	24	0.6	2.2	31.7
<i>Eryngium campestre</i>	19	0.5	3.2	30.4
<i>Hypericum perforatum</i>	17	0.3	5.6	28.6
<i>Hippocrepis comosa</i>	10	0.4	6.0	24.0
<i>Salvia pratensis</i>	10	0.4	6.0	24.0
<i>Centaurea scabiosa</i>	12	0.3	6.4	23.2
<i>Thymus praecox</i>	9	0.5	5.1	22.9
<i>Thymus serpyllum</i>	8	0.5	5.1	20.4
<i>Leontodon hispidus</i>	10	0.4	4.1	16.4
<i>Medicago falcata</i>	15	0.5	2.1	15.8
<i>Sedum album</i>	6	0.6	4.2	15.1
<i>Medicago lupulina</i>	11	0.3	4.5	14.8
<i>Fragaria viridis</i>	9	0.5	3.2	14.4
<i>Scabiosa columbaria</i> aggr.	10	0.3	4.6	13.8
<i>Sedum acre</i>	8	0.4	4.2	13.4
<i>Pimpinella saxifraga</i>	15	0.4	2.2	13.2
<i>Campanula rotundifolia</i>	9	0.2	7.2	13.0
<i>Cirsium acaulon</i>	7	0.3	6.1	12.8
<i>Trifolium pratense</i>	9	0.3	4.8	12.8
				(...)
BF Habitat score				1460.3

3.4.2. E2 - Mesic grasslands

Description: *“Lowland and montane mesotrophic and eutrophic pastures and hay meadows of the boreal, nemoral, warm-temperate humid and mediterranean zones. They are generally more fertile than dry grasslands (E1), and include sports fields and agriculturally improved and reseeded pastures.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*

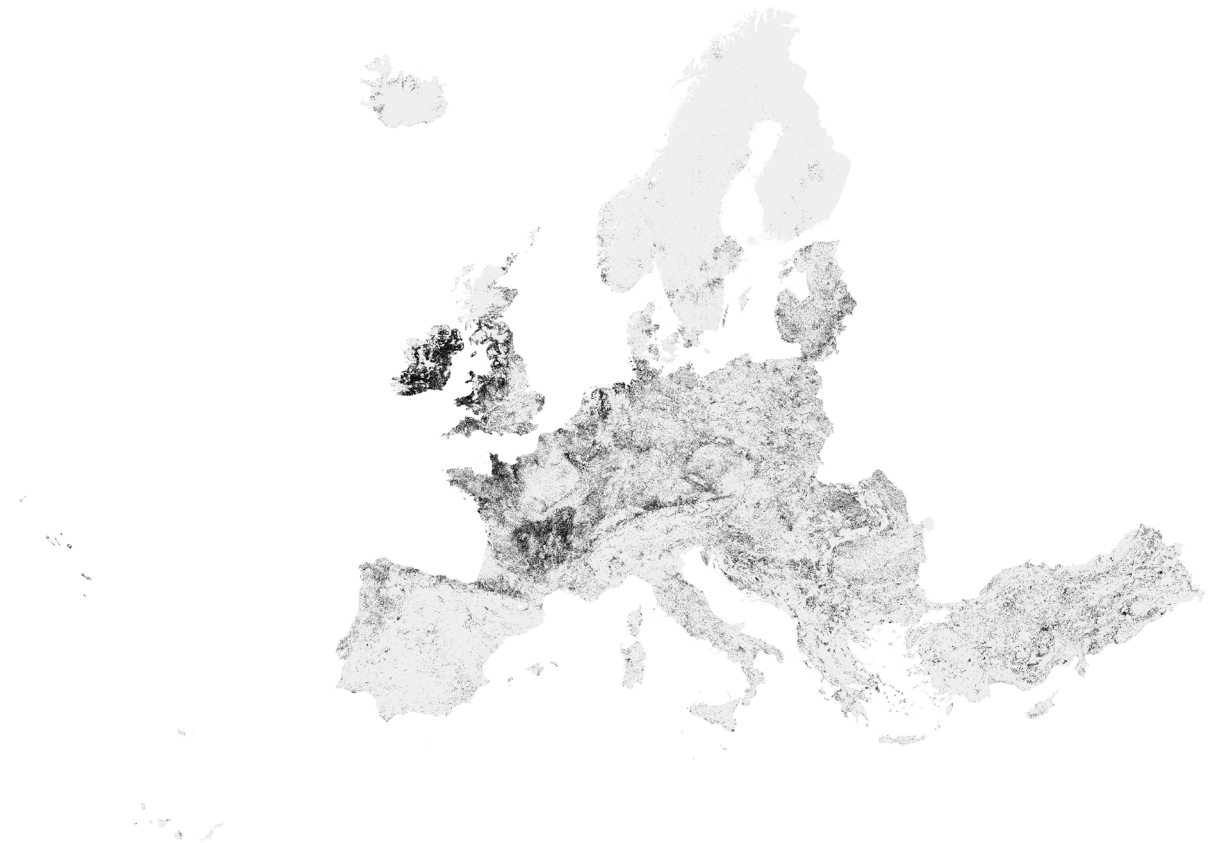


Figure 16. E2 - Mesic grasslands.

Table 12. List of bee-friendly plant species potentially present at E2 - Mesic grasslands.

Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Trifolium repens</i>	52	4.8	8.0	1984.3
<i>Trifolium pratense</i>	49	3.2	4.8	744.8
<i>Plantago lanceolata</i>	60	3.4	2.8	581.4
<i>Taraxacum sect. Taraxacum</i>	38	1.6	7.0	425.6
<i>Achillea millefolium</i> aggr.	54	2.4	2.2	285.1
<i>Lotus corniculatus</i>	35	1.7	4.6	273.7
<i>Ranunculus acris</i> aggr.	42	1.7	3.6	257.0
<i>Dactylis glomerata</i>	51	3.8	1.2	232.6
<i>Veronica chamaedrys</i> aggr.	29	0.9	6.5	169.7
<i>Leucanthemum vulgare</i> aggr.	29	1.1	4.2	134.0
<i>Rumex acetosa</i>	42	1.4	2.1	123.5
<i>Lolium perenne</i>	28	4.0	1.0	112.0
<i>Ranunculus repens</i>	26	1.3	3.1	104.8
<i>Prunella vulgaris</i>	23	0.9	5.0	103.5
<i>Centaurea jacea</i>	19	0.7	7.1	94.4
<i>Leontodon hispidus</i>	19	1.1	4.1	85.7
<i>Vicia cracca</i>	20	0.6	7.0	84.0
<i>Heracleum sphondylium</i>	18	0.9	4.8	77.2
<i>Festuca rubra</i> aggr.	60	11.3	0.1	67.8
<i>Lathyrus pratensis</i>	20	0.7	4.5	63.0
<i>Galium mollugo</i> aggr.	22	1.1	2.2	53.2
<i>Scorzoneroideis autumnalis</i>	20	0.7	3.1	43.4
<i>Daucus carota</i>	15	0.6	4.3	38.7
<i>Cirsium arvense</i>	14	0.4	6.8	37.9
<i>Anthriscus sylvestris</i>	10	0.6	6.1	36.6
<i>Agrostis capillaris</i>	45	7.5	0.1	33.8
<i>Medicago lupulina</i>	14	0.5	4.5	31.5
<i>Bellis perennis</i>	22	0.8	1.7	29.9
<i>Galium verum</i>	17	0.8	2.2	29.9
<i>Plantago media</i>	14	0.4	5.1	28.6
				(...)
BF Habitat score				7084.2

3.4.3. E3 - Seasonally wet and wet grasslands

Description: *“Unimproved or lightly improved wet meadows and tall herb communities of the boreal, nemoral, warm-temperate humid, steppic and mediterranean zones.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*



Figure 17. E3 - Seasonally wet and wet grasslands.

Table 13. List of bee-friendly plant species potentially present at E3 - Seasonally wet and wet grasslands. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Ranunculus repens</i>	38	2.6	3.1	306.3
<i>Filipendula ulmaria</i>	25	1.9	5.4	258.1
<i>Caltha palustris</i>	21	1.6	7.4	249.8
<i>Trifolium repens</i>	22	1.2	8.0	209.9
<i>Argentina anserina</i>	16	2.1	3.4	114.8
<i>Ranunculus acris</i> aggr.	29	1.1	3.6	114.8
<i>Lotus pedunculatus</i>	20	1.2	4.3	103.2
<i>Cirsium palustre</i>	22	0.7	5.8	88.8
<i>Cardamine pratensis</i>	20	0.5	6.1	61.0
<i>Lythrum salicaria</i>	17	0.4	8.3	56.8
<i>Sanguisorba officinalis</i>	12	0.9	5.1	55.1
<i>Galium palustre</i> aggr.	26	0.9	2.2	51.5
<i>Succisa pratensis</i>	15	1.1	3.1	51.1
<i>Potentilla erecta</i>	25	1.5	1.2	45.0
<i>Lathyrus pratensis</i>	18	0.5	4.5	40.5
<i>Plantago major</i>	15	1.1	2.2	36.3
<i>Angelica sylvestris</i>	14	0.6	4.1	34.4
<i>Cirsium oleraceum</i>	8	1.0	4.2	33.6
<i>Silene flos-cuculi</i>	23	0.6	2.1	29.0
<i>Lysimachia vulgaris</i>	16	0.7	2.2	24.6
<i>Myosotis scorpioides</i> aggr.	22	0.7	1.6	24.6
<i>Potentilla reptans</i>	10	0.6	4.1	24.6
<i>Mentha aquatica</i>	10	0.5	4.8	23.8
<i>Vicia cracca</i>	11	0.3	7.0	23.1
<i>Trifolium pratense</i>	12	0.4	4.8	22.8
<i>Galium uliginosum</i>	17	0.6	2.2	22.4
<i>Rumex acetosa</i>	21	0.5	2.1	22.1
<i>Ranunculus flammula</i>	13	0.5	3.2	20.8
<i>Prunella vulgaris</i>	13	0.3	5.0	19.5
<i>Agrostis stolonifera</i>	34	5.5	0.1	18.7
				(...)
BF Habitat score				2587.0

3.4.4. E4 - Alpine and subalpine grasslands

Description: *“Primary and secondary grass- or sedge- dominated formations of the alpine and subalpine levels of boreal, nemoral, mediterranean, warm-temperate humid and Anatolian mountains.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*



Figure 18. E4 - Alpine and subalpine grasslands.

Table 14. List of bee-friendly plant species potentially present at E4 - Alpine and subalpine grasslands. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Trifolium alpinum</i>	10	1.5	3.0	45.2
<i>Anthyllis vulneraria</i>	14	0.6	5.0	42.0
<i>Thymus praecox</i>	13	0.6	5.1	39.8
<i>Helianthemum nummularium</i>	10	0.7	4.6	32.2
<i>Vaccinium myrtillus</i>	12	0.4	5.9	28.5
<i>Geum montanum</i>	15	0.7	2.6	27.3
<i>Silene acaulis</i>	14	0.8	2.0	22.4
<i>Salix herbacea</i>	9	0.4	6.2	22.3
<i>Campanula scheuchzeri</i>	12	0.4	4.2	20.2
<i>Saxifraga oppositifolia</i>	8	0.5	4.2	16.8
<i>Lotus corniculatus</i>	11	0.3	4.6	15.2
<i>Potentilla aurea</i>	17	0.7	1.2	14.3
<i>Lotus alpinus</i>	8	0.4	4.2	13.4
<i>Bellidiastrum michelii</i>	10	0.4	3.0	12.0
<i>Trifolium pratense</i>	8	0.3	4.8	11.4
<i>Saxifraga paniculata</i>	9	0.3	4.0	10.8
<i>Scorzoneroidea helvetica</i>	10	0.5	2.1	10.5
<i>Vaccinium uliginosum</i>	8	0.3	4.3	10.2
<i>Campanula rotundifolia</i>	7	0.2	7.2	10.1
<i>Sibbaldia procumbens</i>	7	0.4	3.4	9.6
<i>Leontodon hispidus</i>	7	0.3	4.1	8.6
<i>Plantago alpina</i>	9	0.8	1.2	8.6
<i>Galium anisophyllum</i>	10	0.4	2.1	8.4
<i>Vaccinium vitis-idaea</i>	7	0.2	5.6	7.8
<i>Ranunculus montanus</i>	8	0.3	3.1	7.4
<i>Gentiana verna</i>	11	0.3	2.1	6.9
<i>Pilosella officinarum</i>	6	0.2	5.1	6.1
<i>Hippocrepis comosa</i>	5	0.2	6.0	6.0
<i>Cirsium spinosissimum</i> aggr.	3	0.3	6.1	5.5
<i>Minuartia sedoides</i>	8	0.3	2.2	5.2
				(...)
BF Habitat score				721.9

3.4.5. E6 - Inland salt steppes

Description: “Saline land with dominant salt-tolerant grasses and herbs. Excludes saline scrubland, listed under F6.8 xero-halophile scrubs.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]



Figure 19. E6 - Inland salt steppes.

Table 15. List of bee-friendly plant species potentially present at E6 - Inland salt steppes. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Artemisia santonicum</i>	26	4.0	3.0	312.0
<i>Tripolium pannonicum</i>	25	2.2	3.0	165.0
<i>Limonium gmelinii</i>	15	1.0	5.0	75.0
<i>Camphorosma annua</i>	9	2.4	2.0	43.2
<i>Plantago maritima</i>	18	1.8	1.2	38.9
<i>Lotus tenuis</i>	11	0.7	4.2	32.7
<i>Taraxacum besarabicum</i>	8	0.4	6.0	19.2
<i>Podospermum canum</i>	11	0.3	3.0	9.9
<i>Polygonum aviculare</i> aggr.	13	0.3	2.2	8.6
<i>Halimione verrucifera</i>	4	0.9	2.0	7.2
<i>Trifolium fragiferum</i>	7	0.4	2.1	5.9
<i>Lepidium cartilagineum</i>	4	0.4	3.4	5.4
<i>Argentina anserina</i>	5	0.3	3.4	5.1
<i>Matricaria chamomilla</i>	10	0.4	1.0	4.0
<i>Plantago tenuiflora</i>	6	0.6	1.0	3.6
<i>Festuca valesiaca</i> aggr.	16	2.0	0.1	3.2
<i>Inula britannica</i>	7	0.2	2.2	3.1
<i>Plantago major</i>	7	0.2	2.2	3.1
<i>Limonium caesium</i>	2	0.3	5.0	3.0
<i>Limonium meyeri</i>	3	0.2	5.0	3.0
<i>Salicornia europaea</i> aggr.	12	2.3	0.1	2.8
<i>Bassia sedoides</i>	4	0.3	2.0	2.4
<i>Trifolium repens</i>	3	0.1	8.0	2.4
<i>Halocnemum strobilaceum</i>	2	0.5	2.0	2.0
<i>Limonium delicatulum</i>	2	0.2	5.0	2.0
<i>Limonium suffruticosum</i>	2	0.2	5.0	2.0
<i>Suaeda vera</i>	5	0.2	2.0	2.0
<i>Limbarda crithmoides</i>	2	0.3	3.0	1.8
<i>Petrosimonia oppositifolia</i>	3	0.3	2.0	1.8
<i>Suaeda corniculata</i>	2	0.4	2.0	1.6
				(...)
BF Habitat score				807.6

3.4.6. E7 - Sparsely wooded grasslands

Description: *“Grasslands with a wooded overstorey that normally has less than 10% cover.”*
[Hill, M.O., Moss, D. & Davies, C.E., 2004b]

Vegetation: For the E7 - Sparsely wooded grasslands habitat there is no vegetation composition defined.



Figure 20. E7 - Sparsely wooded grasslands.

3.5. F - Heathland, scrub and tundra

Description: *“Non-coastal land which is dry or only seasonally inundated (with the water table at or above ground level for less than half of the year) with greater than 30% vegetation cover. Tundra is characterised by the presence of permafrost. Heathland and scrub are defined as vegetation dominated by shrubs or dwarf shrubs of species that typically do not exceed 5 m maximum height. Includes shrub orchards, vineyards, hedges (which may have occasional tall trees). Also includes stands of climatically-limited dwarf trees (krummholz) < 3 m high, such as occur in extreme alpine conditions. Includes [Salix] and [Frangula] carrs. Excludes coppice (G5.7) and [Alnus] and [Populus] swamp woodland (G1.4).” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

3.5.1. F1 – Tundra

Description: *“Vegetated land with graminoids, shrubs, mosses or macrolichens overlying permafrost. European tundras are limited to Spitzbergen and northern Russia. Vegetation with the same species also occurs on boreal mountains and in the low arctic remote from the main permafrost region, notably in Fennoscandia and Iceland; these oroboreal and low arctic habitats are listed under alpine and subalpine grassland E4 or arctic, alpine and subalpine scrub F2.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*



Figure 21. F1 – Tundra.

Table 16. List of bee-friendly plant species potentially present at F1 – Tundra. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Vaccinium vitis-idaea</i>	79	3.1	5.6	1371.4
<i>Vaccinium myrtillus</i>	35	5.7	5.9	1183.7
<i>Vaccinium uliginosum</i>	63	2.7	4.3	725.8
<i>Empetrum nigrum</i> aggr.	94	36.4	0.2	684.3
<i>Betula nana</i>	55	4.3	2.0	473.0
<i>Rubus chamaemorus</i>	34	2.0	5.8	391.6
<i>Calluna vulgaris</i>	9	1.0	7.8	70.2
<i>Cassiope tetragona</i>	7	2.5	3.9	68.5
<i>Cornus suecica</i>	28	1.0	2.4	68.5
<i>Salix glauca</i>	13	0.5	6.0	39.0
<i>Rhododendron tomentosum</i>	11	0.9	3.1	30.7
<i>Andromeda polifolia</i>	18	0.4	2.7	19.4
<i>Phyllodoce caerulea</i>	7	0.3	3.9	8.2
<i>Salix reticulata</i>	5	0.2	6.1	6.1
<i>Salix polaris</i>	4	0.2	6.0	4.8
<i>Arctostaphylos alpinus</i>	28	1.5	0.1	4.2
<i>Salix herbacea</i>	6	0.1	6.2	3.7
<i>Petasites frigidus</i>	5	0.1	6.0	3.0
<i>Pedicularis lapponica</i>	18	0.1	1.5	2.7
<i>Salix lanata</i>	4	0.1	6.0	2.4
<i>Salix phylicifolia</i>	4	0.1	6.0	2.4
<i>Salix hastata</i>	3	0.1	6.2	1.9
<i>Salix nummularia</i>	3	0.1	6.0	1.8
<i>Saxifraga oppositifolia</i>	4	0.1	4.2	1.7
<i>Astragalus alpinus</i>	4	0.1	3.2	1.3
<i>Epilobium anagallidifolium</i>	1	0.2	6.1	1.2
<i>Silene acaulis</i>	4	0.1	2.0	0.8
<i>Betula pubescens</i>	3	0.1	2.2	0.7
<i>Thalictrum alpinum</i>	3	0.1	2.0	0.6
<i>Vaccinium microcarpum</i>	2	0.1	2.9	0.6
				(...)
BF Habitat score				5177.2

3.5.2. F2 - Arctic, alpine and subalpine scrub

Description: *“Scrub occurring north of or above the climatic tree limit, but outside the permafrost zone. Scrub occurring close to but below the climatic tree limit, where trees are suppressed either by late-lying snow or by wind or repeated browsing.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*



Figure 22. F2 - Arctic, alpine and subalpine scrub.

Table 17. List of bee-friendly plant species potentially present at F2 - Arctic, alpine and subalpine scrub. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Vaccinium myrtillus</i>	45	8.9	5.9	2376.3
<i>Vaccinium uliginosum</i>	23	4.6	4.3	451.4
<i>Pinus mugo</i> subsp. <i>mugo</i>	18	10.0	2.5	450.0
<i>Calluna vulgaris</i>	14	3.2	7.8	349.4
<i>Vaccinium vitis-idaea</i>	28	1.9	5.6	297.9
<i>Rhododendron ferrugineum</i>	13	2.7	7.0	245.7
<i>Salix herbacea</i>	9	2.9	6.2	161.8
<i>Salix retusa</i>	9	2.2	6.1	120.8
<i>Alnus viridis</i>	9	4.8	2.0	86.4
<i>Rhododendron hirsutum</i>	10	2.0	4.0	80.0
<i>Erica carnea</i>	9	2.0	4.1	73.8
<i>Arctostaphylos uva-ursi</i>	7	1.8	3.9	49.3
<i>Salix reticulata</i>	7	1.0	6.1	42.7
<i>Rubus idaeus</i>	9	0.4	8.8	31.6
<i>Geranium sylvaticum</i> aggr.	10	0.4	5.1	20.4
<i>Adenostyles alliariae</i>	7	0.9	3.0	18.9
<i>Campanula scheuchzeri</i>	15	0.3	4.2	18.9
<i>Solidago virgaurea</i>	13	0.3	4.2	16.4
<i>Thymus praecox</i>	10	0.3	5.1	15.3
<i>Lotus corniculatus</i>	11	0.3	4.6	15.2
<i>Helianthemum nummularium</i>	8	0.4	4.6	14.7
<i>Bruckenthalia spiculifolia</i>	5	0.7	3.9	13.7
<i>Viola biflora</i>	12	0.5	2.1	12.8
<i>Salix appendiculata</i>	5	0.4	6.2	12.4
<i>Anthyllis vulneraria</i>	8	0.3	5.0	12.0
<i>Sorbus aucuparia</i>	11	0.2	5.3	11.7
<i>Hypericum maculatum</i> aggr.	8	0.2	7.1	11.4
<i>Silene acaulis</i>	11	0.5	2.0	11.0
<i>Salix waldsteiniana</i>	3	0.5	6.1	9.1
<i>Sorbus chamaemespilus</i>	7	0.3	4.3	9.1
				(...)
BF Habitat score				5333.9

3.5.3. F3 - Temperate and mediterranean-montane scrub

Description: “*Shrub communities of nemoral affinities. They include deciduous and evergreen scrubs of the nemoral zone, and deciduous scrubs of the submediterranean and supramediterranean zones. Excluded are heathlands with dominant [Ericaceae] F4, and the typically mediterranean maquis F5, garrigue F6 and phrygana F7.*” [Hill, M.O., Moss, D. & Davies, C.E. [edited ETC/BD], 2004a edited 2012]



Figure 23. F3 - Temperate and mediterranean-montane scrub.

Table 18. List of bee-friendly plant species potentially present at F3 - Temperate and mediterranean-montane scrub. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Prunus spinosa</i>	31	9.3	5.7	1643.3
<i>Rubus fruticosus</i> aggr.	24	7.3	6.0	1051.2
<i>Crataegus monogyna</i>	31	5.0	6.4	992.0
<i>Rubus idaeus</i>	14	4.5	8.8	552.3
<i>Corylus avellana</i>	22	8.3	2.5	456.5
<i>Rubus caesius</i>	15	4.7	6.2	437.1
<i>Salix caprea</i>	12	4.8	5.1	293.8
<i>Hedera helix</i> aggr.	16	2.8	4.7	210.6
<i>Cytisus scoparius</i>	10	3.6	5.8	207.0
<i>Cornus sanguinea</i>	20	2.8	3.4	192.3
<i>Rosa canina</i> aggr.	25	1.7	3.2	136.0
<i>Ligustrum vulgare</i>	14	1.8	4.5	112.1
<i>Rubus ulmifolius</i>	11	1.4	5.1	78.5
<i>Sambucus nigra</i>	14	2.3	1.2	38.6
<i>Galium aparine</i>	17	1.0	2.2	37.4
<i>Calluna vulgaris</i>	6	0.7	7.8	32.8
<i>Epilobium angustifolium</i>	8	0.5	7.1	28.4
<i>Glechoma hederacea</i>	8	0.7	5.0	28.0
<i>Cirsium arvense</i>	8	0.4	6.8	21.7
<i>Geranium robertianum</i>	10	0.5	4.2	21.0
<i>Clematis vitalba</i>	10	1.1	1.9	20.5
<i>Fragaria vesca</i>	13	0.6	2.5	19.8
<i>Vaccinium myrtillus</i>	6	0.5	5.9	17.8
<i>Euonymus europaeus</i>	11	0.6	2.6	17.2
<i>Sorbus aucuparia</i>	8	0.4	5.3	17.1
<i>Hypericum perforatum</i>	10	0.3	5.6	16.8
<i>Aegopodium podagraria</i>	5	0.5	6.6	16.5
<i>Betula pendula</i>	9	1.0	1.8	16.5
<i>Dactylis glomerata</i>	17	0.8	1.2	16.3
<i>Pteridium aquilinum</i>	11	1.4	1.0	15.4
				(...)
BF Habitat score				7295.3

3.5.4. F4 - Temperate shrub heathland

Description: “*Shrub communities of nemoral affinities, in which [Ericaceae] are dominant or at least prominent. Such heaths are best developed on acid soils in the Atlantic zone and also in sub-Atlantic Europe.*” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]



Figure 24. F4 - Temperate shrub heathland.

Table 19. List of bee-friendly plant species potentially present at F4 - Temperate shrub heathland. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Calluna vulgaris</i>	79	36.8	7.8	22676.2
<i>Erica tetralix</i>	27	10.1	7.7	2099.8
<i>Vaccinium myrtillus</i>	28	8.0	5.9	1329.1
<i>Vaccinium vitis-idaea</i>	13	1.7	5.6	123.8
<i>Potentilla erecta</i>	33	1.5	1.2	59.4
<i>Genista pilosa</i>	14	2.4	1.6	53.8
<i>Erica vagans</i>	6	2.5	3.5	52.5
<i>Pilosella officinarum</i>	13	0.5	5.1	33.1
<i>Ulex minor</i>	5	1.3	4.0	26.0
<i>Erica cinerea</i>	10	0.5	4.3	21.7
<i>Ulex gallii</i>	4	1.3	4.0	20.8
<i>Lotus corniculatus</i>	9	0.3	4.6	12.4
<i>Galium saxatile</i>	11	0.5	2.2	12.1
<i>Campanula rotundifolia</i>	8	0.2	7.2	11.5
<i>Pteridium aquilinum</i>	11	0.9	1.0	9.9
<i>Cytisus scoparius</i>	6	0.2	5.8	6.9
<i>Pinus sylvestris</i>	16	0.4	1.0	6.4
<i>Erica ciliaris</i>	3	0.7	3.0	6.3
<i>Genista anglica</i>	8	0.7	1.0	5.6
<i>Helianthemum nummularium</i>	5	0.2	4.6	4.6
<i>Sorbus aucuparia</i>	8	0.1	5.3	4.3
<i>Thymus pulegioides</i>	5	0.2	4.2	4.2
<i>Salix repens</i>	4	0.2	5.1	4.1
<i>Teucrium scorodonia</i>	5	0.2	4.1	4.1
<i>Achillea millefolium</i> aggr.	9	0.2	2.2	4.0
<i>Arctostaphylos uva-ursi</i>	2	0.5	3.9	3.9
<i>Rumex acetosella</i>	9	0.2	2.1	3.8
<i>Betula pendula</i>	10	0.2	1.8	3.7
<i>Hypericum perforatum</i>	6	0.1	5.6	3.4
<i>Plantago lanceolata</i>	6	0.2	2.8	3.4
				(...)
BF Habitat score				26725.6

3.5.5. F5 - Maquis, arborescent matorral and thermo-Mediterranean brushes

Description: *“Evergreen sclerophyllous or lauriphyllous shrub vegetation, with a closed or nearly closed canopy structure, having nearly 100% cover of shrubs, with few annuals and some vernal geophytes; trees are nearly always present, some of which may be in shrub form. Shrubs, sometimes tall, of [Arbutus], [Cistus], [Cytisus], [Erica], [Genista], [Lavandula], [Myrtus], [Phillyrea], [Pistacia], [Quercus] and [Spartium] are typical. Included is pseudomaquis, in which the dominants are mixed deciduous and evergreen shrubs.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*



Figure 25. F5 - Maquis, arborescent matorral and thermo-Mediterranean brushes.

Table 20. List of bee-friendly plant species potentially present at F5 - Maquis, arborescent matorral and thermo-Mediterranean brushes. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Buxus sempervirens</i>	21	10.6	4.1	912.7
<i>Erica arborea</i>	27	9.8	2.7	705.6
<i>Arbutus unedo</i>	19	5.3	2.5	251.8
<i>Pistacia lentiscus</i>	35	3.5	2.0	245.0
<i>Spartium junceum</i>	14	4.6	3.2	205.5
<i>Asparagus acutifolius</i>	30	0.9	6.0	162.0
<i>Myrtus communis</i>	17	4.0	2.0	136.0
<i>Rubia peregrina</i>	37	1.4	2.1	110.9
<i>Rhamnus alaternus</i>	17	1.6	4.0	108.8
<i>Euphorbia dendroides</i>	8	2.9	4.0	92.8
<i>Rubus ulmifolius</i>	17	1.0	5.1	86.7
<i>Calicotome villosa</i>	10	2.1	3.2	67.0
<i>Phillyrea latifolia</i>	21	2.9	1.0	60.9
<i>Rosmarinus officinalis</i>	11	1.0	5.0	55.0
<i>Thymus vulgaris</i>	13	0.9	4.4	51.1
<i>Cistus salviifolius</i>	18	1.3	2.0	46.8
<i>Crataegus monogyna</i>	14	0.5	6.4	44.8
<i>Hedera helix</i> aggr.	11	0.8	4.7	41.4
<i>Teucrium chamaedrys</i>	17	0.6	3.1	31.6
<i>Cistus monspeliensis</i>	12	1.2	2.0	28.8
<i>Quercus ilex</i>	20	0.6	2.2	26.0
<i>Phillyrea angustifolia</i>	14	1.7	1.0	23.8
<i>Lonicera implexa</i>	15	0.5	3.0	22.5
<i>Pistacia terebinthus</i>	10	0.9	2.0	18.0
<i>Calluna vulgaris</i>	4	0.5	7.8	15.6
<i>Calicotome spinosa</i>	6	0.8	3.2	15.3
<i>Amelanchier ovalis</i>	11	0.6	2.2	14.5
<i>Prasium majus</i>	11	0.4	2.7	12.1
<i>Cistus creticus</i>	10	0.6	2.0	12.0
<i>Quercus pubescens</i>	12	0.4	2.5	12.0
				(...)
BF Habitat score				4007.0

3.5.6. F6 – Garrigue

Description: “Evergreen sclerophyllous or lauriphyllous shrub vegetation, with an open canopy structure and some bare ground, usually with many winter annuals and vernal geophytes. Low shrubs of [*Cistus*], [*Lavandula*], [*Rosmarinus*] and [*Stoechas*] are usually present, and there may be some larger shrubs and scattered trees. Garrigue is found mostly in the Mediterranean, Macaronesian and Pontic regions, where it typically derives from degradation or regrowth of broad-leaved evergreen forests (G2), but it extends into deciduous forest areas in the supra-Mediterranean zone and sub-Mediterranean zones and into steppe areas in Anatolia. Includes scrubby land with mainly herbaceous vegetation and a large component of unpalatable non-vernal monocots ([*Asphodelus*], [*Urginea*]) and thistles, provided that shrub cover exceeds 10%.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]



Figure 26. F6 – Garrigue.

Table 21. List of bee-friendly plant species potentially present at F6 – Garrigue. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Rosmarinus officinalis</i>	30	6.9	5.0	1035.0
<i>Thymus vulgaris</i>	40	4.4	4.4	768.5
<i>Lavandula latifolia</i>	19	1.1	5.0	104.5
<i>Erica multiflora</i>	11	3.1	3.0	102.3
<i>Dorycnium pentaphyllum</i>	23	1.4	3.0	96.6
<i>Coronilla minima</i>	18	1.5	3.2	86.2
<i>Genista scorpius</i>	27	2.8	1.1	84.7
<i>Teucrium polium</i> aggr.	27	0.9	3.0	72.9
<i>Aphyllanthes monspeliensis</i>	22	1.7	1.6	60.4
<i>Ulex parviflorus</i>	9	1.6	4.0	57.6
<i>Cistus albidus</i>	11	1.7	2.7	49.9
<i>Genista hispanica</i>	9	2.9	1.2	32.2
<i>Staezelina dubia</i>	13	0.8	3.0	31.2
<i>Lavandula angustifolia</i>	6	1.4	3.4	28.8
<i>Helichrysum stoechas</i>	20	0.7	2.0	28.0
<i>Thymra capitata</i>	7	1.4	2.7	26.9
<i>Erica manipuliflora</i>	4	2.1	3.0	25.2
<i>Phlomis fruticosa</i>	5	2.5	2.0	25.0
<i>Linum suffruticosum</i> aggr.	15	0.8	2.0	24.0
<i>Cistus monspeliensis</i>	7	1.7	2.0	23.8
<i>Eryngium campestre</i>	16	0.4	3.2	20.5
<i>Teucrium chamaedrys</i>	13	0.5	3.1	20.2
<i>Pistacia lentiscus</i>	14	0.7	2.0	19.6
<i>Cistus salviifolius</i>	12	0.8	2.0	19.2
<i>Bupleurum fruticescens</i>	12	0.5	3.1	18.6
<i>Pinus halepensis</i>	21	0.5	1.6	16.3
<i>Fumana thymifolia</i>	17	0.8	1.1	15.2
<i>Coris monspeliensis</i>	17	0.5	1.7	14.7
<i>Argyrolobium zanonii</i>	15	0.3	3.2	14.4
<i>Dactylis glomerata</i>	20	0.6	1.2	14.4
				(...)
BF Habitat score				3445.9

3.5.7. F7 - Spiny Mediterranean heaths (phrygana, hedgehog-heaths and related coastal cliff vegetation)

Description: “Shrublands with dominant low spiny shrubs, widespread in Mediterranean and Anatolian regions with a summer-dry climate, occurring from sea level to high altitudes on dry mountains.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]



Figure 27. F7 - Spiny Mediterranean heaths (phrygana, hedgehog-heaths and related coastal cliff vegetation).

Table 22. List of bee-friendly plant species potentially present at F7 - Spiny Mediterranean heaths (phrygana, hedgehog-heaths and related coastal cliff vegetation). Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Sarcopoterium spinosum</i>	19	7.7	3.4	499.8
<i>Astragalus angustifolius</i>	14	3.7	3.2	165.3
<i>Echinopartum horridum</i>	7	4.4	3.2	98.3
<i>Erinacea anthyllis</i>	8	3.1	3.2	79.1
<i>Thymus vulgaris</i>	14	1.0	4.4	61.1
<i>Astracantha rumelica</i>	6	2.9	3.2	55.5
<i>Genista corsica</i>	8	3.7	1.8	53.9
<i>Genista acanthoclada</i>	8	3.3	1.5	39.0
<i>Genista lobelii</i>	7	3.5	1.5	37.1
<i>Thymbra capitata</i>	10	1.1	2.7	30.2
<i>Anthyllis vulneraria</i>	12	0.4	5.0	24.0
<i>Astracantha parnassi</i> subsp. <i>calabricus</i>	4	1.7	3.2	21.7
<i>Astracantha cretica</i>	4	1.6	3.2	20.4
<i>Berberis cretica</i>	5	1.0	4.0	20.0
<i>Teucrium polium</i> aggr.	13	0.5	3.0	19.5
<i>Dactylis glomerata</i>	23	0.7	1.2	19.3
<i>Helianthemum nummularium</i>	8	0.5	4.6	18.4
<i>Echinopartum lusitanicum</i>	3	1.9	3.2	18.2
<i>Thymus longicaulis</i>	7	1.0	2.4	16.9
<i>Eryngium amethystinum</i>	8	0.5	4.0	16.0
<i>Euphorbia acanthothamnus</i>	4	1.0	4.0	16.0
<i>Daphne oleoides</i>	11	0.5	2.8	15.1
<i>Helichrysum italicum</i>	9	0.8	2.0	14.4
<i>Buxus sempervirens</i>	7	0.5	4.1	14.3
<i>Marrubium velutinum</i>	7	0.6	3.0	12.6
<i>Rosmarinus officinalis</i>	4	0.6	5.0	12.0
<i>Cistus salviifolius</i>	7	0.8	2.0	11.2
<i>Jasione montana</i>	7	0.2	7.3	10.3
<i>Teucrium chamaedrys</i>	11	0.3	3.1	10.2
<i>Clinopodium alpinum</i>	11	0.3	2.9	9.7
				(...)
BF Habitat score				1828.3

3.5.8. F8 - Thermo-Atlantic xerophytic scrub

Description: “Xerophytic scrub formations of the lower slopes of the Canary Islands and Madeira, rich in succulents, in particular cactiform or dendroid spurges [*Euphorbia*] spp., rosette-forming [*Aeonium*] spp. and composites.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]



Figure 28. F8 - Thermo-Atlantic xerophytic scrub.

Table 23. List of bee-friendly plant species potentially present at F8 - Thermo-Atlantic xerophytic scrub. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Euphorbia balsamifera</i>	40	18.7	4.0	2992.0
<i>Euphorbia canariensis</i>	26	7.0	4.0	728.0
<i>Euphorbia regis-jubae</i>	37	4.9	4.0	725.2
<i>Kleinia neriifolia</i>	50	4.5	3.0	675.0
<i>Plocama pendula</i>	28	4.4	2.1	263.9
<i>Rubia fruticosa</i>	40	2.5	2.1	214.2
<i>Schizogyne sericea</i>	24	2.8	3.0	201.6
<i>Launaea arborescens</i>	29	1.8	3.0	156.6
<i>Lycium intricatum</i>	20	1.9	2.3	89.1
<i>Periploca angustifolia</i>	24	1.5	2.0	72.0
<i>Euphorbia aphylla</i>	7	2.3	4.0	64.4
<i>Helianthemum canariense</i>	16	3.1	1.0	49.6
<i>Echium nervosum</i>	11	0.7	5.8	44.9
<i>Lavandula canariensis</i>	12	0.6	5.0	36.0
<i>Globularia salicina</i>	14	1.2	2.0	33.6
<i>Helichrysum melaleucum</i>	12	1.3	2.0	31.2
<i>Sonchus leptocephalus</i>	8	0.9	3.3	23.6
<i>Suaeda vera</i>	9	1.2	2.0	21.6
<i>Bituminaria bituminosa</i>	16	0.4	3.2	20.4
<i>Scilla haemorrhoidalis</i>	13	0.5	3.0	19.5
<i>Hypericum canariense</i>	4	1.2	4.0	19.2
<i>Maytenus umbellata</i>	9	0.8	2.5	18.0
<i>Argyranthemum frutescens</i>	13	0.4	3.0	15.6
<i>Rumex lunaria</i>	11	0.7	2.0	15.4
<i>Euphorbia terracina</i>	8	0.4	4.0	12.8
<i>Aeonium glandulosum</i>	13	0.4	2.2	11.3
<i>Retama raetam</i>	5	0.7	3.0	10.5
<i>Micromeria varia</i>	9	0.4	2.7	9.9
<i>Asparagus umbellatus</i>	8	0.2	6.0	9.6
<i>Ceropegia fusca</i>	11	0.4	2.0	8.8
				(...)
BF Habitat score				6738.2

3.5.9. F9 - Riverine and fen scrubs

Description: *“Riversides, lakesides, fens and marshy floodplains dominated by woody vegetation less than 5 m high.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*



Figure 29. F9 - Riverine and fen scrubs.

Table 24. List of bee-friendly plant species potentially present at F9 - Riverine and fen scrubs. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Salix cinerea</i> subsp. <i>cinerea</i>	31	17.1	5.2	2756.5
<i>Salix purpurea</i>	18	5.8	6.2	647.3
<i>Salix triandra</i>	12	4.1	6.2	305.0
<i>Salix repens</i>	12	4.4	5.1	269.3
<i>Salix eleagnos</i>	9	3.4	6.1	186.7
<i>Salix aurita</i>	8	2.3	9.1	167.4
<i>Frangula alnus</i>	15	2.7	4.1	166.0
<i>Salix cinerea</i> subsp. <i>oleifolia</i>	8	3.1	5.2	129.0
<i>Salix viminalis</i>	7	2.5	6.2	108.5
<i>Myrica gale</i>	12	5.2	1.5	93.6
<i>Rubus caesius</i>	14	1.0	6.2	86.8
<i>Solanum dulcamara</i>	18	0.7	6.2	78.1
<i>Filipendula ulmaria</i>	13	1.0	5.4	70.6
<i>Lythrum salicaria</i>	15	0.4	8.3	50.1
<i>Hippophae rhamnoides</i>	6	3.3	2.0	39.6
<i>Lysimachia vulgaris</i>	21	0.8	2.2	37.0
<i>Calluna vulgaris</i>	6	0.7	7.8	32.8
<i>Galium palustre</i> aggr.	20	0.7	2.2	30.8
<i>Caltha palustris</i>	8	0.5	7.4	29.7
<i>Erica tetralix</i>	6	0.6	7.7	27.7
<i>Rubus fruticosus</i> aggr.	7	0.6	6.0	25.2
<i>Ranunculus repens</i>	14	0.5	3.1	21.7
<i>Mentha aquatica</i>	9	0.5	4.8	21.4
<i>Galium aparine</i>	12	0.7	2.2	18.5
<i>Angelica sylvestris</i>	11	0.4	4.1	18.0
<i>Glechoma hederacea</i>	7	0.5	5.0	17.5
<i>Calystegia sepium</i>	11	0.5	3.0	16.5
<i>Lycopus europaeus</i>	15	0.4	2.1	12.6
<i>Salix salviifolia</i>	3	0.7	6.0	12.6
<i>Cirsium palustre</i>	10	0.2	5.8	11.5
				(...)
BF Habitat score				5795.9

3.5.10. FB - Shrub plantations

Description: *“Plantations of dwarf trees, shrubs, espaliers or perennial woody climbers, mostly cultivated for fruit or flower production, either intended to have permanent cover of woody plants when mature, or else for wood or small tree production with a regular whole-plant harvesting regime.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*

Vegetation: For the FB - Shrub plantations habitat there is no vegetation composition defined.



Figure 30. FB - Shrub plantations.

3.6.G - Woodland, forest and other wooded land

Description: *“Woodland and recently cleared or burnt land where the dominant vegetation is, or was until very recently, trees with a canopy cover of at least 10%. Trees are defined as woody plants, typically single-stemmed, that can reach a height of 5 m at maturity unless stunted by poor climate or soil. Includes lines of trees, coppices, regularly tilled tree nurseries, tree-crop plantations and fruit and nut tree orchards. Includes [Alnus] and [Populus] swamp woodland and riverine [Salix] woodland. Excludes [Corylus avellana] scrub and [Salix] and [Frangula] carrs. Excludes stands of climatically-limited dwarf trees (krummholz) < 3m high, such as occur at the arctic or alpine tree limit. Excludes parkland and dehesa with canopy less than 10%, which are listed under sparsely wooded grasslands E7.” [ILE SAS, 2005]*

3.6.1. G1 - Broadleaved deciduous woodland

Description: *“Woodland, forest and plantations dominated by summer-green non-coniferous trees that lose their leaves in winter. Includes woodland with mixed evergreen and deciduous broadleaved trees, provided that the deciduous cover exceeds that of evergreens. Excludes mixed forests (G4) where the proportion of conifers exceeds 25%.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*



Figure 31. G1 - Broadleaved deciduous woodland.

Table 25. List of bee-friendly plant species potentially present at G1 - Broadleaved deciduous woodland. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Fagus sylvatica</i>	39	17.1	3.0	2000.7
<i>Hedera helix</i> aggr.	35	6.8	4.7	1118.6
<i>Rubus fruticosus</i> aggr.	33	5.1	6.0	1009.8
<i>Quercus robur</i>	30	9.5	1.8	522.5
<i>Acer pseudoplatanus</i>	21	2.8	8.8	520.4
<i>Crataegus monogyna</i>	29	2.1	6.4	389.8
<i>Corylus avellana</i>	33	4.6	2.5	379.5
<i>Fraxinus excelsior</i>	32	6.4	1.8	358.4
<i>Carpinus betulus</i>	26	6.4	2.0	332.8
<i>Quercus petraea</i>	22	8.0	1.8	322.7
<i>Alnus glutinosa</i>	14	6.1	2.5	213.5
<i>Anemone nemorosa</i>	16	1.9	5.1	155.0
<i>Castanea sativa</i>	10	2.7	5.6	151.2
<i>Acer campestre</i>	19	1.5	5.1	145.3
<i>Ligustrum vulgare</i>	15	1.5	4.5	100.1
<i>Vaccinium myrtillus</i>	11	1.5	5.9	97.9
<i>Tilia cordata</i>	8	1.3	8.3	86.0
<i>Prunus avium</i>	15	0.6	9.2	82.4
<i>Quercus pubescens</i>	9	3.6	2.5	81.0
<i>Aegopodium podagraria</i>	11	1.1	6.6	79.9
<i>Cornus sanguinea</i>	17	1.3	3.4	75.9
<i>Prunus spinosa</i>	12	1.1	5.7	75.2
<i>Lamium galeobdolon</i>	20	1.8	2.0	72.0
<i>Lonicera periclymenum</i>	16	1.5	3.0	72.0
<i>Sorbus aucuparia</i>	18	0.6	5.3	57.6
<i>Mercurialis perennis</i>	14	1.8	2.2	54.4
<i>Geranium robertianum</i>	17	0.7	4.2	50.0
<i>Galium odoratum</i>	16	1.4	2.2	49.3
<i>Rubus idaeus</i>	11	0.5	8.8	48.2
<i>Ilex aquifolium</i>	12	0.9	4.2	45.4
				(...)
BF Habitat score				10054.6

3.6.2. G2 - Broadleaved evergreen woodland

Description: *“Temperate forests dominated by broad-leaved sclerophyllous or lauriphyllous evergreen trees, or by palms. They are characteristic of the Mediterranean and warm-temperate humid zones.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*

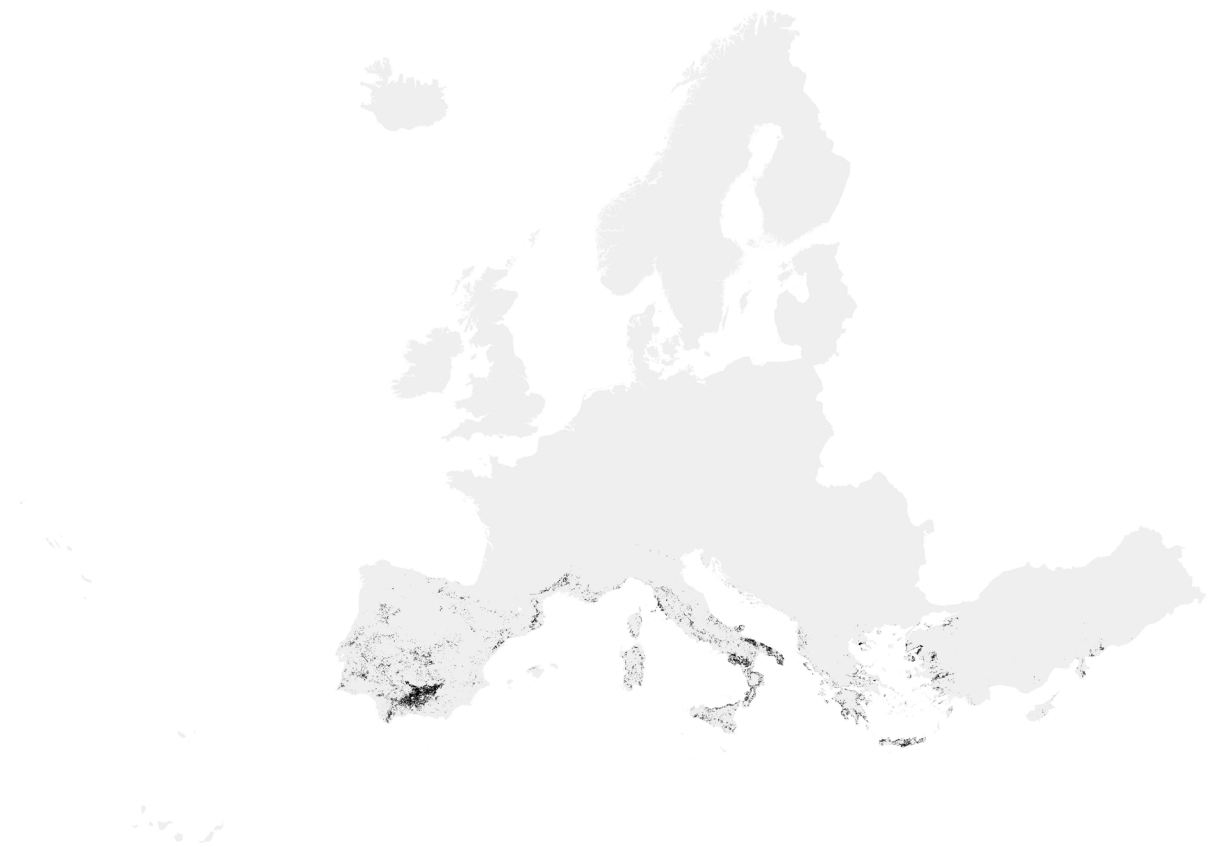


Figure 32. G2 - Broadleaved evergreen woodland.

Table 26. List of bee-friendly plant species potentially present at G2 - Broadleaved evergreen woodland. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Quercus ilex</i>	49	29.7	2.2	3153.1
<i>Quercus rotundifolia</i>	20	12.4	3.5	868.0
<i>Hedera helix</i> aggr.	32	4.4	4.7	661.8
<i>Pistacia lentiscus</i>	31	8.5	2.0	527.0
<i>Rubia peregrina</i>	60	3.1	2.1	398.4
<i>Asparagus acutifolius</i>	39	1.5	6.0	351.0
<i>Quercus coccifera</i>	20	5.1	2.2	221.0
<i>Erica arborea</i>	23	3.4	2.7	208.5
<i>Quercus suber</i>	13	6.3	2.5	204.7
<i>Arbutus unedo</i>	26	3.1	2.5	201.5
<i>Ruscus aculeatus</i>	34	2.9	1.6	159.2
<i>Rubus ulmifolius</i>	21	1.4	5.1	149.9
<i>Buxus sempervirens</i>	10	3.5	4.1	143.5
<i>Crataegus monogyna</i>	23	0.9	6.4	132.5
<i>Phillyrea latifolia</i>	32	3.0	1.0	96.0
<i>Rhamnus alaternus</i>	20	1.2	4.0	96.0
<i>Ilex aquifolium</i>	7	3.0	4.2	88.2
<i>Viburnum tinus</i>	14	1.9	3.0	79.8
<i>Quercus pubescens</i>	21	1.5	2.5	78.8
<i>Fraxinus ornus</i>	14	1.2	4.2	70.6
<i>Lonicera implexa</i>	20	0.8	3.0	48.0
<i>Teucrium chamaedrys</i>	16	0.7	3.1	34.7
<i>Thymus vulgaris</i>	11	0.7	4.4	33.6
<i>Cistus salviifolius</i>	15	1.0	2.0	30.0
<i>Rubus fruticosus</i> aggr.	7	0.6	6.0	25.2
<i>Rosmarinus officinalis</i>	7	0.7	5.0	24.5
<i>Daphne gnidium</i>	15	0.5	3.0	22.5
<i>Myrtus communis</i>	11	1.0	2.0	22.0
<i>Prunus spinosa</i>	9	0.4	5.7	20.5
<i>Pistacia terebinthus</i>	14	0.7	2.0	19.6
				(...)
BF Habitat score				8682.0

3.6.3. G3 - Coniferous woodland

Description: “Woodland, forest and plantations dominated by coniferous trees, mainly evergreen (*[Abies]*, *[Cedrus]*, *[Picea]*, *[Pinus]*, *[Taxus]*, *Cupressaceae*) but also deciduous *[Larix]*. Excludes mixed forests (G4) where the proportion of broadleaved trees exceeds 25%.”
[Hill, M.O., Moss, D. & Davies, C.E., 2004b]



Figure 33. G3 - Coniferous woodland.

Table 27. List of bee-friendly plant species potentially present at G3 - Coniferous woodland. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Picea abies</i>	59	19.0	2.0	2242.0
<i>Vaccinium myrtillus</i>	56	6.7	5.9	2226.2
<i>Pinus sylvestris</i>	51	19.7	1.0	1004.7
<i>Vaccinium vitis-idaea</i>	40	1.9	5.6	425.6
<i>Calluna vulgaris</i>	24	1.7	7.8	318.2
<i>Rubus fruticosus</i> aggr.	18	2.8	6.0	302.4
<i>Sorbus aucuparia</i>	43	1.0	5.3	229.3
<i>Rubus idaeus</i>	19	0.9	8.8	149.9
<i>Fagus sylvatica</i>	19	2.0	3.0	114.0
<i>Abies alba</i>	17	6.7	0.5	57.0
<i>Hedera helix</i> aggr.	8	1.3	4.7	48.9
<i>Pteridium aquilinum</i>	14	2.6	1.0	36.4
<i>Vaccinium uliginosum</i>	14	0.6	4.3	35.8
<i>Acer pseudoplatanus</i>	10	0.4	8.8	35.4
<i>Corylus avellana</i>	13	1.0	2.5	32.5
<i>Betula pendula</i>	20	0.8	1.8	29.3
<i>Frangula alnus</i>	14	0.5	4.1	28.7
<i>Betula pubescens</i>	27	0.4	2.2	23.4
<i>Solidago virgaurea</i>	18	0.3	4.2	22.7
<i>Pinus nigra</i>	4	2.2	2.5	22.0
<i>Fragaria vesca</i>	14	0.6	2.5	21.3
<i>Pinus pinaster</i>	5	2.7	1.6	20.9
<i>Quercus robur</i>	14	0.8	1.8	20.5
<i>Crataegus monogyna</i>	6	0.4	6.4	15.4
<i>Hieracium murorum</i>	13	0.5	2.2	14.3
<i>Pseudotsuga menziesii</i>	4	2.3	1.6	14.3
<i>Ulex europaeus</i>	3	0.5	7.0	10.5
<i>Rubus saxatilis</i>	9	0.2	5.5	10.0
<i>Cytisus scoparius</i>	4	0.4	5.8	9.2
<i>Sorbus aria</i> aggr.	7	0.3	4.2	8.8
				(...)
BF Habitat score				7877.7

3.6.4. G4 - Mixed deciduous and coniferous woodland

Description: *“Forest and woodland of mixed broad-leaved deciduous or evergreen and coniferous trees of the nemoral, boreal, warm-temperate humid and mediterranean zones. They are mostly characteristic of the boreonemoral transition zone between taiga and temperate lowland deciduous forests, and of the montane level of the major mountain ranges to the south. Neither coniferous, nor broadleaved species account for more than 75% of the crown cover. Deciduous forests with an understorey of conifers or with a small admixture of conifers in the dominant layer are included in unit G1. Conifer forests with an understorey of deciduous trees or with a small admixture of deciduous trees in the dominant layer are included in unit G3.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*

Vegetation: These habitats are not defined in terms of vegetation composition due to its complexity at European scale. Currently, the classification of mixed woodland is being revised, and the new revisions of the habitat types may exclude this class, being its areas reclassified as G1, G2 or G3, dependently on the dominant tree cover.



Figure 34. G4 - Mixed deciduous and coniferous woodland.

3.6.5. G5 - Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice

Description: *“Stands of trees greater than 5 m in height or with the potential to achieve this height, either in more or less continuous narrow strips or in small (less than about 0.5 ha) plantations or small (less than about 0.5 ha) intensively-managed woods. Woodland and coppice that is temporarily in a successional or non-woodland stage but which can be expected to develop into woodland in the future. Excludes parkland (E7.1, E7.2).” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

Vegetation: The G5 - Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice habitat is not defined in terms of vegetation composition due to its variability and occurrence as small patches at the European scale, which makes it difficult to obtain robust data on these areas.

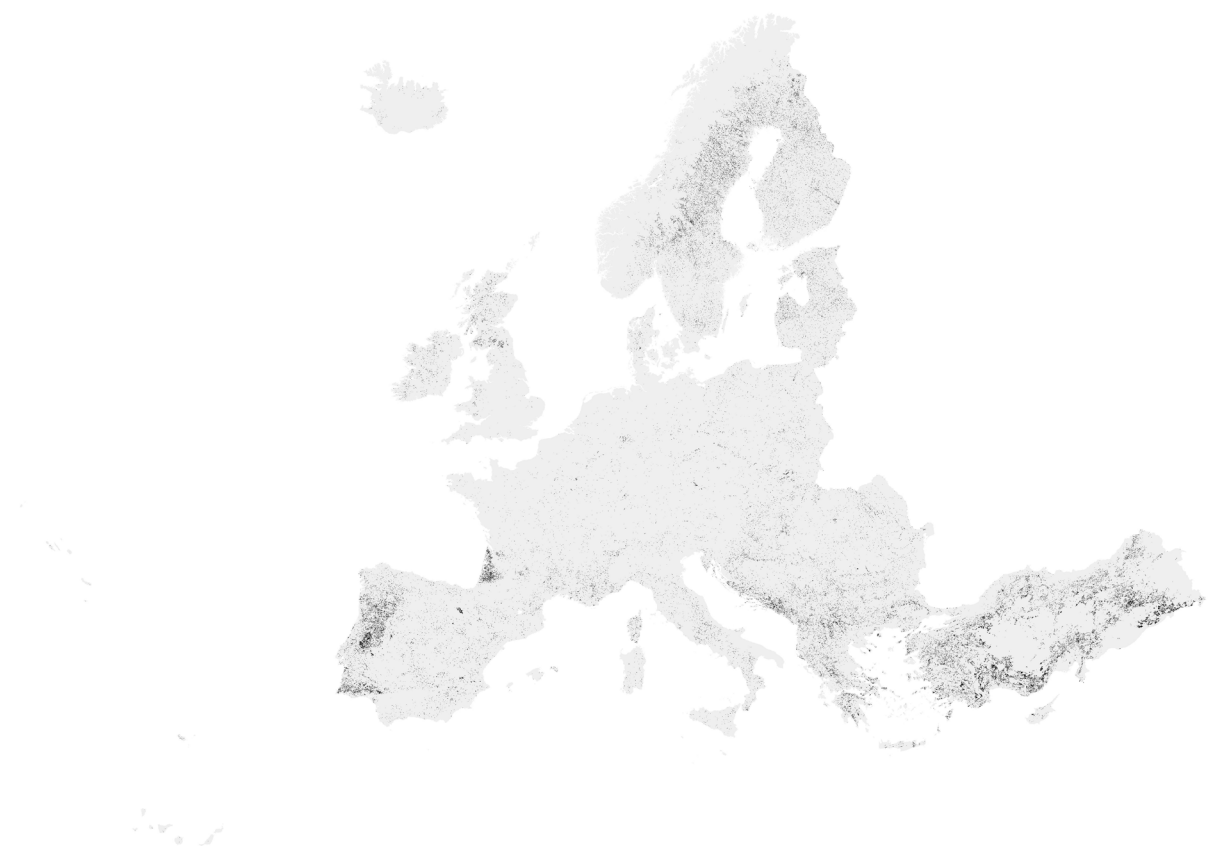


Figure 35. G5 - Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice.

3.7.H - Inland unvegetated or sparsely vegetated habitats

Description: *“Non-coastal habitats with less than 30% vegetation cover (other than in crevices of rocks, scree or cliffs) which are dry or only seasonally wet (with the water table at or above ground level for less than half of the year). Subterranean non-marine caves and passages including underground waters and disused underground mines. Habitats characterised by the presence of permanent snow and surface ice other than marine ice bodies.” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

Vegetation: The EUNIS Level 1 H - Inland unvegetated or sparsely vegetated habitats - Inland surface waters habitats, and its sublevels habitats, are habitats characterized to be unvegetated habitats or habitats with low vegetation cover. For this reason, there is no vegetation composition defined for these habitats.

3.7.1. H2 – Screees

Description: *“Accumulations of boulders, stones, rock fragments, pebbles, gravels or finer material, of non-aeolian depositional origin, unvegetated, occupied by lichens or mosses, or colonized by sparse herbs or shrubs. Included are screees and scree slopes produced by slope processes, moraines and drumlins originating from glacial deposition, sandar, eskers and kames resulting from fluvio-glacial deposition, block slopes, block streams and block fields constructed by periglacial depositional processes of downslope mass movement, ancient beach deposits constituted by former coastal constructional processes. Deposits originating from aeolian depositional processes (dunes) or from eruptive volcanic activity are not included; they are included in H5 and H6 respectively. High mountain, boreal and mediterranean unstable screees are colonized by highly specialised plant communities. They or their constituting species may also inhabit moraines and other depositional debris accumulations in the same areas. A very few communities form in lowland areas elsewhere.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*

Vegetation: For the H2 – Screees habitat, there is no vegetation composition defined.



Figure 36. H2 – Screees.

3.7.2. H3 - Inland cliffs, rock pavements and outcrops

Description: *“Unvegetated, sparsely vegetated, and bryophyte- or lichen-vegetated cliffs, rock faces and rock pavements, not presently adjacent to the sea, and not resulting from recent volcanic activity. Parts of seacliffs free from the influence of wave or wind transported marine salt are included. Rock accumulations resulting from depositional processes are excluded and listed under H2 or H5.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*

Vegetation: For the H3 - Inland cliffs, rock pavements and outcrops habitat, there is no vegetation composition defined.



Figure 37. H3 - Inland cliffs, rock pavements and outcrops.

3.7.3. H4 - Snow or ice-dominated habitats

Description: *“High mountain zones and high latitude land masses occupied by glaciers or by perennial snow. They may be inhabited by algae and invertebrates.” [Devillers, P., Devillers-Terschuren, J. and Vander Linden, C., 2001]*

Vegetation: For the H4 - Snow or ice-dominated habitats there is no vegetation composition defined.



Figure 38. H4 - Snow or ice-dominated habitats.

3.7.4. H5 - Miscellaneous inland habitats with very sparse or no vegetation

Description: *“Miscellaneous bare habitats, including glacial moraines, freeze-thaw features, inland sand dunes, burnt ground and trampled areas. Vegetation, if present, is dominated by algae, lichens or bryophytes, with vascular plants absent or very sparse.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*

Vegetation: For the H5 - Miscellaneous inland habitats with very sparse or no vegetation habitats there is no vegetation composition defined.



Figure 39. H5 - Miscellaneous inland habitats with very sparse or no vegetation.

3.8.1 - Arable land and market gardens

Description: *“Habitats maintained solely by frequent tilling or arising from recent abandonment of previously tilled ground such as arable land and gardens. Includes tilled ground subject to inundation. Excludes lawns and sports fields (E2.6), shrub orchards (FB), tree nurseries (G5.7) and tree-crop plantations (G3.F etc.).” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

3.8.1. I1 - Arable land and market gardens

Description: *“Croplands planted for annually or regularly harvested crops other than those that carry trees or shrubs. They include fields of cereals, of sunflowers and other oil seed plants, of beets, legumes, fodder, potatoes and other forbs. Croplands comprise intensively cultivated fields as well as traditionally and extensively cultivated crops with little or no chemical fertilisation or pesticide application. Faunal and floral quality and diversity depend on the intensity of agricultural use and on the presence of borders of natural vegetation between fields.” [Hill, M.O., Moss, D. & Davies, C.E., 2004a]*



Figure 40. I1 - Arable land and market gardens.

Table 28. List of bee-friendly plant species potentially present at I1 - Arable land and market gardens. Occurrence is the percentage occurrence frequency, Average cover is the average cover of the plant species in the habitat, BF Value is the bee-friendliness value, BF Index is the bee-friendliness index, BF Habitat score is the bee-friendliness habitat score. For further details, see methodology (section 2).

Species	Occurrence	Average cover	BF Value	BF Index
<i>Stellaria media</i>	45	3.3	4.2	623.7
<i>Cirsium arvense</i>	42	1.6	6.8	454.7
<i>Convolvulus arvensis</i>	42	1.9	4.1	327.2
<i>Capsella bursa-pastoris</i>	43	1.6	4.2	289.0
<i>Polygonum aviculare</i> aggr.	44	1.8	2.2	174.2
<i>Cyanus segetum</i>	25	1.3	5.1	165.8
<i>Viola arvensis</i>	41	1.6	2.2	141.2
<i>Papaver rhoeas</i>	25	1.6	3.5	140.0
<i>Veronica persica</i>	26	1.2	3.6	112.3
<i>Fallopia convolvulus</i>	45	1.8	1.2	97.2
<i>Solanum tuberosum</i>	6	2.6	5.5	85.5
<i>Sinapis arvensis</i>	17	0.8	6.2	84.3
<i>Taraxacum</i> sect. <i>Taraxacum</i>	20	0.6	7.0	84.0
<i>Vicia sativa</i>	23	0.7	4.3	69.8
<i>Tripleurospermum maritimum</i> aggr.	31	1.9	1.1	64.8
<i>Raphanus raphanistrum</i>	16	0.7	5.5	61.0
<i>Persicaria lapathifolia</i>	21	1.3	2.2	60.1
<i>Myosotis arvensis</i>	26	0.8	2.8	58.9
<i>Galium aparine</i>	23	1.0	2.2	50.6
<i>Spergula arvensis</i>	16	0.8	3.2	41.0
<i>Sonchus arvensis</i>	16	0.6	4.2	40.3
<i>Mentha arvensis</i>	13	0.5	5.8	37.4
<i>Galinsoga parviflora</i>	11	1.5	2.2	36.3
<i>Lamium purpureum</i>	18	0.6	3.1	33.5
<i>Persicaria maculosa</i>	18	0.8	2.2	31.7
<i>Anthemis arvensis</i>	16	0.8	2.2	28.2
<i>Veronica arvensis</i>	21	0.6	2.2	27.7
<i>Euphorbia helioscopia</i>	16	0.4	4.2	26.9
<i>Trifolium repens</i>	11	0.3	8.0	26.2
<i>Galeopsis tetrahit</i> aggr.	15	0.8	2.1	25.2
				(...)
BF Habitat score				4108.6

3.8.2. I2 - Cultivated areas of gardens and parks

Description: *“Cultivated areas of small-scale and large-scale gardens, including kitchen gardens, ornamental gardens and small parks in city squares. Excludes allotment gardens (I1.2).” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

Vegetation: For the I2 - Cultivated areas of gardens and parks habitats there is no vegetation composition defined.



Figure 41. I2 - Cultivated areas of gardens and parks.

3.9. J - constructed, industrial and other artificial habitats

Description: *“Primarily human settlements, buildings, industrial developments, the transport network, waste dump sites. Includes highly artificial saline and non-saline waters with wholly constructed beds or heavily contaminated water (such as industrial lagoons and saltworks) which are virtually devoid of plant and animal life. Excludes disused underground mines (H1.7).” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

Vegetation: The EUNIS Level 1 J - constructed, industrial and other artificial habitats and its sublevels habitats, are urban habitats characterized to be unvegetated or habitats with a very low vegetation cover. For this reason, for these habitats there is no vegetation composition defined.

3.9.1. J1 - Buildings of cities, towns and villages

Description: *"Buildings in built-up areas where buildings, roads and other impermeable surfaces occupy at least 30% of the land. Includes agricultural building complexes where the built area exceeds 1 ha."* [Hill, M.O., Moss, D. & Davies, C.E., 2004b]

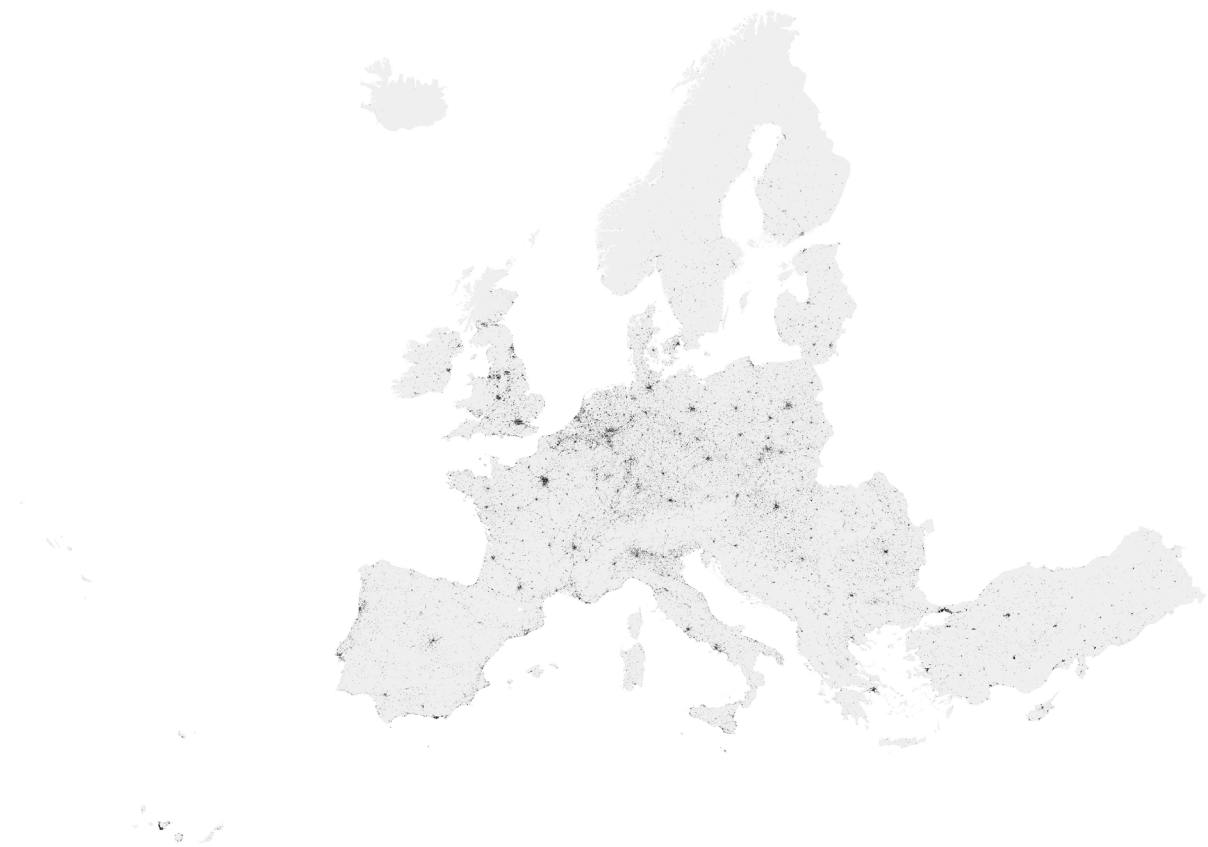


Figure 42. J1 - Buildings of cities, towns and villages.

Vegetation: For the J1 - Buildings of cities, towns and villages habitats there is no vegetation composition defined.

3.9.2. J2 - Low density buildings

Description: *“Buildings in rural and built-up areas where buildings, roads and other impermeable surfaces are at a low density, typically occupying less than 30% of the ground. Excludes agricultural building complexes where the built area exceeds 1 ha (J1.4).” [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

Vegetation: For the J2 - Low density buildings habitats there is no vegetation composition defined.



Figure 43. J2 - Low density buildings.

3.9.3. J3 - Extractive industrial sites

Description: *"Sites in which minerals are extracted. Includes quarries, open-cast mines and active underground mines. Excludes disused underground mines (H1.7)." [Hill, M.O., Moss, D. & Davies, C.E., 2004b]*

Vegetation: For the J3 - Extractive industrial sites habitats there is no vegetation composition defined.



Figure 44. J3 - Extractive industrial sites.

3.9.4. J4 - Transport networks and other constructed hard-surfaced areas

Description: *"Includes roads, car parks, railways, paved footpaths and hard-surfaced areas of airports, water ports and recreational areas."* [Hill, M.O., Moss, D. & Davies, C.E., 2004b]

Vegetation: For the J4 - Transport networks and other constructed hard-surfaced areas habitats there is no vegetation composition defined.



Figure 45. J4 - Transport networks and other constructed hard-surfaced areas.

3.9.5. J5 - Highly artificial man-made waters and associated structures

Description: *"Inland artificial waterbodies with wholly-constructed beds or heavily contaminated water, and their associated conduits and containers. Includes saltworks by the coast. Excludes man-made but semi-natural waterbodies (C1, C2, C3)."* [Hill, M.O., Moss, D. & Davies, C.E., 2004b]

Vegetation: For the J5 - Highly artificial man-made waters and associated structures habitats there is no vegetation composition defined.



Figure 46. J5 - Highly artificial man-made waters and associated structures.

3.9.6. J6 - Waste deposits

Description: *"Tips, landfill sites and slurries produced as byproducts, usually unwanted, of human activity."* [Hill, M.O., Moss, D. & Davies, C.E., 2004b]

Vegetation: For the J6 - Waste deposits habitats there is no vegetation composition defined.



Figure 47. J6 - Waste deposits.

3.10. Summary of bee-friendliness habitat scores for EUNIS terrestrial Level 2 habitats

An overview of the bee-friendliness habitat score for EUNIS terrestrial Level 2 habitats is shown in Table 28 and Figure 48.

These BF Habitat scores cannot be interpreted as an overall index of suitability of the habitats for honey bees since they only reflect the potential bee-friendliness in terms of food resources, and do not take into account any intrinsic characteristics of the habitat or other environmental variables (e.g. temperature, rain, wind, solar radiation). A more detailed approach, considering other variables, will be developed for the landscape suitability maps (WP3, sub-task 3.4.2).

Table 29. Bee-friendliness habitat score (BF Habitat score) for the main EUNIS terrestrial Level 2 habitat with vegetation composition defined. For further details see methodology (section 2).

EUNIS - Level 2	BF Habitat score
F4 - Temperate shrub heathland	26725.6
D3 - Aapa, palsa and polygon mires	13537.4
G1 - Broadleaved deciduous woodland	10054.6
G2 - Broadleaved evergreen woodland	8682.0
D1 - Raised and blanket bogs	8618.8
G3 - Coniferous woodland	7877.7
F3 - Temperate and mediterranean-montane scrub	7295.3
E2 - Mesic grasslands	7084.2
F8 - Thermo-Atlantic xerophytic scrub	6738.2
F9 - Riverine and fen scrubs	5795.9
F2 - Arctic, alpine and subalpine scrub	5333.9
F1 - Tundra	5177.2
I1 - Arable land and market gardens	4108.6
F5 - Maquis, arborescent matorral and thermo-Mediterranean brushes	4007.0
F6 - Garrigue	3445.9
E3 - Seasonally wet and wet grasslands	2587.0
B2 - Coastal shingle	1892.3
B3 - Rock cliffs, ledges and shores, including the supralittoral	1836.8
F7 - Spiny Mediterranean heaths	1828.3
E1 - Dry grasslands	1460.3
D5 - Sedge and reedbeds, normally without free-standing water	901.5
D2 - Valley mires, poor fens and transition mires	880.3
E6 - Inland salt steppes	807.6
E4 - Alpine and subalpine grasslands	721.9
B1 - Coastal dunes and sandy shores	644.9
D4 - Base-rich fens and calcareous spring mires	597.1

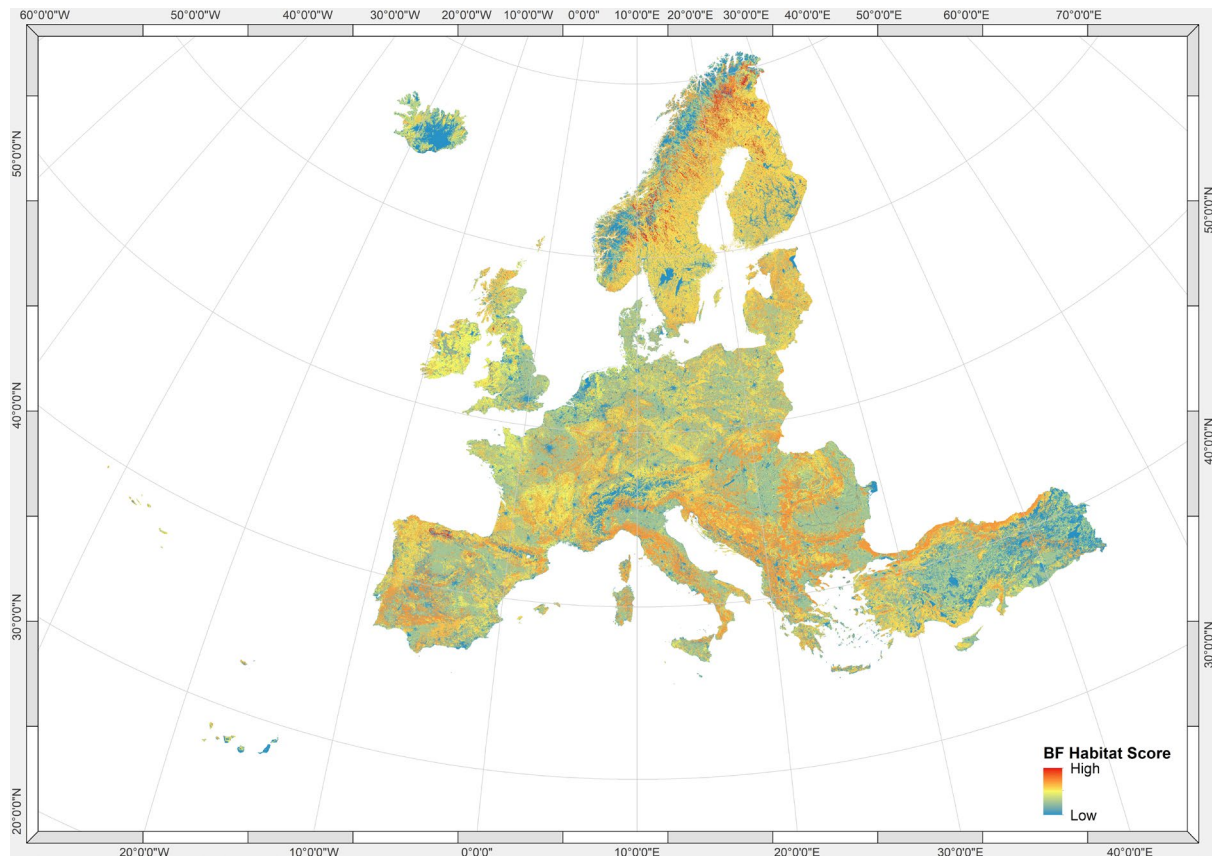


Figure 48. Map of bee-friendliness habitat score (BF Habitat Score) of EUNIS terrestrial Level 2 habitats. *BF Habitat Score of the EUNIS Level 1 habitats C, H and J was defined to be equal to zero. BF Habitat Score of the EUNIS Level 2 habitat D6 was defined to be equal to zero. BF Habitat Score of the EUNIS Level 2 habitat E7 was defined to be the average of EUNIS Level 1 habitat E. BF Habitat Score of the EUNIS Level 2 habitat FB was defined to be the average of EUNIS Level 1 habitat F. BF Habitat Score of the EUNIS Level 2 habitat G4 was defined to be the average of EUNIS Level 2 habitats G1, G2 and G3. BF Habitat Score of the EUNIS Level 2 habitat G5 was defined to be the average of EUNIS Level 1 habitat G. BF Habitat Score of the EUNIS Level 2 habitat I2 was defined to be half the average of EUNIS Level 1 habitat I.*

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