| **European Red List of Habitats Table** | |
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| **Habitat Type Name** | **Habitat Description** |
| A2.5a Arctic coastal salt marsh | This habitat comprises the coastal salt marshes from the Arctic Sea, in Europe found in estuaries and fjords along the north coast of Iceland, Norway and Russia, and besides on acrtic islands like Svalbard and Nova Zembla. Several salt-marsh species of the Atlantic coastal marshes do not reach this region, while other, typical arctic species are mainly restricted to it and only incidentally are found more southwards. The distinction between the Arctic region and the Northern Atlantic region is – of course – gradual, but for the salt marshes the presence of the alliances *Puccinellion phryganodes* (in lower salt-marsh belts) and *Caricion glareosae* (in higher belts) is a good indicator for the Arctic region. For the distinction between Atlantic and Arctic salt marshes we follow the boundaries and divisions given by Dijkema et al. (1984) for maritime plants (situated roughly between the 65 and 70°N latitudinal line). According to this definition the habitat type does not occur in the European Union, but within the EU28+ arctic salt marshes are found on the north-coast of Norway, the north-coast of Iceland, the Svalbard archipelago and Jan Mayen island. Besides the characteristic species of the mentioned alliances, *Puccinellia phryganodes* and *Carex glareosa*, other typical species of these arctic salt marshes are *Potentilla anserina* ssp*. egedii*, *Stellaria humifusa*, *Gentianella detonsa, Carex salina*, *Carex ursina*, *Carex subspathacea* and – in muddy places –the “Ice-Sea glasswort” *Salicornia pojarkova*. The habitat has several species in common with the Atlantic salt-marshes, like some species with a northern distribution in the Atlantic and Baltic (*Puccinellia distans* subsp. *borealis*, *Carex mackenziei*) and some widespread salt-marsh species like *Triglochin maritima, Plantago maritima, Agrostis stolonifera* and *Festuca rubra*, which this far north don’t become dominant.  Arctic coastal salt marshes are under pressure from coastal erosion, changes in sea ice, increased industriell activities ofshore as oil-drilling, and pollution.  Indicators of good quality:   * Few open non-vegetated areas * Dominance of typical arctic species * No signs of erosion * No tracks of recreation or pollution.   Characteristic species:  Flora  Vascular plants: *Agrostis stolonifera*, *Carex glareosa, Carex mackenziei, Carex salina, Carex subspathacea, Carex ursina, Cochlearia officinalis, Festuca rubra, Gentianella detonsa, Juncus bufonius, Puccinellia distans* subsp*. borealis, Puccinellia phrygnoides, Plantago maritima, Triglochin maritima, Potentilla anserina* subsp*. egedii, Stellaria humifusa*  Mosses: *Bryum salinum*, *Drepanocladus uncinatus* |
| A2.5b Baltic coastal meadow | This habitat comprises natural or semi-natural grasslands along the coasts of the Baltic Sea. The habitat resembles A2.5c, Atlantic salt marshes, but in the Baltics tidal differences are much smaller, in the northern parts insignificant and the Baltic sea has a pronounced salinity gradient. Because of this, the species composition and zonation belts are different and the geomorphology is more flat, without pronounced levees and depressions. In general a zonation is found of specific communities in the lower parts, the hydrolittoral (below mean water level) and others in the higher parts (geolittoral, above mean water level). But species composition also changes in longitudinal direction over the area due to climatological as well salinity gradient that ranges from about 20‰ near the Kattegat, through  8‰ in the Darß-region to 2-5‰ in the Bothnian Gulf and Finnish Gulf. Tidal differences are small, and overruled by irregular, seasonal fluctuations in flooding regime due to storms, wind direction, changes in air pressure and drifting ice. The habitat is found on clayey sediments, sometimes mixed with gravelly substrates. Besides, the land upheaval of the northern parts of the Baltic Sea, continuing after the recession of the last glaciers in the ice ages, causes the development of saline meadows on non-sedimentary soils. Overall, the habitat is best represented in large bays, where clayey sediments are available, like in the Bothnian Bay and in Western Estonia.  In relatively saline areas, the most flooded, hydrolittoral and lower geolittoral belts harbour communities of the *Puccinellion maritimae*, with amongst others *Puccinellia maritima*, *Triglochin maritima* , *Spergularia maritima* and *Plantago maritima*, and of the *Spergulario-Puccinellion*, with *Puccinellia distans(*ssp. *distans* andssp. *borealis)* and *Spergularia salina*. Sometimes *Salicornia europaea* is present. The total vegetation cover often is low (< 50%). However in areas strongly influenced by freshwater, like in the Darß, large helophytes or *Cyperaceae* of the *Scirpion maritimi* dominate the lower belts, mainly *Bolboschoenus maritimus*, but also *Schoenoplectus tabernaemontani*, *Eleocharis uniglumis* , *Carex paleacea* or *Carex halophila* may dominated such areas. The lower belt is especially pronounced in the northern part of the Bothnian Gulf, where the land uplift creates bare substrate that becomes colonized by pioneer species.  The higher, geolittoral belt has in general a closed vegetation cover and is characterized by communities of the *Armerion maritimae* and *Potentillion anserinae*, containing the following species: *Juncus gerardi*, *Festuca rubra*, *Agrostis stolonifera*, *Vicia cracca*, *Potentilla anserina*, *Carex nigra*, *Trifolium fragiferum*, *Lotus tenuis,* and *Calamagrostis stricta*. In many cases the species composition is a mixture of ‘real’ salt marsh species (halophytes) and more freshwater indicating species. In places with freshwater influence *Blysmus rufus* may dominate. On the higher edge of the meadows, the habitat may form transitions to or mosaics with grassland communities of the *Cynosurion cristati* (habitat E2.1a).  The Bothnian Gulf is one of the few areas in Northern-Europe where after the Ice Ages new, endemic taxa have developed. Endemics of the saline meadows are *Deschampsia cespitosa* ssp*. bottnica* (= *Deschampsia bottnica*),  characteristic of gravelly shores within the salt meadows, and *Euphrasia bottnica*, which grows in the higher parts of the meadows. Also a high amount of boreal-arctic species  is found here, having (sometimes rare) relict populations from a period when there existed a connection between the Baltic and the White Sea. Examples of such species are mainly found in brackish conditions, like *Puccinellia phryganodes* and *Primula nutans* ssp*. finmarchica*, more characteristic of Arctic salt marshes (habitat A2.5a), and *Carex glareosa*, *Carex mackenziei*, *Carex paleacea* and *Carex halophila* (in both habitat A2.5a and A2.5b). Most of these species grow in low grasslands and depend on grazing for their sustainable survival. Rare species in the saline meadows of the Baltic States is *Angelica palustris*, while along the East-German and Polish Baltic coast, Middle Sweden, southern Finland and Estonia the rare *Eleocharis parvula* forms pioneer communities on muddy, brackish soils in sheltered lagoons.  Traditionally the saline meadows have been more-or-less intensively grazed or mowed for ages, but due to recent abandonment of this type of land-use, in several parts of the Baltics the habitat is threatened by succession towards reed beds. Unlike for the Atlantic salt-marshes, such reed beds are not considered part of the habitat itself, but are in the definition of C5.1.  The habitat forms an important breeding and resting sites for many water birds and migratory birds. It also contains a set of specialized insects, in many cases living on just one or a few halophytic plant species.  Indicators of good quality:  The following characteristics are considered as indicators of good quality:   * Regularly flooding with brackish water * Low vegetation structure * Absence of large stands of Phragmites australis * Absence of shrubs * Presence of rare or endemic species * Presence of several zonation belts * Reguarly erosion by sea ice   Characteristic species:  Flora Vascular plants: *Agrostis stolonifera, Blysmus rufus, Bolboschoenus maritimus, Calamagrostis stricta,Carex glareosa, Carex mackenziei, Carex nigra, Carex paleacea, Centaurium littorale, Centaurium pulchellum, Eleocharis acicularis, Eleocharis parvula, Eleocharis uniglumis, Festuca rubra, Glaux maritima, Juncus gerardi, Odontites littoralis, Ophioglossum vulgatum, Phragmites australis, Plantago maritima, Potentilla anserina* subsp*. anserina, Potentilla anserina* subsp*. egedii, Puccinellia capillaris, Puccinellia distans, Salicornia europaea* (very rare)*, Spergularia maritima, Spergularia salina, Trifolium fragiferum, Triglochin maritima, Vicia cracca.*  Fauna Birds: Dunlin (*Calidris alpina schinzii*) |
| A2.5c Atlantic coastal salt marsh | This habitat comprises natural grasslands on saline, clayey substrates along the coasts of the Atlantic Ocean, including the North Sea, characterized by halophytes. The northern limit of the habitat lies in northern Iceland and northern Norway (see habitat A2.5a), the southern limit lies in central Portugal (estuary of river Mondego),from which point southwards the salt marshes have predominantly Mediterranean characteristics. The most important factor for this azonal habitat is flooding by sea water, creating a gradient from lower, daily flooded parts towards higher parts with a low flooding frequency and duration and a more fluctuating soil salinity. With the flooding, sediments are brought in, and differences in sedimentation patterns (sand is deposited in the more dynamic parts, clay in low dynamic areas) creates a geomorphology of deep drainage channels (creeks), bordered by higher, sandy levees, with lower, clayey depressions behind. The salt marshes form transitions to bare mud flats on the lower elevation, and dunes or dune slacks on the higher part. These salt marshes are found in sheltered parts along the coast, like in lagoons, in sea inlets behind dunes, on the inland side of barrier islands, in estuaries, and in the Wadden Sea also on so-called “green beaches” (transition areas flooded both from North Sea and Wadden Sea) and rarely on sheltered parts of broad beaches.  The typical zonation of the North-Western Atlantic contains very open annual *Salicornia* species and perennial *Spartina* fields in the pioneer marsh (alliances *Thero-Salicornion*, *Spartinion maritimae*), open communities of *Puccinellia maritima*, *Limonium vulgare*, *Halimione portulacoides* , *Triglochin maritima* , *Spergularia maritima* and *Plantago maritima* in the lower salt marsh (alliance *Puccinellion maritimae*) and more closed communities of *Juncus gerardi*, *Festuca rubra*, *Agrostis stolonifera*, *Armeria maritima*, *Elytrigia pycnanthus*, *Juncus maritimus* and *Artemisia maritima* in the higher salt marsh (alliance *Armerion maritimae*). The latter form transitions towards brackish *Potentillion anserinae* communities (sometimes considered as *Loto tenuis-Trifolion fragiferi* Westhoff et Den Held ex de Foucault 2009) or towards *Plantago coronopus*, *Sagina maritima* and *Cochlearia danica* ommunities (alliance *Saginion maritimae*)on rarely flooded sand dunes. In places with seepage of freshwater, *Blysmus rufus*, *Phragmites australis* or *Bolboschoenus maritimus* may dominate the vegetation (alliance *Scirpion maritimae*). Also *Apium graveolens* and *Oenanthe lachenalii* are characteristic for such brackish transitions. Alpha diversity is in general low and rare species are few, for example *Halimione pedunculata*, *Salicornia disarticulata*, *Scirpus americanus, Hordeum maritimum, Puccinellia fasciculata*  and *Bupleurum tenuissimum*. In the thermo-Atlantic regions of Southwestern France, Northern Spain and Portugal, several other species with an Atlantic-Mediterranean distribution are found. In the first place several perennials chenopods grow here, like *Sarcocornia perennis*, *Arthrocnemum fruticosum* and *Suaeda vera*. Other ‘southern elements’ include *Inula crithmoides*, *Juncus acutus*, *Frankenia laevis*, *Hutchinsia procumbens*, *Triglochin bulbosa subsp. barrelieri*, *Parapholis incurva,* and *Spartina maritima* on the lower parts of the salt marsh.  Along the Atlantic coast saline meadows are also found in sites that have been embanked, sometimes centuries or decades ago, but still are fed with saline or brackish water. Such salt marshes often lack the typical  geomorphology but contain almost the same species composition as freely flooded salt marshes.  They are described here as part of Atlantic salt marshes; in most cases they only represent a small part of the area of the habitat type.  Many of the salt marshes along the Atlantic coast have a long tradition of extensive grazing. Ungrazed salt marshes are rare, but large examples exist, for instance in the Netherlands. No management leads, because of progressing clay sedimentation and nutrient enrichment, towards relatively species poor salt-marshes, were the lower belts are dominated by *Halimione portulacoides*, and the higher parts by *Elytrigia atherica  (pycnanthus)*. Close to dunes or dikes *Phragmites australis* may dominate, but unlike in the Baltics, salinity and larger tidal fluctuations prevent reed to dominate large areas and threaten the diversity of the salt marshes. Therefore, reed beds form part of the Atlantic salt marshes, end in almost all cases these reed beds contain several halophytes. In general it is expected that low extensive grazing causes the highest biodiversity in Atlantic salt marshes.  Salt marshes are important stop overs on the fly ways of migrating birds. *Puccinellia maritima* for example provides a consistent diet for goose species. The habitat also is an important breeding and resting site for many waders. Besides for birds, salt marshes are important for specialized invertebrates (insects), many of them living just on one or a few halophytic plant species. They are considered as very productive ecosystems and the creeks form nurseries for some fish species, like *Dicentrarchus labrax*.  Salt marshes are threatened by drainage, building of hard sea defense systems (dikes), modification of the topography, invasive species (*Spartina anglica*, *Spartina alterniflora*) and eutrophication of the sea water. Sea level rise, resulting from climatic change, may cause erosion, especially of the pioneer belts with *Salicornia* where vegetation cover is very low.  Indicators of good quality:  The following characteristics are considered as indicators of good quality:   * Pattern of branching creeks, with levees and depressions * Regularly flooding with sea water (absence of dikes…) * Presence of rare species * Low level or absence of invasive and nitrophilous species * Complete set of zonation belts, with no overrepresentation of certain belts * Absence of erosion   Characteristic species:  Vascular plants: *Agrostis stolonifera, Armeria maritima,  Apium graveolens,Artemisia maritima, Aster tripolium, Atriplex litoralis, Atriplex prostrata, Blysmus rufus, Bolboschoenus maritimus, Bupleurum tenuissimum, Carex distans,  Carex extensa, Centaurium littorale,Centaurium pulchellum,Cochlearia danica, Cochlearia officinalis ssp. anglica, Cochlearia officinalis ssp. officinalis, Desmazeria marina, Festuca rubra, Frankenia laevis, Frankenia pulverulenta, Glaux maritima, Halimione pedunculata, Halimione portulacoides, Hordeum marinum, Hutchinsia procumbens, Juncus gerardi, Juncus maritimus, Limonium vulgare, Lotus tenuis,Odontites littoralis, Oenanthe lachenalii, Parapholis incurva, Parapholis strigosa, Phragmites australis,Plantago coronopus, Plantago maritima,Potentilla anserina, Puccinellia distans ssp. distans,Puccinellia fasciculata, Puccinellia maritima, Sagina maritima, Salicornia disarticulata, Salicornia europaea agg (S. brachystachya, S. obscura, S. ramosissima), Salicornia procumbens agg. (S. dolichostachya, S. fragilis, S. nitens, S. procumbens s. decumbens), Sarcocornia perennis, Spartina anglica, Spartina alterniflora, Spartina maritima, Spergularia maritima,Spergularia salina, Suaeda maritima, Triglochin bulbosa subsp. barrelieri, Triglochin maritima, Trifolium fragiferum, Triglochin maritima.*  Mosses: *Hennediella heimii* (*Pottia heimii*)  Birds: Oystercatcher (*Haematopus ostralegus*), Eurasian spoonbill (*Platalea leucorodia*), Pied avocet (*Recurvirostra avosetta*), Common shelduck (*Tadorna tadorna*), Common redshank (*Tringa totanus ssp. totanus*), Common eider (*Somateria mollissima*), .... |
| A2.5d Mediterranean and Black Sea coastal salt marsh | These coastal salt marshes include various Mediterranean and western Black Sea plant communities of the classes *Juncetea maritimi* and *Salicornietea fruticosae* which are under influence of saline sea water. On the thermo-Atlantic coast along the SW Iberian Peninsula tidal flooding is relevant and determines communities zonation. The northern limit of this habitat along the Atlantic shores is the Mondego river mouth in Central Portugal. In the Mediterranean Sea and the Black Sea, soil texture, salinity and water content govern the main gradients. The vegetation is dominated by perennial and shrubby halophytes growing on the extreme upper shores of low sedimentary coasts, sheltered from the waves mechanical action.  The habitat can develop on a variety of sandy and muddy sediments, but in coasts with coarse sands beach communities develop (habitat B1.1b). The species composition is diverse, depending on the geographical range and the climatic conditions. On the Black Sea coast this habitat is presented mainly by mono-dominant communities of the tall rushes *Juncus maritimus* and/or *Juncus acutus.* Besides, shrub communities of Halocnemum stobilaceum occur in the Northern Black Sea coast of Romania and Ukraine. However, in the Danube Delta and on the marine sandbanks within the Razelm-Sinoe lagoon complex (known as the southern Delta), behind sand dunes or around saline ponds and lakes, salt marshes occur with vegetation more similar to continental inland salt marshes, for example with *Salicornia perennans, Puccinellia limosa* and *Juncus gerardi.*  In the Mediterranean the habitat is much more diverse, especially in the Iberian Peninsula and in southern Italy (Sicily, Apulia, Calabria), where soil salinity levels reach the highest values due to extreme climatic summer drought. In these parts of the range the habitat forms a mosaic of tall rushes mixed with shrubby and other herbaceous species, often with succulent stems and/or leaves, forming halophytic shrublads and thickets (alliances *Arthrocnemion glauci* and *Salicornion fruticosae*).In soils with brackish water beds of reed and other tall helophytes grow. Annual halophytic species (*Salicornia* sp., *Suaeda* sp) may exist in small spots occupying depressions between the communities of tall rush, shrub and thickets (class *Thero-Salicornietea*), while *Frankenia* spp.and *Sagina maritima* (class *Saginetea maritimae*)grow on the higher parts of sandy shores. The habitat further includes Mediterranean halo-psammophile meadows *(Plantaginion crassifoliae),* humid halophilous moors with the shrubby stratum dominated by *Artemisia coerulescens* (*Agropyro-Artemision coerulescentis),* halo-nitrophilous shrubby seablite thickets of *Suaeda vera* rarely inundated (*Suaedion verae*), shrub communities of *Limoniastrum* sp.(*Limonastrion monopetali*,*Limonion algarvenso-lanceolatii*), and communities in the Dalmatian coastal region, in somewhat drier habitats with less salt, which are not directly affected by waves and tides(*Agropyro-Plantaginion maritime*). On intertidal muds, cord grasses (*Spartinion maritimae*) may grow, but these are relatively rare in the Mediterranean and more common along the Atlantic coast.  Characteristic species:  Vascular plants: *Aeluropus littoralis, Artemisia caerulescens, A. gallica, A. santonicum, Arthrocnemum macrostachyum, Aster tripolium*, *Atriplex hastata,* *Bassia hirsuta*, *Carex extensa*, *C. distachya*, *Centaurium tenuiflorum, Centaurea dracunculifolia, Elymus athericus, Elymus elongatus, Limbarda crithmoides, Iris spuria*, *Juncus acutus,* *J. maritimus, J. subulatus, Gladiolus communis, Gypsophila tomentosa, Halocnemum strobilaceum, Halimione portulacoides, Frankenia hirsuta, F. pulverulenta, Limoniastrum monopetalum, Limonium algarvenso-lanceolatum, L. bellidifolium, L. gmelini, L. narbonense, L. oleifolium, Limonium supinum, L. virgatum, Linum maritimum*, *Lotus presili, L. tenuis, Plantago crassifolia*, *P. cornuti, P. maritima, Rumex pulcher, Puccinellia convoluta, P. festuciformis, Schoenus nigricans, Salsola soda, Sarcocornia fruticosa*, *S. perennis, Senecio aurícula, Sonchus crassifolius, S. maritimus*, *Suaeda maritima, S. splendens*, *S. vera, Triglochin bulbosum.*  Indicators of good quality:  In good conditions the habitat is a complex of different salt-marsh meadows, perennial herbs and halophytic succulent shrubs, annuals, halo-nitrophilous communities and beds of tall helophytes. It is sensitive to changes in the water regime (drainage, flooding), which quickly change the balance between the communities in the salt marshes due to aridification or over wetting.The following characteristics may be considered as indicators of good quality, but these indicators differ in different regions and between communities:   * occurrence of mosaics and gradients between the different plant communities in the salt marshes, with no over-representation of some groups; * long-term stability in the dynamic of flooding and the water salinity. |
| B1.1a Atlantic, Baltic and Arctic sand beach | The beaches along the west-coast of the Atlantic Ocean, the North Sea and the Baltic form a transition between the marine and terrestrial world. The lower parts of the beach (sublittoral/littoral foreshore), which are inundated most of the day, are considered under marine habitats. The higher (supralittoral or – in the Baltic – geolittoral) part, only rarely inundates during extreme high tides, is considered under terrestrial types. Sand beaches are found along sedimentary coasts, where the sediments deposited by waves and currents have a particle size of about 0.1 to 2 mm. Sedimentation of finer coastal particles results in salt marshes(habitat A2.5b and c). Sedimentation of coarser material results in shingle shores (habitat B2.1-3a), while shores with particular large cobbles and boulders (about >100 mm) are considered under rocky shores and cliffs (habitat B3.1\_3a).  Sand beaches form a very dynamic habitat under the constant influence of disturbance by sea water, wind and salt spray, causing erosion and accretion, and by amounts of organic matter brought by the tides. The sediment is supplied from erosion of the coasts, carried shoreward from the sea bottom or brought in by rivers. On Iceland and Macaronesian islands sand beaches may be made up of black, volcanic (basaltic) sediments. In the Baltic tidal influence is limited and salinity is relatively low; here beaches are more influenced by freshwater.  Vegetation is scarce in space and time , restricted to the backshore (higher beach) and mainly restricted to litter deposits on the high-tide line. Typical species of such drift-lines are a range of *Atriplex* species (*Atriplex caltheca*, *Atriplex glabriuscula*, *Atriplex laciniata*, *Atriplex littoralis*, *Atriplex longipes*, *Atriplex patula*, *Atriplex prostrata*), *Cakile maritima* (incl. different subspecies) and *Salsola kali*.  *Beta vulgaris* subsp. *maritima* is also frequently present, and grows on shingles as well. These are all annuals, adapted to dynamic, yearly changing conditions. Most of them have deep rooting systems in the freshwater floating on the deeper marine water. Seeds are dispersed by sea or wind and they have adaptations to deal with high salt concentrations. One of the few common perennial species on the Atlantic and North Sea beaches is *Honckenya peploides*, growing also in primary and white dunes, and often accompanied by primary dune species, like *Elytrigia farctus* subsp*. boreoatlantica*, *Leymus arenarius*, *Ammophila arenaria* and *Calystegia soldanella*. On the – less dynamic – Baltic Sea sand beaches perennial species are more common, including species associated with primary and white dunes, as well as helophytic species of wet conditions (*Bolboschoenus maritimus*, *Scirpus tabernaemontani*). Other typical species in the wet, lower parts of the Baltic beaches are often associated with pioneer habitat along rivers, like *Potentilla anserina*, *Ranunculus sceleratus*, *Polygonum hydropiper*, *Rorippa palustris*, *Juncus bufonius*, *Polygonum lapathifoliym*, *Chenopodium rubrum* and *Agrostis stolonifera*. *Potentilla anserina* is also common in boreal driftlines, for example in Iceland, Norway and Scotland, where it is accompanied by *Mertensia maritima*. Helophytic species may be found on Atlantic beaches as well, but only rarely, in places where freshwater leaches out of high dunes and forms streams to the sea. Also *Salix* shrubs may grow in such conditions. In the bay of Biscaye, *Euphorbia peplis* can grow on the upper part of sand beaches.  A group of typical invertebrates of beaches is associated with the drift lines and its vegetation, while several other invertebrates live oligophagous on characteristic plants species, like on *Cakile maritima*. Several bird species breed on beaches (for example ringed plover, little tern), often in places with many shells, but only in those places where there is no disturbance by tourism.  The Sanderling (*Calidris alba*) is a typical feeder in the surf on the beaches during its migration.  Indicators of good quality:  The following characteristics are considered as indicators of good quality:  ·      Presence of drift-line vegetation ·      Forming gradients  and progressive morphologic profile towards primary dunes ·      Presence and success of breeding birds in spring/summer  Characteristic species:  Flora: *Atriplex caltheca*, *Atriplex glabriuscula, Atriplex laciniata, Atriplex littoralis, Atriplex longipes, Atriplex patula, Atriplex prostrata, Beta vulgaris* subsp. *maritima, Cakile maritima , Honckenya peploides, Matricaria maritima, Mertensia maritima, Polygonum maritimum, Polygonum* *oxyspermum*, *Polygonum raii, Potentilla anserina, Salsola kali*  Fauna, birds: Ringed plover (*Charadrius hiaticula*), Little tern (*Sternula albifrons*), Kentish plover (*Charadrius alexandrinus*) |
| B1.1b Mediterranean and Black Sea sand beach | The habitat is represented by the lowest level of the supralittoral, just above the mean normal tide limit, where the drift material accumulates and the sand may be enriched with nitrogenous organic matter. It comprises beaches along the Mediterranean Sea, the Black Sea and on the Macaronesian islands. These beaches are sandy, sometimes composed of a mixture of gravel and sand, but pure gravel shores are distinguished as a separate shingle type (habitat B2.1-6b). Typically on these beaches there is very sparse vegetation cover composed mainly of few annuals. The vegetation belongs to the Class *Cakiletea maritimae*, whose plant communities have a very low cover, sometimes not more than 1%. The species occur on drift lines along the surf line, where the salinity usually is very high. Examples of typical halo-nitrophilous species are *Cakile maritima* (*Cakile maritima* subsp. *aegyptica* is accepted for the Mediterranean and *Cakile maritima* subsp. *euxina* is accepted for the Black sea), *Salsola kali*, *Salsola kali* subsp. *ruthenica* and *Xanthium strumarium*. On sandy beaches rarely visited by people some perennial psammophytes also occur, such as *Polygonum maritimum* and *Euphorbia peplis* while *Crambe maritima* and *Polygonum mesembricum* could be mentioned for the Black Sea. On Macaronesian islands also *Atriplex glauca* subsp. *ifniensis* is characteristic. During storms, the highest parts of the beaches are sporadically inundated by sea water, which sometimes cause drastic changes in the species composition. Sandy beach ridges, which represent the most initial phase of the dune-forming, may also host pioneer species of the Class *Ammophiletea* consisting mainly of geophytes and hemicryptophytes such as *Elymus farctus*, *Leymus racemosus* and *Eryngium maritimum*. In the Black Sea, the first stages of shifting dunes can be observed at the coastal sand strips at the surf line and up to 30 m inside the beach where the tidal difference is very small. Due to human pressure, beaches may remain without any vegetation even though the habitat could be still suitable for many arthropods. The complete lack of vegetation on the upper beach is a very common phenomenon caused by excessive trampling and, in particular, by the mechanical cleaning of the beach which, together with the litter, removes all living plants. The typical floristic and community structure can be observed mainly in isolated and rarely visited beaches. In good conditions the beaches have vegetation represented mostly by annuals including also some perennials. This habitat is naturally strongly dynamic but when the human impact increases, plant species may disappear completely.  Indicators of good quality:  In good conditions the beaches have vegetation represented mostly by annuals including also some perennials. This habitat is naturally strongly dynamic but when the human impact increases, plant species may disappear completely. Indicators for good quality are:  - presence of characteristic plant species (mainly annuals with few perennials)  - presence of some beach litter (natural beach litter, with few or without anthropogenic litter)  - lack of intense tourist trampling or anthropogenic structures  - lack of alien species, such as *Cenchrus incertus*.  Characteristic species:  Flora  Vascular plants: *Cakile maritima, Salsola kali, Salsola kali* subsp*. ruthenica, Xanthium strumarium, Euphorbia peplis, Polygonum maritimum, P. mesembricum, Crambe maritima.* Other species: *Argusia sibirica, Eryngium maritimum, Elymus farctus, Leymus racemosus, Matthiola tricuspidata, Raphanus maritimus.*  Fauna  Invertebrates: *Orchestia bottae, Cicindela hybrida, Hecamede albicans, Tethina cinerea, Hersodromya curtipennis.*  Birds: *Charadrius dubius, Ch. alexandrinus.* |
| B1.3a Atlantic and Baltic shifting coastal dune | Primary dunes and white dunes along the coasts of the Atlantic Ocean, including the North Sea, and the Baltic Sea. Primary dunes are found on sandy beaches along sedimentary coasts, where plenty of sand is available. They are formed by *Elytrigia farctus*, which is able to catch blowing sand and built up small dunes, in some cases mixed with drift line species (*Cakile maritima*, *Salsola kali*). In the northern Baltic Sea embryonic dunes are formed by *Leymus arenarius* and occasionally also by *Honckenya peploides* or *Agrostis stolonifera*. Such embryonic dunes often last only a year and disappear after severe storms. In sheltered conditions, for examples along expanding coasts, they may however grow higher, outside the influence of salt ground water, until a level where *Ammophila arenaria* is able to establish and to provide more stability to the dunes. Marram grass can develop a very deep root system with which the plant grows higher and higher when overblown by sand. In this way dunes grow up to high ridges, forming the so-called white dunes (named after the soil color which is related to the absence of organic, “grey” material). White dunes have a very open vegetation cover, an alternating relief and form (still) a very dynamic environment (due to wind and salt spray) where few species can survive. In good conditions there is a clear zonation of primary and white dunes, while on very broad, expanding shores even large areas with a mixture of embryonic dunes, drift-line communities and white dunes may develop.  *Leymus arenarius* and x *Calamagrostis baltica* can have a similar role as *Ammophila* in relatively cold regions, although the white dunes (in fact “black” on volcanic Iceland) don’t grow that high in cold regions. A constant species in all Atlantic and Baltic white dunes is *Festuca arenaria*. Other associated species are *Sonchus arvensis* var. *maritimus*, *Oenanthe oakesiana*, *Honckenya peploides*, in boreal regions *Lathyrus japonicus* and in relatively warm regions *Calystegia soldanella*, *Eryngium maritimum*, *Euphorbia paralias*, *Polygonum maritimum*, and several species more typical for Mediterranean white dunes (see habitat B1.3b). Amongst the more restricted species are *Linaria loeselii* (Baltics), *Pancratium maritimum,* *Linaria thymifolia* and *Hieracium eriophorum* (Southwestern France) and *Galium arenarium* and *Galium neglectum* (Bay of Biscaye and Channel islands).  Besides the relatively low diversity of vascular plants some remarkable fungi grow here, several of them being restricted to coastal dunes. Examples are *Agaricus devoniensis*, *Cyathus stercoreus*, *Hohenbuehelia culmicola*, *Melanoleuca cinereifolia*, *Peziza ammophila*, *Phallus hadriani*, *Psathyrella ammophila* and *Stropharia halophila.*  The fauna of this extreme habitat contains several specialized species of beetle.  Indicators of good quality:  ·      Natural zonation from embryonic dunes to white dunes, or mosaic of embryonic and white dunes  ·      Irregular vegetation structure, with open sand  ·      Irregular, alternating relief (with high ridges and depressions)  ·      Presence of characteristic fungi  ·      No disturbance by man  ·      Absence of erosion patterns  Characteristic species:  Vascular plants: *Agrostis stolonifera, Ammophila* *arenaria*, *Astragalus baionensis*, *Cakile maritima*, x *Calamagrostis baltica*, *Calystegia soldanella*, *Elymus farctus* subsp. *boreoatlantica, Eryngium maritimum*, *Euphorbia paralias*, *Festuca arenaria*, *Galium arenarium*, *Galium maritimum*, *Galium neglectum*, *Honckenya peploides*, *Hieracium eriophorum,* *Lathyrus japonicus*, *Leymus arenariu*s, *Linaria thymifolia*, *Linaria loeselii*, *Mathiola sinuata,* *Oenanthe oakesiana*, *Pancratium maritimum, Polygonum maritimum, Silene uniflora* subsp*. thorei, Solidago virgaurea* subsp*. macrorhiza, Sonchus arvensis* var. *maritimus*  Fungi: *Agaricus devoniensis, Cyathus stercoreus, Hohenbuehelia culmicola, Melanoleuca cinereifolia, Peziza ammophila, Phallus hadriani, Psathyrella ammophila, Stropharia halophila* |
| B1.3b Mediterranean and Black Sea shifting coastal dune | Embryonic shifting dunes and "white" shifting dunes along the shoreline of the Macaronesian islands, Black Sea, Mediterranean and Thermo-Atlantic region (northwards up to central Portugal) represent the first stages of dune construction. The habitat consists of mobile coastal sand ridges which are occupied by open grasslands; they sometimes form tall dune ridges but in many cases rather low (less than 10 m high). A zonation is distinguished form primary, embryonic dunes towards higher, and more stable white dunes, but these different sectors are not always well separated. Embryonic dunes are characterised by *Elymus farctus* (= *Elytrigia juncea* = *Agropyron junceum*) that produces horizontal rhizomes which crawl along the sand or penetrate it. Its stalks constitute obstacles where sand accumulates to a few decimetres forming embryonic dunes. These dunes are at the start of the psammosere; they grow by sand accretion and are sporadically inundated by the sea during storms. More inland, white shifting dunes are found, characterised by the dominance of *Ammophila arenaria* (subsp. *arundinacea* in the Mediterranean) that has a growth form in which the older parts (strong erect culms up to 1.5 m high) protect the plant and enable it to regenerate from its center. *Ammophila arenaria* is a very important rhizomatous dune species as it constitutes a barrier for windblown sand, contributing to the increase of the dune height. These dunes occur on yellow, very permeable and humus poor soils. Among the characteristic species accompanying the dominant grasses on embryonic and white dunes *Sporobolus pungens, Chamaesyce peplis* ( = *Euphorbia peplis*), *Otanthus maritimus, Medicago marina, Anthemis maritima, Eryngium maritimum, Pancratium maritimum, Euphorbia paralias, Calystegia soldanella, Echinophora spinosa, Cutandia maritima* and *Polygonum maritimum* could be mentioned. On the Macaronesian islands both *Ammophila arenaria* and *Elymus farctus* are absent, but in some places white dunes exist, characterized by *Chamaesyce peplis* ( = *Euphorbia peplis*)*, Euphorbia paralias, Cyperus capitatus, Polygonum maritimum* (with some island endemics such as *Plantago madarensis* on Madeira) and succulent shrubs of the alliance *Traganion moquinii* (see habitat B1.6c). Large parts of the Mediterranean dunes are disturbed or completely destroyed by human pressure such as tourism activities, coastal urbanisation and industry.  Indicators for good quality:   * Undisturbed, discrete coastal dune zonation (spatial succession pattern) * Sparse vegetation cover ≥ 20% * No presence of alien or ruderal species   Characteristic species:  Flora: *Elymus farctus* (=*Agropyron junceum*)*, Ammophila arenaria, Androcymbium psammophilum, Anthemis maritima, Anthemis tomentosa, Calystegia soldanella, Convolvulus caput-medusae, Cutandia maritima, Cyperus capitatus, Echinophora spinosa, Eryngium maritimum, Euphorbia paralias, Chamaesyce peplis (=Euphorbia peplis), Honkenya peploides, Leymus arenarius, Medicago marina, Ononis natrix, Otanthus maritimus, Pancratium maritimum, Polycarpaea nivea, Polygonum maritimum, Sporobolus pungens, Zygophyllum fontanesii.* |
| B1.4a Atlantic and Baltic coastal dune grassland (grey dune) | Stabilized or semi-stabilized dune grasslands or chamaephytic vegetations (grey dunes) of the Atlantic and Baltic coasts, dominated by grasses, herbs, mosses and lichens. This habitat is usually dominated by perennial species, with a certain proportion of therophytes. The type is distributed along the Baltic coast and the Atlantic coast, from southern Norway to halfway Portugal, including the British Islands, Ireland and (marginal) Iceland.  It is a grassland type of dry dune sands that has a broad diversity in species composition. Species composition changes over the climatic north-south and west-east gradients, but differs also within one site on different soils (acid to slightly calcareous sands) and under different microclimates (especially north versus south exposition). Most species of the European temperate coastal grasslands are also found in inland sand grasslands, but several dune chamephytic species have their optimum in the coast. Especially in the south (Southwest-France to Portugal) communities of the order *Crucianelletalia* contain several coastal dune restricted  and endemic species.  The occupied area of the type depends on the size of the dunes, which is relatively large along shallow, sandy seas with relatively large tidal differences. In stretches of rocky coast dunes and the associated grasslands are limited to small parts in the estuaries of rivers. In dynamic dune landscapes these grasslands may form temporary natural succession stages, which could be overgrown with shrubs, overblown with sand, or washed away during severe storms. Such situations are rare, however. In more stabilized dunes these grasslands are maintained by natural dynamics like wind, salt spray, drought and grazing (rabbits), in combination with semi-natural management by cattle and sheep grazing (decreasing drastically or abandoned in certain areas) or rarely by mowing.  Indicators of good quality:  In good conditions these grasslands are rich in forbs, mosses and lichens. They are threatened by natural succession towards shrubland (a.o. *Hippophae rhamnoides*, *Salix repens subsp. arenaria*) and forest (*Quercus* spp, *Pinus* spp),  and by encroachment of tall or dense grasses (a.o. *Calamagrostis epigejos*, *Ammophila arenaria, Festuca rubra*), herbs and shrubs (incl. non-native species like *Prunus serotina*) under suboptimal conditions (for instance high atmospheric deposition, low dynamics, no grazing, eutrophication linked to human frequentation). The habitat is also locally threatened by trampling. Also the non-native moss *Campylopus introflexus* behaves as an invasive species. In cases of overgrowth with grasses, shrubs and trees, more intensive management may help maintenance of species diversity. A patchy pattern of grassland and shrubs on a landscape scale is, on the other hand, of importance for several typical bird species of coastal dune complexes.  The following characteristics may be considered as indicators of good quality, but these indicators differ in different regions:  ·     High species richness  ·     Presence of rare and/or threatened species (characteristic communities species)  ·     Absence or low presence of invasive or nitrophilous species  ·     Diversity within the type within an area and over the whole range  ·     High cover of lichens (in some varieties)  ·     Low vegetation structure  ·     Low cover of encroaching tall grasses, tall herbs and shrubs  ·     Low cover of alien and ruderal species  ·     Presence of typical fauna (birds, lizards, butterflies, other invertebrates)  Characteristic species:  Flora  Vascular plants: *Aetheorhiza bulbosa, Agrostis capillaris, Aira praecox, Alyssum loiseleurii, Anacamptis pyramidalis, Anthyllis vulneraria subsp. maritima, Asperula cynanchica, Artemisia crithmifolia, Asparagus officinalis ssp. prostrata, Asterolinum stellatum, Avenula pubescens, Calystegia soldanella, Carex arenaria, Cochlearia danica, Corynephorus canescens, Crucianella maritima, Dianthus arenarius, Dianthus hyssopifolius ssp. gallicus, Ephedra distachya, Erodium glutinosum, Erodium lebelli, Eryngium campestre, Euphorbia portlandica, Festuca polesica, Festuca filiformis (=tenuifolia), Festuca vasconsensis, Festuca rubra, Galium arenarium, Galium verum, Gentiana campestris, Gentiana cruciata, Geranium molle, Geranium sanguineum, Helichrysum arenarium, Helichrysum stoechas, Hieracium umbelatum, Jasione montana, Lagurus ovatus, Lathyrus maritima, Koeleria albescens (=maritima, = cristata ssp. arenaria), Linaria arenaria, Linaria maritima, Luzula campestris, Medicago littoralis, Medicago marina, Mibora minima, Myosotis ramosissima, Omphalodes littoralis, Ononis natrix ssp. ramosissima, Ononis repens, Phleum arenarium, Polygala vulgaris, Rosa pimpinellifolia, Rumex acetosella, Sanguisorba minor, Sedum acre, Silene conica, Silene nutans, Silene otites, Teesdalia nudicaulis, Thesium humifusum, Thymus praecox, Thymus serpyllum, Trifolium scabrum, Tuberaria guttata, Viola canina, Viola curtisii, Viola kitaibeliana, Viola littoralis, Viola rupestris*.  Mosses: *Brachythecium albicans*, *Tortula ruraliformis*  Lichens: *Cetraria spp*., *Cladina spp*., *Cladonia spp*., *Peltigera spp., ...* in the Baltic Sea region: *Racomitrium canescens, Ceratodon purpureus, Polytrichum juniperinum, P. piliferum*  Fauna  Mammals: rabbit (*Oryctolagus cuniculus*)  Birds: *Burhinus oedicnemus*, *Oenanthe oenanthe*, *Tadorna tadorna*  Reptiles: *Lacerta agilis*  Insects: many species of Coleoptera (ground beetles), Saltatoria (grass hoppers), Formicidae (ants) and Hymeoptera (bees, wasps), and Lepidoptera (butterflies)  Lepidoptera examples: *Argynnis niobe*, *Issoria lathonia*, *Mesoacidalia aglaja* |
| B1.4b Mediterranean and Macaronesian coastal dune grassland (grey dune) | These stable coastal dunes of the Mediterranean are dominated by herbs, graminoids and chamephytes, with a broad variety of plant communities: a) fixed dunes of the western and central Mediterranean and North Africa, with *Crucianella maritima* (a steno Mediterranean species) and *Pancratium maritimum*; b) coastal stabilised dune grassland communities with medium to fine calciumcontaining sand, growing approximately 200 m from the sea on dunes of about 0.15-10 m; c) associations with many small annuals and often abundant ephemeral spring bloom of deep sands in dry interdunal depressions of the coasts: d) dune formations of pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea* class; e) meso- and thermo-Mediterranean xerophile, mostly open, short-grass perennial grasslands rich in therophytes, as well as therophyte communities of oligotrophic soils on base-rich, often calcareous substrates. All of these components are established generally landwards of the white dunes. The term "grey dunes" originates from the color of the substratum which comes from the increased proportion of humus and silt in the sand. Here, the amount of windblown sand is much reduced, compared to the white dunes, and also salt spray and erosive processes are highly reduced, with higher plant cover. The number of species in general is higher than in shifting dunes. These communities may be followed in succession by evergreen sclerophyllous coastal scrubs and in some cases by *Quercus ilex* woodlands, but may form relatively stable grassland in more extreme sites, less suitable for shrubs.  Human pressures reduce coastal landscape heterogeneity and biodiversity and converge to a striking simplification of the natural zonation on highly urbanized coasts. The impoverishment of soils in highly disturbed areas not only reduces the number of typical native species, but also promotes the colonization of alien and ruderal species. Touristic development and recreational activities (trampling, infrastructures) are the most severe threats for dune habitats, together with land clearance for the expansion of cultivated lands, sand extraction and changes due to in sand enrichment. In fact, large parts of the Mediterranean grey dunes are currently influenced by touristic and recreational activities, or have changed to urbanized areas, arable lands or woody plantations.  Indicators of good quality:  The following characteristics may be considered as indicators of good quality, but these indicators differ in different regions: - High species richness - Presence of rare and/or threatened species - Diversity within the type within an area and over the whole range - High cover of open soil - Low cover of encroaching tall grasses, tall herbs and shrubs - No cover of alien species - No or few indications of disturbance  Characteristic species:  Flora: *Crucianella maritima, Pancratium maritimum, Euphorbia terracina, Ephedra distachya, Silene nicaeensis, Silene subconica, Malcolmia lacera, Malcolmia ramosissima, Evax astericiflora, Evax lusitanica, Anthyllis hamosa, Linaria pedunculata, Brachypodium*spp.*, Ononis variegata, Silene colorata*ssp.*canescens, Cutandia maritima, Cutandia divaricata, Phleum arenarium, Medicago littoralis, Vulpia membranacea, Alkanna tinctoria.* |
| B1.4c Black Sea coastal dune grassland (grey dune) | Stabilized or semi-stabilized dune grasslands (grey dunes) represented by perennial communities, dominated by grasses, herbs, mosses and lichens. The type is distributed along the Black Sea coast, but mostly found in its western and north-western part. This habitat includes dune complexes which differ in size and height (from 2–3 m up to 50 m above sea level). These dunes are better developed on flat shores, where there is a wider contact zone between the Black Sea influence and the adjacent vegetation, mostly forests. The vegetation of the Black Sea dunes is a complex of grasslands, small shrubs and small forests. Perennial species dominate but many annuals occur, principally on the more mobile sands, usually present on high ridges. On northern exposed, moist slopes, many mosses and lichens occur. The most fixed wet sands at the depressions in the dunes are covered by the coenoses mostly dominated by tall grasses, sedges and rushes, forming transitions to humid dune slacks (habitat B1,8b). The vegetation of the Black Sea fixed dunes shows a large diversity in species composition. Along the western coast of the Black Sea it changes gradually from south to north. The main gradient is climatic and also biogeographical. This gradient is associated with a reduction of East-Mediterranean species and an increase of Pontic steppe species. According to this gradient the Western Black Sea grey dunes are divided into two main types: northern and southern grey dunes, with the Balkan Range in Bulgaria as a conditional border between the two sub-types. The northern Black Sea grey dunes have optimal distribution in the region of the Danube Delta in Romania and around the Azov Sea in Ukraine. The southern Black Sea dune grasslands are widely distributed in the Southern Black Sea coast of Bulgaria and European Turkey. Especially the southern Black Sea dunes are rich in some Balkan and Balkan-Anatolian endemics, like *Lepidotrichum uechtritzianum*, while the northern types are less rich in both annuals and endemic species. These dune grasslands are threatened by direct destruction and degradation from the construction activities in resort areas, both in Bulgaria and Romania. There is also invasion of natural and alien shrub and three species as *Paliurus spina-christi, Ailanthus altissima, Amorpha fruticosa, Robinia pseudacacia, Eleagnos angustifolia*.  Characteristic species:  Vascular plants: *Alyssum borzaeanum, Alyssum hirsutum, Artemisia campestris, Astragalus onobrychis, Astragalus varius, Astrodaucus littoralis, Carex ligerica, Centaurea arenaria, Cynanchum acutum, Cionura erecta, Convolvulus persicus, Corispermum nitidum, Dianthus polymorphus, Ephedra distachya, Erysimum diffusum, Euphorbia sequierana, Festuca beckerii, Festuca vaginata, Gypsophila trichotoma, Helichrysum arenarium, Galiliea mucronata, Jasione heldreichii, Jurinea albicaulis, Koeleria glauca, Lepidotrichum uechtritzianum, Linaria genistifolia, Linum tauricum, Marrubium peregrinum, Melica cilliata, Pancratium martimum, Rumex tenuifolius, Scabiosa argentea, Secale sylvestre, Seseli tortuosum, Silene borystenica, Silene euxina, Silene thymifolia, Stipa borysthenica, Syrenia montana, Teucrium polium, Verbascum purpureum*.  Mosses: *Grimmia sp. pl. Tortella sp. pl., Tortula ruralis*.  Lichens: *Cladonia sp.pl*.  Fauna  Amphibians and reptilians: *Pelobates syriacus, Testudo graeca, Eremias arguta, Podarcis taurica, Vipera ursinii*.  Birds: *Burchinus oedicnemus, Charadrius alexandrinus, Calandrella brachydactylla*  Insects: *Stibaropus henkei, Byrsinus fossor* |
| B1.5a Atlantic and Baltic coastal Empetrum heath | This habitat comprises decalcified fixed dunes dominated by relatively low *Empetrum nigrum* heaths along the cooler parts of the northern Atlantic and Baltic coasts, south to the mainland Dutch dunes, north to northern Norway (Finnmark) and Iceland.  It includes both dry dunes as well as moist dune slacks with dominant *Empetrum nigrum,* both of which are late succession stages in the development of stable dunes and dune slacks, and which may be long maintained under light grazing pressure or other factors (like salt spray) which limit the development of scrub and woodland. In northern Estonia, and possibly also in Iceland, some sites of the habitat are dominated by *Empetrum hermaphroditum*.  In the dry dune subtype *Calluna vulgaris* may co-dominate, but *Calluna*-heath without *Empetrum nigrum* is considered under B1.5b Atlantic coastal *Calluna* and *Ulex* heath. Especially in the Wadden Sea area and the Baltics it may be difficult to distinguish between these two types but the presence of *Empetrum* may be considered to assign communities to this habitat B1.5a. Within this geographical range *Calluna vulgaris*-dominated heathlands without *Empetrum nigrum* occur often more locally on dunes, as in relatively old grey dunes, where cover of *Calluna* can slowly increase. *Empetrum nigrum* in general is able to outcompete *Calluna* on slightly deeper  and better soils and on more moist sites such as north-facing slopes. In dry dunes, mosses and lichens form an important part of the plant diversity.  In the wet dune slack subtype, *Erica tetralix* may grow as a co-dominant and *Empetrum nigrum* may actually be absent, but in such cases these heathlands can still be included here, as the complete species composition is not very different.  In some situations, the non-native cranberry *Oxycoccus macrocarpus* (=*Vaccinium macrocarpon*) may become dominant, providing an important food source for man and animals. In relatively stable hydrological conditions, *Sphagnum* spp. may reach high cover. In dune slack heathlands *Carex trinervis* is a common associate, within the small range of its distribution.  Indicators of good quality:  An optimal state of this habitat type is a low scrub formed by heaths, sedges and grasses, and mosses and lichens, with few open patches and without non-native species, trees or tall shrubs. Indicators of good quality are:   * relatively low, closed structure * dominance by heath sub-shrubs * presence of high diversity of mosses and lichens * absence of non-native, invasive species * absence or low abundance of trees and tall shrubs * occurring both in dry dunes and dune slacks   Characteristic species  Vascular plants: *Calluna vulgaris, Carex arenaria, Carex trinervis, Empetrum nigrum, Erica tetralix, Genista tinctoria, Hieracium umbellatum, Polypodium vulgare, Pyrola minor, Pyrola rotundifolia, Salix repens, Vaccinium macrocarpon, Vaccinium uliginosum, Vaccinium vitis-idaea*  Mosses*: Dicranum scoparium, Hypnum jutlandicum, Pleurozium schreberi, Sphagnum spp.* and several species of *Hepaticae*  Lichens: *Cladina spp., Cladonia spp.* |
| B1.5b Atlantic coastal Calluna and Ulex heath | Decalcified fixed dunes colonized by relatively low heaths and spiny legumes in the European Atlantic coasts under humid climatic conditions, often with dominance of *Calluna vulgaris* and/or *Erica* spp. Soils are coarsely sandy and well drained and under the predomimant hydric regime (high rainfall or ground water) leaching of soluble basic nutrients, particularly calcium, is very active.  Sedges and grasses are common all over the habitat’s range. In the southern sector (southern Portugal) an endemic gorse preferently grows in this habitat (*Ulex australis* subsp. *welwistchianus*), while another one is also frequent in North-western Iberia (*Ulex europaeus* subsp. *latebracteatus*). Several coastal scrub species occur in the habitat, like *Genista triacanthos* and *Halimium halimifolium*. In the northern parts of the Atlantic coast and the Baltics the habitat is replaced by dune heaths dominated by *Empetrum nigrum* (B1.5a).  This low sized heathland is forming a dense scrub and plays an important role in the dune fixation. Soils are acidic, coarse sandy and have a low water retention capacity.  **Indicators of good quality:**  An optimal state of this habitat type is a dense scrub formed by heaths, gorses and some herbaceous plants (*Carex* and grasses) of low size (40 to 80 cm), with no or few open patches and without exotic species, trees or tall shrubs. Indicators of good quality are:   * relatively low, closed structure * dominance by heaths and gorses * absence of non-native, invasive species * absence or low abundance of trees and tall shrubs   **Characteristic species:**  ***Flora***  Vascular plants:A*grostis stolonifera* var*. pseudopungens, Calluna vulgaris, Carex arenaria, Carex trinervis, Erica ciliaris, Erica cinerea, Erica scoparia, Erica umbellata. Festuca vasconcensis, Genista triacanthos, Halimium halimifolium, Pseudoarrhenatherum longifolium, Ulex australis* subsp*. welwitschianus, Ulex europaeus* subsp*. latebracteatus*.  ***Fauna***  Birds: *Alectoris rufa, Caprimulgus europaeus, Caprimulgus ruficollis, Galerida thekleae, Lanius senator, Lullula arborea, Merops apiaster, Saxicola torquata, Sylvia conspicillata, Sylvia melanocephala, Sylvia undata.*  Reptiles and amphibians: *Chalcides striatus, Chamaeleo chamaeleon, Hemorrhois hippocrepis, Macroprotodon brevis, Malpolon monspessulanus, Pleurodeles waltl,* *Podarcis bocagei, Podarcis carbonelli, Psammodromus algirus, Rhinechis scalaris, Testudo graeca.* |
| B1.6a Atlantic and Baltic coastal dune scrub | A broad habitat type, covering more or less all low to high scrub in dry dunes and wet dune slacks in the Baltic and Atlantic coastal regions. The species composition differs over climatic regions. In north-western Europe and the southern Baltic *Hippophae rhamnoides* and *Salix repens* ssp. *arenarius* are mainly dominating in dry dunes, while *Ulex europaeus*, *Cytisus scoparius* and *Rubus ulmifolius* are important species in dry dunes of the warmer parts of the Atlantic coasts. In wet dune slacks, typically *Salix* scrub is found, especially *Salix repens*, *Salix cinerea*, *Salix atrocinerea* and *Salix rosmarinifolius*. In the Baltic region *Salix repens* ssp. *arenarius* and *Salix rosmarinifolius* grow together with boreal heather species, while along the Portuguese coast in wet dunes *Salix repens* and *Salix atrocinerea* are accompanied by some Atlantic-Mediterranean species, like *Scirpus holoschoenus*. *Salix repens* ssp. *arenarius* is found in drier parts of the dunes as well. In mesic dune slacks it is typically accompanied by *Monotropa hypopitys*, living saprophytic on *Salix*-specific ectomycorrhizal fungi, and by *Pyrola minor* and *Pyrola rotundifolia*, forming the association *Pyrolo-Salicetum*. This association is known for many rare fungi, of which some live in symbiosis with *Salix repens*. Very low *Salix repens*-scrub (mowed or grazed) forming a component in fen or grassland communities is not included in this habitat, but considered under dune slacks (B1.8a) or dune grasslands (B1.4a). The same goes for relatively low scrub of *Rosa spinosissima* (sometimes known as *R. pimpinellifolia*), forming a component of grasslands.  The habitat is especially well developed in dry, calcium-rich dunes, where it reaches several meters of height and may form a dense formation, relatively rich in shrub species. Besides the already mentioned species *Rhamnus cathartica*, *Ligustrum vulgare*, *Berberis vulgaris*, *Euonymus europaeus*, *Sambucus nigra*, *Crataegus monogyna* and several species of *Rosa* and *Rubus* contribute to the biodiversity. The many berries produced by the shrubs play an important role as a food source for birds, especially during the migrating season in late summer and autumn. A typical accompanying species is the climbing *Bryonia cretica*.  The dune shrublands have been classified in the order *Salicetalia arenariae*, in which three alliances are distinguished: *Salicion arenariae*, *Ligustro-Hippophaeion*, and *Holoschoeno australis-Salicion arenariae*, the latter being restricted to the warmest parts of the Atlantic coast. Additional the communities of *Salix cinerea* (alliance *Salicion cinereae*.) are included in the habitat. The Pyrolo-Salicetum is sometimes classified in the *Empetrion nigri*.  In some places also *Juniperus* species form coastal scrub. *Juniperus communis* is known from temperate coasts, for example calcareous dunes of north-western Jutland. In the Mediterranean coasts several other *Juniperus* species are found, and some of them northwards reach the warmer Atlantic dunes.  Indicators of good quality:   * Dense and high structure of scrub * Diversity in shrub species * Absence of non-native species, like *Rosa rugosa, Eleagnos spp., Cornus spp., ...* * Low cover of trees * Presence of breeding birds * Food supply for migrating birds in autumn * Presence of rare fungi   In some parts of the range (for example England) dune shrubs have been planted and form a threat to dune grasslands and other more species-rich habitats.  Characteristic species:  Flora:*Berberis vulgaris, Calamagrostis epigejos, Carex arenaria, Cornus sanguineus, Crataegus monogyna, Cytisus scoparius, Euonymus europaeus, Hippophae rhamnoides, Juniperus communis, Ligustrum vulgare, Monotropa hypopitys, Pyrola minor, Pyrola rotundifolia, Rhamnus catharticus, Rosa rubiginosa, Rosa spinosissima, Rubus thallasarctos, Rubus caesius, Rubus ulmifolius, Salix cinerea, Salix repens ssp. arenarius, Sambucus nigra, Ulex europaeus*  Birds: Nightingale (*Luscinia megarhynchos*) |
| B1.6b Mediterranean and Black Sea coastal dune scrub | Scrub and thicket on stabilized or semi-stabilized dune systems of the Mediterranean, thermo-Atlantic (southern Portugal) and Black Sea coasts. The dominant shrubs and herbaceous species are diverse and may vary from site to site. These scrub and thickets often constitute the transition between grey dunes and coastal woodlands. In the Mediterranean region the most widespread coastal scrub and thickets are dominated by *Juniper* species: *Juniperus phoenicea* and *Juniperus oxycedrus* (subsp. *macrocarpa*, subsp. *transtagana*). In the warmest areas of the thermo-Mediterranean climate, various sclerophyllous, lauriphyllous or drought-deciduous scrub and thickets are found, from the classes *Ononido-Rosmarinetea, Quercetea ilicis, Cisto-Lavanduletea, Retametea raetami, Cisto-Micromerietea*. These communities dominated by shrubs and thickets and vegetation cover could be very close but in some cases it could be also relatively open. On open spots, many herbaceous species from the surrounding dune grasslands are common between the shrubs. Along the Black Sea coast several deciduous shrubs may dominate, such as *Paliurus spina-christii, Osyris alba* and *Carpinus orientalis*, but also some small evergreen species, such as *Ruscus aculeatus* and *Jasminum fruticans* may participate in the scrub or form very large stands on the dunes. Dunes with communities of *Hippophae rhamnoides*, which are typical for north-western Europe, are restricted to northern Italy in the Mediterranean and to the Danube Delta in the Black Sea region. Some anciently cultivated plants, like *Ziziphus jujuba*, represent semi-natural shrub plantations in the dunes of the Southern Black Sea coast. Invasive species, like *Eucalyptus* sp., *Amorpha fruticosa, Eleagnos angustifolia* may expand with important impacts on native vegetation.  Indicators of good quality:  In good conditions these scrubs and thickets are dominated by native species. They could be subjected to the natural succession (expanding of forest vegetation), often related to stabilization of the dune systems.  The following characteristics may be considered as indicators of good quality:   * High species richness and prevalence of native shrubs and herbaceous species * Absence of communities dominated by invasive species * Absence of forest plantations and forest expansion * Long-term stability of the relative proportions of scrub and grasslands in the mosaics of the dune landscape   Characteristic species:  Flora: *Anthyllis hermaniae, Artemisia campestris, Asparagus acutifolius, Asparagus aphyllus, Bupleurum semicompositum, Calamagrostis epigejos, Carpinus orientalis, Catapodium rigidum, Centaurea pumilio, Cistus creticus, Cistus laurifolius, Cistus salviifolius, Clematis flammula, Corema album, Coridothymus capitatus, Dactylis glomerata, Daphne sericea, Erica manipuliflora, Erica multiflora, Erodium laciniatum, Ephedra fragilis, Jasminum fruticans, Juniperus phoenicea* subsp*. turbinata, Juniperus oxycedrus* subsp. *macrocarpa, Juniperus navicularis, Hipophae rhamnoides* subsp. *caucasica, Halimium halimifolium, Helichrysum conglobatum, Helichrysum italicum, Helichrysum stoechas, Ephedra campylopoda, Ephedra distachya, Lagurus ovatus, Lonicera implexa, Limonium graecum, Limonium hyssopifolium, Limonium ocymifolium, Limonium echioides, Lycium schweinfurthii, Melica minuta, Myrtus communis, Osyris alba, Paliurus spina-christii, Periploca graeca, Pistacia lentiscus, Phagnalon graecum, Phillyrea angustifolia, Prasium majus, Pseudorlaya pumila, Quercus coccifera, Rhamnus alaternus, Rhamnus lycioides* ssp. *oleoides, Reichardia picroides, Rubia peregrina, Rubia tenuifolia, Ruscus aculeatus, Silene colorata, Smilax aspera, Teucrium fruticans, Teucrium capitatum, Trachynia distachya, Tuberaria guttata, Valantia hispida, Vulpia fasciculata.* |
| B1.6c Macaronesian coastal dune scrub | This habitat type consists of coastal dunes of the Canarian archipelago, colonized by herbaceous and woody plants often with succulent leaves and stems. It is absent in the islands of El Hierro and La Palma. Shifting dunes are populated by herbaceous plant communities of the alliance *Polycarpeo niveae-Euphorbion paraliae* and the fixed grey dunes are covered by the perennial woody communities of the *Traganion moquinii*. In both cases vegetation cover is sparse, and the climate is Mediterranean arid or desert-like.  Indicators of good quality:   * No disturbance signals * Low vegetation cover * Absence of invasive alien species   Characteristic species:  Flora: *Androcymbium psammophilum, Lotus lancerottensis, Polycarpaea nivea, Polygonum balansae* var*. tectifolium, Pulicaria burchardii, Senecio leucanthemifolius* var*. falcifolius, Traganum moquinii, Zygophyllum fontanesii, Zygophyllum gaetulum.* Other taxa of broad distribution: *Cyperus kalli, Euphorbia paralias, Polygonum mariitimum*. |
| B1.7a Atlantic and Baltic broad-leaved coastal dune woodland | This is a very broadly defined habitat of Atlantic coastal dunes, comprising a diversity of relatively open to closed woodlands which develop where more stable coastal sands are invaded by broadleaved trees typical of the local soils and climatic conditions. It includes forests in dry and wet conditions, on calcareous and acidic sands and in the climatic gradient from southern Norway and the Baltics towards central Portugal. Many of these forests are indistinguishable in their floristic composition from inland examples of the same general type.  A first division can be made between forests of dry and moist soils. In moist dune slacks in the whole range of the habitat these forests are rather similar, with *Betula pendula* as one of the most important tree species, accompanied by *Populus tremula*. The understory consists of a combination of dune shrubs and common dune slack species, like *Mentha aquatica, Phragmites australis, Valeriana officinalis, Cirsium palustre, Eupatorium cannabinum and Calamagrostis epigejos* (alliance Ligustro vulgaris-Betulion pubescentis, sometimes considered as part of the Alnion incanae). In wetter conditions *Alnus glutinosa* or *Betula pubescens* may become dominant (Alnion glutinosae, Betulion pubescentis), with helophytic species like *Thelypteris palustris* and *Lycopus europaeus*. In some sites *Sphagnum* species dominate the moss layer. Rarely *Salix alba* will colonise wet dune slacks, forming woodlands.  The dry forests are more diverse, with *Quercus robur* as the dominant species in the Northwest-Atlantic and Baltic, and more thermophilous *Quercus* species (*Q. ilex, Q. rotundifolia, Q. suber*) in the warmer parts of the Atlantic coast, south of Loire estuary. In general these forests have a similar species combination to more inland forests on sandy soils, although some typical dune species like *Carex arenaria* and *Calamagrostis epigejos* will occur more frequently. The *Quercus* forests from the acidic dune sands in the northern and Baltic part of the range (alliance Quercion roboris) are often relatively species poor, with a heathy aspect beneath the trees, *Calluna vulgaris, Empetrum nigrum, Festuca ovina, Carex arenaria, Lonicera periclymenum, Polypodium vulgare* and other common species in the herb layer, and in many cases a high cover of bryophytes (*Pleurozium schreberi, Hypnum* spp*., Dicranum scoparium, Polytrichum* spp.) and lichens (*Cladonia* spp.). On slightly richer, more mature soils, *Fagus sylvaticus* may be dominant, or a combination of *Quercus robur, Ulmus minor, Acer pseudoplatanus* and *Fraxinus excelsior* (classified under Alnion incanae). The field layer may contain a set of geophytes, like *Scilla non-scripta* and *Galanthus nivalis*. Most different from inland types are the *Quercus robur* forests on calcareous dune sands, widespread in the central part of the Dutch dunes, but elsewhere rare. These, in many cases relatively young forests, contain a lot of shrubs, like *Crataegus monogyna, Rosa* spp., *Berberis vulgaris, Euonymus europaeus, Ligustrum vulgare, Hippophae rhamnoides* and *Rhamnus cathartica*. The herb layer differs, depending on the exposition of the dunes, but often includes a combination of species preferring dry, sandy soils and species of more humus- rich soils, with mixtures such as*Carex arenaria, Calamagrostis epigejos, Glechoma hederacea, Polygonatum odoratum, Convallaria majalis, Geranium robertianum* and *Galium aparine*. Sometimes rare species are found in the woodland edges, like *Scrophularia vernalis.* In the southern part of the distribution range more Mediterranean species are found in the canopy, like *Quercus ilex, Q. suber* and *Q. pyrenaica* sometimes mixed with *Pinus pinaster*, and in the understorey *Ruscus aculeatus, Cistus salviifolius, Arbutus unedo, Rubia peregrina, Ligustrum vulgare* and *Iris foetidissima.*  Because the coastal dunes of Europe have been relatively intensively used by man for many centuries, and in other parts are very dynamic, in general dune forests are relatively young and in many places also rare. Other woodlands have been created by planting, often with pine species, like dune areas between the Loire estuary and Les Landes in (South)western France. In general dune woodlands are restricted to the more inland parts of the dunes, but in some places low trees grow seawards as far as the first dune ridge, being reduced to a bonsai structure by the salty wind. Old plantations with dominance of deciduous trees with a similar structure and species composition as natural forests may be considered under this habitat. Pine forests on dunes belong to B1.7d (Baltics) or B1.7e (Mediterranean), while lower, shrubby woodlands, for example dominated by *Salix cinerea* in dune slacks or *Crataegus monogyna* on dry dunes, and *Sambucus nigra* woodland, in most cases growing together with Hippophae rhamnoides, are considered part of habitat B1.6a.  Indicators of good quality  These are relatively young woodlands, which often still are in a certain stage of succession. Open structures contribute to the richness of the species diversity.  • Variety of open woodlands (with many gradients towards shrub, heathland and grassland) and closed forests (with more typical species of shaded conditions)  • Dominance of broad-leaved species  • Absence of non-native or nitrophilous species  • Abundance of spring-flowering geophytes  • No or a low rate of disturbance by recreation  Characteristic species:  Tree canopy: *Acer pseudoplatanus, Alnus glutinosa, Betula pendula, Betula pubescens, Fagus sylvatica, Quercus ilex, Q. petraea, Q. pyrenaica, Q. robur, Q. suber, Ulmus minor*  Understorey/Herb layer: *Calamagrostis epigejos, Carex arenaria, Convallaria majalis Crataegus monogyna, Hedera helix, Ligustrum vulgare, Lonicera periclymenum, Polygonatum odoratum Ruscus aculeatus, Scilla non-scripta, Scrophularia vernalis, Teucrium scorodonia.* |
| B1.7b Black Sea broad-leaved coastal dune woodland | Natural or semi-natural tree and tree-shrub communities distributed along the Black Sea coast. The habitat has a very limited distribution in Bulgaria, where it is restricted mainly to two sites with the biggest dune systems: the Kamchia Reserve and the mouth of the Ropotamo River. Besides it is known from the Baltata Reserve. In Romania dunes with alluvial forest vegetation and many lianas are found in the maritime part of Danube’s Delta. The habitat was completely destroyed in the places of today’s Sunny Beach resort in Bulgaria. In the South-Western Black Sea coast (Ropotamo River) these woodlands occupy mostly the eastern, steep slopes on the biggest dune in Bulgaria, which is about 50 m high. The woods on the dunes have typical xerothermic features, the trees being small and strongly branched. These coenoses are dominated by *Carpinus orientalis*, *Fraxinus ornus*, *Quercus cerris*, *Q. frainetto* and *Q. pubescens*. The shrub layer is well developed and dominated mostly by *Ruscus aculeatus*, but also *Cotinus coggygria*, *Cornus mas* and the liana species *Asparagus acutifolius* participate in the floristic structure. The species composition of the herbaceous layer is diverse. In other areas covered by wooded dunes in Bulgaria and Romania the dunes are low (1.5-2 m) and partly covered by alluvial forest vegetation. Tree species typical for such forests are *Acer campestre*, *Fraxinus oxycarpa*, *Quercus robur*. Climbing species are common, like *Hedera helix*, *Periploca graeca* and *Smilax excelsa*. In good conditions these woodlands are dominated by native species. They are threatened by erosion and degradation. Other threats are fires, urban development, tourist pressure, and forestation with plantations of coniferous species (mostly *Pinus pinaster*). A main threat is the invasion of alien species, like *Amorpha fruticosa*, *Robinia pseudacacia* and *Eleagnus angustifolia*.  Indicators of quality:   * High species richness * Prevalence of native forest, shrub and herbaceous species * Absence of invasive species * Natural structure (absence of forest plantations and forest regeneration) * Long-term existence of mosaics of woodland, shrubland and psammophytic grasslands on the dune systems   Characteristic species:  Flora, trees: *Carpinus orientalis*, *Fraxinus ornus*, *F. oxycarpa*, *Quercus cerris, Q. frainetto*, *Q. pubescens*, *Q. robur.*  Flora, shrub & herb layer, climbers: *Asparagus acutifolius*, *Calystegia silvatica*, *Cotinus coggygria*, *Cornus mas*, *Dactylis glomerata*, *Hedera helix*, *Periploca graeca*,  *Ruscus aculeatus*, *Smilax excelsa* |
| B1.7c Baltic coniferous coastal dune woodland | Dune woods develop naturally where coastal sands become sufficiently stabilised and remote from the influence of saline ground water or spray to sustain a permanent cover of trees and they bear a strong resemblance to the zonal woodland types of the regional climate. On the Baltic coast of Germany, Denmark, Sweden, Finland, Poland, Estonia, Lithuania and Latvia, where the climate is Boreal to the north and east, Continental to the south-west, dune woods persist locally, though often reduced in quality now by replanting with introduced conifers. *Pinus sylvestris* is the natural coloniser and dominant and the overall character is similar to G3.4/5a Temperate Continental *Pinus sylvestris* woodland.  Associated trees and shrubs include *Quercus robur* to the south, with *Betula pendula, Juniperus communis*. Often there is a heathy field layer with *Vaccinium myrtillus, V. vitis-idaea, Calluna vulgaris, Empetrum nigrum, Arctostaphylos uva-ursi*, *Deschampsia flexuosa* and such distinctive boreal plants as *Moneses uniflora, Linnaea borealis, Chimaphia umbellata* and *Pyrola rotundifolia.* More locally, on calcareous sands, the flora can be basiphilous and, in more open stands, have a distinctively grassy look with *Festuca ovina, Hieracium pilosella, Peucedanum oreoselinum, Phleum phleoides, Thymus serpylllum.* On more recently colonised sands, dune species such as *Ammophila arenaria, Leymus arenarius* and *Carex arenaria* can persist among the trees. In Poland a variety of the habitat is found in wet depressions, with *Ledum palustre* dominating the field layer.  Indicators of quality:   * Presence of mature canopy of *Pinus sylvestris* with associated woody and herb species. * Absence of planted *Pinus sylvestris* or other commercial conifers with loss of associated native flora. * Infrequent burial of trees by storm-blown sands and forest fires. * Absence of logging. * Absence of human disturbance due to tourism or military activity.   Characteristic species:  Tree canopy: *Betula pendula, Quercus robur, Pinus sylvestris*  Field layer: *Arctostaphylos uva-ursi*, *Calluna vulgaris, Deschampsia flexuosa,* *Empetrum nigrum, Juniperus communis, Linnaea borealis, Melampyrum pratense, Moneses uniflora, Peucedanum oreoselinum, Chimaphila umbellata, Pyrola rontundifolia, Vaccinium myrtillus, V. vitis-idaea*  Mosses: *Leucobryum glaucum*  Lichens: *Cladina* subgen. *Cladina*, *Cetratia islandica, Stereocaulon* sp. |
| B1.7d Mediterranean coniferous coastal dune woodland | Dune woods develop naturally where coastal sands become sufficiently stabilised and remote from the influence of saline ground water or spray to sustain a permanent cover of trees and they bear a strong resemblance to the zonal woodland type(s) of the particular regional climate. Within the Mediterranean zone, on the coasts of Cyprus, Albania, Italy, Spain and the Atlantic coast of Portugal, various pine dominate the vegetation landscape, similar to G3.7 Mediterranean lowland to sub-montane *Pinus* woodland. The commonest trees in the western Mediterranean are *Pinus pinea, Pinus pinaster* and *Pinus halepensis* and in the east *Pinus brutia*. The first three are also widely planted on stable coastal sands in the Mediterranean and long-established plantations with natural undergrowth (like in the equivalent Annex 1 habitat type 2270 Wooded dunes with *Pinus pinea* and/or *Pinus pinaster*) are included in this habitat type. Associated woody species include *Phillyrea angustifolia, Rhamnus oleoides, Pistacia lentiscus, Olea europaea* var. *sylvestris, Tamarix gallica* and *Tamarix africana,* with *Juniperus macrocarpa, Juniperus phoenicea* and *Juniperus oxycedrus* in Spain and Portugal. Where such shrubs exceed the cover of pines, the vegetation is included in B1.6b Mediterranean and Black Sea coastal dune scrub.  Indicators of quality:   * Absence of planted native or introduced pines or other forestry trees such as *Eucalyptus* * Presence of uneven aged pine canopy with subordinate shrub layer * Presence of typical associated flora without weeds * Lack of disturbance from coastal tourism   Characteristic species:  Tree canopy species: *Pinus bruti, Pinus halepensis, Pinus pinea, Pinus pinaster.* Understorey species: *Juniperus macrocarpa, Juniperus phoenicea, Juniperus oxycedrus, Olea europaea* var. *sylvestris, Phillyrea angustifolia, Pistacia lentiscus, Rhamnus oleoides, Tamarix gallica, Tamarix africana.* |
| B1.8a Atlantic and Baltic moist and wet dune slack | This is a very broad habitat, comprising all open and closed, low to tall, aquatic, marsh and helophyte vegetation of moist to wet depressions in coastal dunes of the Atlantic and Baltic coasts. It comprises dune lakes and ponds with open water and floating or submerged vegetation, pioneer communities on bare shores, calcareous and acidic fen communities, as well as beds of helophytic reeds and sedges. Within the communities of the hygrosere (the succession series in dune slacks) the late succession stages (scrub, forests) and wet heathlands are considered under other habitats (respectively  B1.6a, B1.7a and B1.5a). Also mesic grasslands in coastal dunes are not included in the dune slack habitat, although they may in some cases grow in mosaic with this habitat. On a higher level EUNIS makes a distinction between coastal and inland habitats, but mesic freshwater grasslands in coastal areas are included under inland types, for example grasslands of the *Calthion palustris*, *Nardo-Juncion squarrosi*, *Cynosurion cristati* or *Molinion caeruleae*. In coastal areas such grasslands are often associated with old, traditionally managed meadows or pastures, and are less characteristic for dynamic dune slacks. In many cases they are found on the transition from dunes towards the inland, in other situations they are part of old, traditional mosaic landscapes (like machairs, see B1.9).  Dune slacks may develop in two ways. In the first place wind activity may blow out sand, resulting in depressions up to the depth level of groundwater. These depressions are known as secondary dune slacks. Primary dune slacks are the result of new formed fore-dunes, which isolate a beach from the influence of the sea and thus create a depression with groundwater influence within two ridges. In the Wadden Sea area a rare, third situation occurs on so-called green beaches, found on the head or tail of barrier islands. Such beaches are irregularly flooded both from the North Sea and from the Wadden Sea direction, and have complex gradients of dune slack, salt marsh and dry dune communities.  The water table in dune slacks fluctuates strongly during the year, with relatively wet conditions in winter and spring, and sometimes extreme dry conditions in summer. Because of these fluctuations peat layers rarely develop. In the Baltic coast the water table of dune slacks fluctuates less, and here in some cases acidic mire communities or even bogs develop in dune slacks.  In very wet conditions the dune slack communities of this habitat may form azonal climax communities, but in most slacks the pioneer and mire communities, as well as sedge and reed beds show succession towards scrub (*Salix*) and forest (*Salix*, *Betula*, *Alnus*). Mowing or grazing is practiced to conserve species rich, intermediate and young succession stages, for example communities of the alliances *Caricion davallianae* and *Caricion nigrae*. However, although such management may slow down succession, due to other changes in this dynamic landscape species composition changes in time. For example coastal erosion or sedimentation will change the size and place of freshwater lenses, and in this way affect the vegetation of dune slacks. In calcareous dune slacks, due to high precipitation rates, decalcification takes places, leading to changes in species composition. For this reason, the species rich calcareous fen communities of the *Caricion davallianae* are best preserved in dynamic landscapes, where now and then new primary dune slacks are formed. They may survive in older dune slacks, but only in places with a high rate of seepage of calcareous groundwater.  As many of the vegetation types of dune slacks are also found inland, in similar or other habitats, few plant species are restricted to the Atlantic and Baltic dune slacks. Some coastal species have been described as different ecotypes (*Parnassia palustris*), others have relatively larger populations in coastal areas (*Liparis loeselii*, *Sagina nodosa, Centaurium littorale, Potamogeton coloratus*). Only a few species are mainly restricted to coastal areas, like *Carex trinervis*.  Along the Atlantic coast these dune slacks are found from Norway to northern Spain, with relatively large areas in the broad dunes of Jutland, the Wadden Sea, mainland Netherlands, northern France and southwestern France. In Ireland, England and the Baltic coasts the dune slacks are relatively rare and more widespread. In Spain their occurrences are marginal, while the dune slacks along the Portuguese Atlantic coast belong to the Mediterranean habitat B1.8b.  Indicators of good quality:   * No anthropogenic changes in water table * Species richness * Occurrence of rare and endangered species * Broad diversity in different types of dune slacks and related plant communities * Forming intact landscape mosaics with and transitions towards dry dune habitats   Characteristic species:  Vascular plants:*Agrostis canina, Agrostis stolonifera, Anagallis tenella, Apium inundatum, Baldellia ranunculoides ssp. ranunculoides, Blackstonia perfoliata, Bolboschoenus maritimus, Calamagrostis canescens, Calamagrostis epigejos,Calamagrostis stricta, Carex demissa* (= *Carex oederi, C. serotina*), *Carex flacca, Carex hartmanii, Carex nigra, Carex punctata, Carex trinervis, Centaurium erythraea, Centaurium littorale,Centaurium pulchellum,  Centunculus minimus, Chara aspera, Chara baltica, Chara canescens, Cicendia filiformis, Cladium mariscus, Dactylorhiza incarnata, Dactylorhiza majalis subsp. purpurella, Eleocharis palustris, Eleocharis quinqueflora, Eleocharis uniglumis, Epilobium palustre, Epipactis palustris, Equisetum variegatum, Erica tetralix, Gentianella amarella, Herminium monorchis, Hippuris vulgaris, Holoschoenus romanus, Hydrocotyle vulgaris, Juncus acutus, Juncus alpinoarticulatus* (= *J. anceps*)*, Juncus arcticus* subsp*. arcticus,  Juncus arcticus* subsp*. balticus, Juncus articulatus, Juncus bufonius, Juncus maritimus, Juncus subnodulosus, Liparis loeselii, Littorella uniflora, Lythrum salicaria, Mentha aquatica, Myrica gale, Oenanthe lachenalii, Ophioglossum vulgatum, Orchis palustris, Oxycoccus macrocarpon* (=*Vaccinium macrocarpon*)*, Parnassia palustris, Phragmites australis, Pilularia globulifera,Platanthera bifolia, Potamogeton coloratus, Potamogeton gramineus, Potamogeton pectinatus, Potentilla erecta, Pyrola rotundifolia,  Radiola linoides,Ranunculus baudotii, Ranunculus flammula, Sagina nodosa, Salix repens* subsp*. arenarius, Samolus valerandi, Schoenus nigricans, Teucrium scordium*  Mosses: *Aneura pinguis, Bryum pseudotriquetrum, Calliergonella cuspidata, Campylium stellatum, Drepanocladus aduncus, Moerckia hibernica, Pellia endiviifolia, Preissia quadrata*  Amphibians: *Bufo calamita* |
| B1.8b Mediterranean and Black Sea moist and wet dune slack | This habitat type develops in small permanent or temporary fresh water bodies in the depressions between dune ridges of the Mediterranean and Black Sea coasts. These wetlands occur at the lower parts of white and grey dune systems, having a patchy distribution. Coastal dune slacks are more common along the Atlantic coasts as in the warmer Mediterranean and Black Sea coasts .Plant communities in wet dune slacks depend on the groundwater level. This varies spatially and temporally and dune slacks may occur in a range from permanent water bodies to waterlogged or moist sandy depressions.  The communities consist of typical hydro- or hygrophytic species. The permanent or semi-permanent (persisting until summer) water bodies, like small ponds, lakes and pools, are inhabited by aquatic vegetation, with species of the classes *Potametea* or *Charetea.* Often a zone of high grasses (reed, sedges, rushes, reed mace) develops at their periphery. Nutrient content also varies, but mostly the water is eutrophic to mesotrophic, sometimes even dystrophic. Temporary water bodies are very diverse in water depth and duration of water retention. Stands of high helophytes, like *Phragmites australis*, *Typha* spp*.,* *Juncus* spp., *Carex* spp. *Cladium mariscus*, *Holoschoenus* spp. and *Scirpus* spp*.* develop mostly on theover-wet sands, which desiccate during the summer. In such conditions, a slight salinization is possible, and halophytic species or small therophytes of the class *Isoeto-Nanojuncetea* may inhabit the bare bottoms. Such dune slacks are species rich and highly specialised habitats, and they are threatened by the lowering of water table.  Indicators of quality:  The habitat is very sensitive to every human disturbance, resulting from tourism development, physical damage, eutrophication, over growth through lack of grazing, climate change and especially changes in the water regime. The most important indicators of good quality are:   * natural water regime * balance between the hygrophytic and hydrophytic vegetation * diversity of plant communities depending on water dynamic * occurrence of a range of different dune slacks within dune systems at a landscape level   Characteristic species:  *Blackstonia perfoliata, Bolboschoenus maritimus*, *Carex distans, Centaurium pulchellum, Ceratophyllum demersum*, *Cladium mariscus*, *Cyperus flavescens, Holoschoenus romanus* (= *Scirpoides holoschoenus*), *Juncus acutus*, *Juncus littoralis*, *Juncus maritimus*, *Lemna minor*, *Lemna* *trisulca*, *Myriophyllum spicatum*, *Orchis laxiflora (= Anacamptis palustris)*, *Phragmites australis*, *Potamogeton spp., Samolus valerandii, Schoenus nigricans, Scirpus (=Schoenoplectus)* *lacustris*, *Typha angustifolia, Typha latifolia* |
| B1.9 Machair | Machairs are complex landscapes that support more or less extensive, short-turf dune grasslands in mosaics with calcareous lochs, saltmarshes, fens and other coastal habitats. In the National Vegetation Classification of the United Kingdom, twelve vegetation types have been mentioned belonging to the machair landscape. The grassland part is generally considered as ‘machair in the strict sense’ or ‘machair grassland’. The landscape always shows a long history of human intervention, especially through grazing, low-intensity systems of rotational cropping and fishery-related activities. Grazing may include cattle and/or sheep grazing, sometimes grazing by horses or goats is involved. Grazing by rabbits is an important natural phenomenon. The habitat type is found along the Atlantic coasts of Ireland and Scotland (where the largest and richest examples are found on the Outer Hebrides), characterised by a moist and cool climate, on calcareous sandy soils, that are blown inland from the shores by strong prevailing western winds, overlying peat or impermeable bedrock. The pH values are normally above 7.0. The dynamics of the system are enhanced by the digging and trampling activities of rabbits and domestic animals. The name machair is derived from the Irish word *magh*, meaning low-laying, fertile plain. A smooth surface is often considered an important criterion, like in the definition of Curtis: ‘systems in which the bulk of the area consists of a flat to gentle-sloping landform from which ridges are absent or very restricted and with a consequent restriction of the area of *Ammophila*’. The more or less humid sandy soils contain a significant proportion of shell fragments (up to 60 % of the soil or even more), producing lime-rich conditions. During winter, the low-lying parts of the system are flooded or at least waterlogged. The grasslands are dominated by rather generalist grasses including *Poa pratensis* and *Festuca rubra*, but a species- and flower-rich herb layer attracts many insects, whereas the complex landscape setting is important for breeding waders and other birds. As an example, at present, machairs support the healthiest western European population of the threatened Corncrake (*Crex crex*). On the European continent, to some extent, similar landscapes can be found, but not in the same complex landscape setting. In the Netherlands, for instance, low-lying, undulating plains with species-rich dry to humid dune grasslands do occur on old grazing grounds in the southwestern part of the country (*vroongronden*), but these sites are not dynamic and to a large extent decalcified. Calcareous, dynamic grasslands with a long history of human interference can be observed in the mainland dunes of Holland province (zeedorpenlandschap), but these are lacking the other landscape elements and wide-ranging grazing.  Indicators of good quality:  The following characteristics can be considered as indicators of good quality:   * High richness in herb species * Long-term, non-intensive human land-use, including grazing * Complex landscape setting, with grasslands and small water bodies and other elements   Characteristic species:  Flora: *Achillea millefolium, Arabis brownii, Asperula cynanchica, Bellis perennis, Cochlearia scotica Erodium cicutarium, Euphrasia marshallii, Euphrasia officinalis, Galium verum, Gentianella campestris, Lot us corniculatus,  Plantago lanceolata, Sedum acre, Thalictrum minus ssp. arenarium, Thymus praecox, Trifolium repens,* and many orchids, among which *Coeloglossum viride, Dactylorhiza fuchsii subsp. hebridensis, Dactylorhiza purpurella, Gymnadenia conopsea, Orchis mascula, Platanthera chlorantha and Spiranthes spiralis. Arabis brownii* is endemic to Ireland, *Cochlearia scotica, Dactylorhiza fuchsii* subsp*. hebridensis* and *Euphrasia marshallii* are endemic to Scotland. |
| B2.1a Atlantic, Baltic and Arctic coastal shingle beach | This habitat includes coastal shingle deposits, made up of pebbles or small to medium-sized cobbles, in the Arctic, Atlantic and Baltic region. It includes the higher supralittoral (or geolittoral) part of beaches above mean high tide which do not contain marine plant and animal communities. Such deposits are the result of sedimentation in a high energy environment of relatively coarse material (diameter between 2 and 200 mm) derived from eroded cliffs or glacial moraines.  Shingle deposits are mostly found in previously glaciated areas, and are therefore more common along the northern Atlantic and Baltic shores than in the Mediterranean and Black Sea. The majority and the best examples are found on the British and French coasts with 30% of the beaches of England and Wales consisting of shingle.  Variation in shingle deposits depends on geomorphology and coastal location. Typical shingle beaches are steep, because the waves easily flow through the coarse surface of the beach, decreasing the effect of backwash erosion and increasing the formation of sediment. One or two ridges can be noted, which indicate highest and mean tide or more on stormy beaches. The pebbles and cobbles often have been rounded by the wave activity, and the material usually consists of hard rocks, for example quartzite, granite and sandstone. Shores with larger cobbles, boulders or stable rocks are considered under B3.1a Rocky shores and cliffs. A mixture of shores with stones and finer material (shingles) between them is very common on moraine shores and in some locations extensive apposition beaches or cuspate forlands develop, where a series of consolidated parallel ridges of shingle structures are formed.  Much the largest site (over 2000 ha) is at Dungeness in Kent, southern England but other examples are found at Korshage in Denmark and on the German island of Rügen.  Because of the movement of the pebbles and stones, due to the tidal waves, this is a very dynamic environment where almost no perennial plant species can live but stabilized deposits can trap sand, silt or clay and driftlines with organic material can occur when slightly more abundant but still very open vegetation may develop. On apposition beaches and in the northern Baltic Sea where these shores are derived from moraine with mixed grain size, there are also variants with more abundant vegetation.  Characteristic plant species are mostly perennial, halophytic and nitrophilous and include *Crambe maritima*, *Glaucium flavum*, *Honckenya peploides*, *Beta maritima, Rumex crispus* and in the northern regions *Mertensia maritima, Leymus arenarius* and *Lathyrus japonicus* (= *L. maritimus*). In the high arctic (Svalbard) typical species of stony beaches are *Mertensia maritima*, *Cerastium alpinum*, *Cochlearia officinalis ssp. groenlandica* and *Sagina intermedia*.  Where driftlines are deposited, *Cakile maritima* , *Salsola kali* and *Atriplex* species may grow, species also common on sand beaches. In the Baltic region, shores with less rounded stones of variable size occur which are included in this shingle habitat, although they are not shingles in a strict sense. These habitats are common on moraine shores and have an open structure of stones and boulders of different sizes (6-60 cm), with meadow-like patches between them. Vegetation cover is in general less than 50%. Besides more-or-less halophytic species, like *Glaux maritima*, *Centaurium littorale*, *Centaurium pulchellum*, *Agrostis stolonifera* and *Plantago maritima*, also species more characteristic for tall-herb communities are found, like *Phalaris arundinacea*, *Vicia cracca*, *Sonchus arvensis* var. *maritimus*, *Valeriana sambucifolia* ssp. *salina*, *Angelica archangelica* ssp. *litoralis*, *Rumex crispus*, *Plantago major* ssp. *intermedia*, *Tanacetum vulgare* and *Veronica longifolia*.  More stabilized shingle deposits with grassland, scrub and woodland are considered under Red List habitats B2.4, B2.5 and B2.6.  Shingle beaches are a hostile environment for most animal species, very dry with extreme fluctuations in temperature. However, some seabirds and waders nest on consolidated shingle and certain specialized invertebrates are associated with this habitat, mainly occurring on the higher, rarely inundated parts, in places where plants grow. The fauna includes a relatively large set of bees (particularly *Bombus* bumble bees) , wasps, ants, beetles and spiders, of which several are restricted to this habitat.  Indicators of good quality:   * No disturbance of fauna, inclusing ground breeding birds and resting grey seals * Presence of rare fauna species * No intensive trampling or mechanical removing of shingle or vegetation * Stability of plant populations   Characteristic species :  Flora: *Angelica archangelica* ssp. *littoralis, Aster tripolium, Atriplex glabriuscula, Atriplex laciniata, Atriplex litoralis, Atriplex prostrata, Cakile maritima, Cerastium alpinum*, *Cochlearia officinalis ssp. groenlandica  Crambe maritima, Desmazeria marina,  Eryngium maritimum, Glaucium flavum, Honkenya peploides, Inula crithmoides, Isatis tinctoria, Lathyrus japonicus, Lavatera arborea, Linaria vulgaris, Mertensia maritima, Polygonum maritimum, Polygonum raii, Sagina intermedia, Salsola kali, Suaeda fruticosa (= S. vera), Tripleurospermum maritimum (=Matricaria maritima)*  *Fauna:*  Invertebrates: *Bembidion bipunctatum* (ground beetle), *Dyschirus angustatus* (ground beetle), *Ethelcus verrucatus* (weevil), *Megalesi yatesi* (fly), *Pseudomogoplistes squamiger* (cricket), *Sitticus inexpectus* (spider), *Trichoncus affinis* (spider),  Birds: *Arenaria interpres, Haematopus ostralegus, Sterna* spp*., Tringa totanus* |
| B2.1b Mediterranean and Black Sea coastal shingle beach | This habitat represents beaches with pebbles or small- to medium-sized cobbles (as opposed to sand beaches of type B1.1b). Typically, the stones’ size ranges from 2 mm to 200 mm diameter. The habitat is mainly formed on abrasive coasts, where sea waves (mostly in winter) weather physically the coastal cliffs.The eroded material forms shingle beaches, where different size of stones are mixed with mollusc shells, algae and sea grasses (*Zostera* spp., *Posidonia oceanica*) that are washed ashore. These deposits are normally rich in nitrogen due to the high quantity of decaying plant and animal remnants. In most sites there is no vegetation in this habitat, but in some places communities of annual and even perennial plants may occur, most frequent from the class *Cakiletea maritimae*. Sometimes semi-ruderal and nitrophilic coenoses can be developed as well. All communities have open structure and usually very low cover. The most typical plants are *Argusia sibirica*, *Crambe maritima*, *Matthiola sinuata, Glaucium flavum, Euphorbia* *peplis* and *Salsola kalii*. In the thermo-Mediterranean zone, some large coastal gravel banks may be partially colonised by evergreen woodland or riparian thickets dominated by *Quercus ilex*, *Tamarix africana* or *Vitex agnus-castus*. Such habitats are not included in this habitat type, but are considered under the relevant scrub and forest types.  These shingle beaches are rare along the western Black Sea coasts, but more common along the Mediterranean coasts, although sometimes they cannot be clearly distinguished from sand beaches.  Indicators of quality:  Well conserved shingle beaches host mostly annuals, but also by some perennials. Although this habitat is mobile in nature and thus adapted to natural disturbances, intense human disturbances may cause the complete removal of vegetation cover. Indicators of good quality are:   * the persistence of low vegetation cover * diversity and dominance of annual species and presence of some perennials * absence of active tourist pressure or anthropogenic structures on the beaches that prevent the drift accumulation * absence of alien species such as *Cenchrus spinifex* and *C.* *longispinus*.   Characteristic species:  Vascular plants: *Atriplex hastata, A. glabriuscula*, *A. tatarica, Argusia sibirica*, *Beta vulgaris subsp. maritima,* *Cakile maritima*, *Crambe maritima*, *Elytrigia juncea*, *Eryngium maritimum*, *Euphorbia peplis*, *Glaucium flavum*, *Lactuca tatarica*, *Leymus racemosus*, *Malcolmia maritima*, *Matthiola sinuata, M. tricuspidata, Medicago marina*, *Achillea maritima*, *Polygonum maritimum*, *P. mesembricum*, *Raphanus raphanistrum subsp. landra, Salsola kali*, *Sporobolus pungens, Xanthium orientale subsp. italicum*  Invertebrates: *Orchestia gammarela*, *Fucelia maritima*, *Thoracochaeta brachystoma*, *Aleochara algarum*, *Labidura riparia*  Birds: *Arenaria interpres*, *Calidiris alba* (during migration and wintering) |
| B3.1a Atlantic and Baltic rocky sea cliff and shore | This is a linear, narrow habitat of rocky cliffs and shores along the coasts of the Arctic Sea, the Baltic Sea, the North Sea and the Atlantic Ocean (southwards until Oporto, Portugal). In most cases it is related to eroding coasts, where the bedrock is exposed due to the eroding energy of the sea, but in some cases (like in the upheaval area of the Bothnian Gulf) rocky shores are found on sedimentary coasts. The habitat is restricted to hard cliffs, made of granite (crystalline rocks), sandstone, limestone, marble or schists. Soft, quickly eroding cliffs (for example with a loamy soil) are under habitat B3.4a. Pebble beaches are not included here, but considered part of shingles (habitat B2.1-3a). Littoral caves (HD Annex 1-type 8330) are considered under marine types. Anthropogenic rocky shores (dikes, stone walls) may contain several of the same species as sea cliffs, but are not considered part of this natural habitat. The habitat is dominated by exposed bedrock, while vegetation cover is low. The slopes are in many cases steep. Erosion at sea level causes the fall of higher parts of the cliffs, which conserves the steepness of cliffs, but in hard bedrock erosion rates are insignificant. Near the shoreline sometimes a notch is seen, where waves have eroded the bedrock surface. Elevation ranges from a few to several hundreds of meters. Amongst the highest sea cliffs in Europe are Slieve League in County Donegal, Ireland, reaching about 600 meters above the sea, and the cliffs on the West-coast of Iceland (more than 400 meters). The majority of the bedrock sea shores along the Baltic Sea are low with smoothed and rounded slopes, which are products of glacial abrasion. Cliffs are primary habitats on which no or little succession takes place, due to constant disturbance and ecological constraints by waves, wind and salt spray, combined with a lack of available water in the substrate. There is some influence of grazing, especially on cliff tops. But in many cases this habitat is inaccessible and rather undisturbed, the latter being a rarity on the European continent. Exceptions exist however, like in the Baltic Sea area, where summer houses are built also on sea cliffs. Rocky sea cliffs show gradients in species composition along the climatic gradient from south to north; besides three altitudinal zones are distinguished, from the supralittoral belt to the cliff top. The lowest, supralittoral zone is under the influence of waves, wind and sea spray and has a similar species composition as rocky shores, mainly consisting of lichens and algae. Also the middle cliff zone is very exposed, both wind and salt spray, and almost absent of soil development. Here a mixture of halophytic and chasmophytic vascular plant species is found. A species more-or-less restricted to this zone is the fern *Asplenium marinum*. The upper cliff and cliff top have a deeper soil, a higher vegetation cover and a vegetation which forms transitions towards grassland, heathland, shrub and forest habitats. In contrast to other regions in the world, hardly any shrub or tree species is found on the Atlantic cliffs, as few salt resistant species exist on the continent. The rocky shores of the Baltic Sea make an exception due to the low salinity of the sea. Also the gradient from south to north shows a shift in species composition in Europe. Common species over most of the latitudinal gradient are *Armeria maritima, Crithmum maritimum, Plantago coronopus, Plantago maritima, Silene vulgaris* subsp *maritima*, and on the cliff top *Agrostis stolonifera* and *Festuca rubra*. Typical northern cliff species are *Cochlearia scotica, Ligusticum scoticum, Puccinellia maritima* (on relatively wet sites), *Saxifraga oppositifolia, Sedum* (=*Rhodiola*) *roseum* and *Silene acaulis*. The lower cliff zone and rocky shores in boreal areas (like in the Baltic) contain few vascular plants, but are mainly occupied by filamentous algae and lichens (*Caloplaca* sp., *Ramalina* sp.). The arctic cliffs of Svalbard and Jan Mayen island contain *Oxyria digyna* and *Chrysosplenium tetrandum* as typical species, while (further) arctic elements are formed by *Alopecurus alpinus, Taraxacum arcticum, Cerastium arcticum* and several lichens. Cliff species with a relatively southern distribution are *Catapodium marinum, Sagina maritima, Daucus carota* subsp. *gummifer, Euphorbia portlandica, Inula crithmoides, Spergularia rupicola, Plantago crassifolia, Plantago maritima, Frankenia laevis, Dactylis glomerata* subsp. *oceanica* and several species of *Limonium*. Examples of *Limonium* species with a restricted range are *Limonium binervosum* agg., *Limonium dodartii, Limonium dufourei, Limonium girardianum, Limonium normannicum, Limonium ovalifolium* and *Limonium virgatum*. Along the coasts of the Channel, the rare *Rumex rupestris* (a species of the Annex II of the Habitats Directive) may be found in places where freshwater gathers on the lower part of cliffs, together with *Apium graveolens, Samolus valerandi* and *Agrostis stolonifera*. *Halimione portulacoide*s and *Salicornia ramosissima* can grow in the most wind and salt spray exposed cliffs, like those of the Massif Armoricain. Some cliffs have a high diversity of saxicole lichens. Some rare species are characteristic for some biogeographic zones, like *Teloschistes flavicans*. The coastal cliffs of Europe are important breeding sites for large colonies of sea birds, amongst which puffins, northern gannets, guillemots and razorbills. Different birds nest in different parts of the cliffs, but in general steep cliffs are preferred (safe against predators) in areas where plenty of sea food is available. Bird colonies may harbour several nitrophilous plant species, due to the guano and trampling, like *Tripleurospermum maritimum, Stellaria media, Cochlearia danica, Cochlearia officinalis, Atriplex* ssp., *Beta vulgaris* subsp. *maritima, Sonchus oleraceus* and *Poa annua*. In some cliffs of Brittany, the rare *Asplenium obovatum* subsp. *obovatum* is found.  Indicators of good quality:  The following characteristics are considered as indicators of good quality:  ·     no disturbance by man  ·     presence of sea bird colonies  ·     presence of characteristic zonation belts  ·     high diversity in lichens  Characteristic species:  Flora  *Agrostis stolonifera,* *Allium schoenoprasum, Anthyllis vulneraria,* *Armeria maritima, Asplenium marinum, Aster tripolium, Atriplex prostrata, Beta vulgaris* subsp *maritima, Catapodium marinum, Cochlearia danica, Cochlearia officinalis, Cochlearia scotica, Crithmum maritimum, Dactylis glomerata* subsp*. hispanica, Dactylis glomerata* subsp*. oceanica, Daucus carota* subsp*. gummifer, Euphorbia portlandica, Festuca rubra, Frankenia laevis, Inula crithmoides, Lavatera arborea , Ligusticum scoticum, Limonium binervosum* agg., *Limonium dodartii*, *Limonium normannicum*, *Limonium ovalifolium, Lotus corniculatus, Plantago maritima, Puccinellia maritima, Sagina marítima, Saxifraga oppositifolia, Sedum acre, Sedum (=Rhodiola) roseum, Silene acaulis, Silene vulgaris* subsp*. maritima, Spergularia rupicola.*  Bryophytes: *Schistidium maritimum*  Lichens (Baltic Sea): *Aspicilia leprocescens, Caloplaca* spp*., Lasallia pustulata, Lecanora actophila, Lichina confinis, Umbilicaria spodochroa, Verrucaria maura*  Fauna  Birds: Atlantic puffin (*Fratercula arctica*), northern gannet (*Sula bassana*), black guillemot (*Cepphus grylle*), Thick-billed murre or Brünnich’s guillemot (*Uria lomvia*), Common murre (*Uria aalge*; *only on boreal and arctic islands*), razorbill (*Alca torda*), little auk (*Plautus alle*; *arctic*), glaucous gull (*Larus hyperboreus*), European herring gull (*Larus argentatus*), Common gull (*Larus canus*), Lesser black-backed gull (*Larus fuscus*), Great black-backed gull gull (*Larus marinus*), Kittiwake (*Rissa tridactyla*), Northern fulmar (*Fulmarus glacialis*) |
| B3.1b Mediterranean and Black Sea rocky sea cliff and shore | This habitat type comprises open, halo-chasmophytic communities developing on the cliffs along the thermo-Atlantic, Mediterranean and Black Sea coasts. These coenoses develop under the influence of salt spray from the sea, especially in the supralittoral parts. Vertical to gently sloping bedrock and stable boulders in the supralittoral (or splash zone) of the majority of rocky shores are typically characterised by diverse maritime communities of yellow and grey lichens, such as *Xanthoria parietina*, *Caloplaca marina*, *Lecanora atra* and *Ramalina* spp. The black lichen *Verrucaria maura* is also present, but usually in lower abundance than in the littoral fringe zone. In wave exposed conditions, where the effects of salt spray extend further up the shore, the lichens generally form a wide and distinct band. The higher parts of sea cliffs are colonized by disjunct assemblages of salt-tolerant, halophytic or even halo-nitrophilous crevice plants (chasmophytes) or by more or less closed salt-tolerant grasslands (mainly on the cliff top). Perennial herbs are dominant, but also some annuals occur. There are processes of aridisation of the vegetation on the top of the higher rocks where the floristic composition is richer in different species depending upon the neighbouring dominant vegetation. The floristic composition depends also on the bedrock types, which are very diverse in the different part of habitat’s range. The main two groups are calcareous and silicate (often with volcanic origin) rocks and even loess-sand low cliffs along the Romanian Black Sea coast. Rare and endemic plants as well as widely distributed and ruderal nitrophilous species occur in the species composition. The vegetation belongs to the class *Crithmo-Staticetea* and the character species *Crithmum maritimum* is common everywhere in the habitat’s range. The Mediterranean sea cliffs harbour numerous endemics of extremely local occurrence, in particular many species belonging to the genus *Limonium*, which comprises at least 43 and probably 120 to 150 Mediterranean cliff species, many of which restricted to a few localities. Several of these species are seriously threatened, like for instance *Limonium remotispiculum* of southern Italy and *Limonium strictissimum* of Corsica and Caprera. Some stable and high coastal cliffs are inhabited by shrub communities of *Ficus carica*, *Colutea arborescens* and *Ulmus minor*.  Indicators of good quality:  In good conditions this habitat is rich in regional endemic species and the natural floristic structure is given by salt-tolerant chasmophytic species and halophytes. It is threatened by natural causes: the abrasive activities of sea waves leading to the natural destruction of the rocks. Other threats are the tourist development of the coastal areas, pollution and nitrification of the coastal cliffs and increase of not typical ruderal or alien species.  Characteristic species:  Flora  Vascular plants: *Allium commutatum, Ameria ruscinonensis, Anthemis rigida, Anthyllis barba-jovis, Asteriscus maritimus, Atriplex hastata, Atriplex tatarica, Bellium crassifolium, Bellium minutum, Brassica insularis, Brassica tyrrhena, Catapodium marinum, Centaurea cineraria, Centaurea filiformis, Cephalaria mediterranea, Cichorium intybus, Cichorium spinosum, Crithmum maritimum, Convolvulus lineatus, Crucianella rupestris, Daucus carota, Daucus gingidium, Dianthus sardous, Ecballium elaterium, Elymus pycnanthus, Euphorbia pithyusa, Halimione verrucifera, Frankenia hirsuta, Frankenia laevis, Frankenia pulverulenta, Helichrysum litoreum, Helichrysum pseudolitoreum, Helichrysum rupestre, Hyoseris taurina, Genista tyrrhena, Goniolimon collinum, Kochia prostrata, Lactuca saligna, Leuzea salina, Limonium sp.pl., Lotus cytisoides, Melilotus officinalis, Parapholis incurva, Phleum crypsoides, Phleum exaratum, Phleum subulata, Plantago weldenii, Prangos ferulacea, Psilurus incurvus, Reichardia picroides, Sagina maritima, Scolymus hispanicus, Sedum litoreum, Senecio bicolor, Senecio cineraria, Seseli bocconii, Silene caliacrae, Silene compacta, Silene martinolii, Silene sedoides, Valantia muralis, Xanthium spinosum*.  Lichens: *Caloplaca marina, Lecanora atra, Ramalina sp.pl. Verrucaria maura, Xanthoria parietina*  Fauna  Invertebrates: *Ligia italica, Littorina neritoides*.  Birds: *Apus apus, Calonectris diomedea, Falco eleonorae, Hydrobates pelagicus, Larus audouinii, Phalacrocorax aristotelis, Puffinus yelkouan, Sturnus roseus, Oenanthe pleshanca*  Mammals: *Monachus monachus.* |
| B3.1c Macaronesian rocky sea cliff and shore | This habitat comprises the rocky sea cliffs of the Macaronesian islands, which are formed by a narrow strip of lava bedrock (basalt) that is influenced by salt spray from the sea. Some of the Macaronesian coastal cliffs are among the highest sea cliffs in Europe and the world, like the Cliffs of the Giants along the western coast of Tenerife, with vertical walls reaching 500 meters above sea level, and the cliffs of Gabo Girao in Madeira, reaching a height of 540 m above sea level. The habitat refers to the area that is still under influence of the sea (waves, salt spray and strong wind), but above the mean high tide (supralittoral). The sea cliffs of the Macaronesian islands differ from those of the temperate Atlantic coast and the Mediterranean coast due to the dominance of a set of Macaronesian endemic species. The cliffs of the different island groups also show a diversity in species composition, which is expressed in three alliances of the class *Crithmo-Limonietea*: *Frankenio-Astydamion* of the Canary island, *Helichrysion obconico-devium* of the Madeiran archipelago and *Euphorbio azoricae-Festucion petraeae* on the Azores. In the Canary islands, the most characteristic species of sea cliffs are *Astydamia latifolia* and several endemic species of *Limonium*. Species that are also found at Atlantic and/or Mediterranean sea cliffs are *Crithmum maritimum, Plantago coronopus, Frankenia laevis, Frankenia pulverulenta*, and *Asplenium marinum*. Additional characteristic species which are restricted to the Canary islands are *Plantago aschersonii, Lotus glaucus, Argyranthemum frutescens, Frankenia ericifolia, Atractylis preauxiana, Reichardia crystallina* and *Reichardia ligulata*. The characteristic *Limonium* species are often restricted to only one or two islands, like *Limonium imbricatum* (La Palma, Tenerife), *Limonium fruticans*(Tenerife), *Limonium macrophyllum* (Tenerife, Gran Canaria) and *Limonium brassicifolium* (El Hierro, La Gomera). *Limonium pectinatum* (including*L. humboldtii*) is a more widespread species of coastal cliffs, found on most of the Canary Islands and also on Selvagens. *Limonium papillatum* is found on coastal cliffs of Lanzarote and Fuertaventura, but also on the smaller islands Alegranza, La Graciosa, Lobos and Selvagens. On Madeira the endemic shrubs *Helichrysum  obconium* and *Helichrysum devium* form different plant communities of coastal cliffs. Other characteristic species are *Lotus glaucus*, the endemic *Limonium pyramidatum*, *Crithmum maritimum, Lotus loweanus, Frankenia laevi*s and *Plantago coronopus*. In the Azores, the most characteristic species are the endemics *Azorina vidali, Daucus carota* subsp*. azorica, Euphorbia azorica, Festuca petraea, Myosotis maritima, Solidago sempervirens* subsp*. azorica* and *Spergularia azorica. Juncus acutus* grows on littoral lava bed depressions that are temporarily submerged in sea water, but also on rocky shores. Like in other coastal regions in the Macaronesian archipelagos, an altitudinal gradient with different zones may be distinguished within the cliff habitat, from the supralittoral belt to the cliff top, with algae and lichens on the lowest parts and transitions towards succulent vegetation and thicket on the higher cliffs. Additionally, in the Macaronesian archipelagos coastal cliffs and small islands form important nesting sites to pelagic and coastal seabirds, especially where these are inaccessible to predators and undisturbed by human or animals (e.g. no grazing). Important birds of the Macaronesian coastal cliffs are several species of Petrels and Shearwaters.  Indicators of good quality:  • No human or animal disturbance (e.g. no grazing)  • Presence of sea bird colonies  • Presence of characteristic zonation belts  • Absence of alien plant species (like *Mesembryanthemum* sp., *Carpobrotus* sp.)  Characteristic species:  Flora: *Argyranthemum frutescens, Asplenium marinum, Astydamia latifolia, Atractylis preauxiana, Azorina vidali, Crithmum maritimum, Daucus carota subsp. azoricus, Euphorbia azorica, Festuca petraea, Frankenia ericifolia, Frankenia laevis, Frankenia pulverulenta, Helichrysum devium, Helichrysum obconium, Limonium brassicifolium, Limonium fruticans, Limonium imbricatum, Limonium macrophyllum, Limonium papillatum, Limonium pectinatum (incl. L. humboldtii), Limonium pyramidatum, Lotus glaucus, Lotus glaucus,Lotus loweanus, Myosotis maritima, Plantago aschersonii, Plantago coronopus, Reichardia crystallina,Reichardia ligulata, Solidago sempervirens subsp. azorica, Spergularia azorica*  Fauna: Macaronesian Shearwater (*Puffinus baroli*), Manx Shearwater (*Puffinus puffinus*), Plain Swift (*Apus unicolor*), Band-rumped Storm Petrel or Madeiran Storm Petrel (*Oceanodroma castro*), Bulwer’s Petrel (*Bulweria bulwerii*), Cory’s Shearwater (*Calonectris diomedea*), Little Shearwater (*Puffinus assimilis*), White-faced Storm Petrel (*Pelagodroma marina*) and Fea’s Petrel (*Pterodroma feae*), which is only present on Buggio, Desertas Islands. |
| B3.4a Atlantic and Baltic soft sea cliff | The habitat refers to coastal loamy cliffs, with a bedrock of clays, shales or loamy sands, sometimes mixed with layers of pebbles, peat or gravel, which erode much quicker than cliffs with a hard bedrock. Erosion may be caused by storms, rain, waves and seepage from the inland, causing landslides, resulting in many sites in less steep cliffs than hard cliffs. The vegetation cover is low, with pioneer species prevailing, but sometimes with more closed grassland, shrubs and trees on the highest and less eroded parts, and also on parts of the cliff that have shifted downward by landslides. Because of soil movements and water streaming down the rock, many micro-habitats exist. Differences in bedrock layers, sediment size, soil chemistry, water flow and erosion patterns result in a widely varied habitat, with different species composition in different places.  In general, most species on the Atlantic and Baltic soft sea cliffs are common, widely spread ruderal species, that have adaptations to survive the turbulent conditions, for example deep rooting systems, broad spreading rhizomes or stolones, or a short life cycle. Examples of such common pioneers are *Tussilago farfara*, *Calamagrostis epigejos*, *Petasites spurius*, *Petasites hybridus*, *Hieracium umbellatum*, *Equeisetum arvense* and *Arabidopsis thaliana*. Where grasslands succeed to develop *Cynosurus cristatus*, *Dactylis glomerata*, *Daucus carota* subsp *gummifer*, *Agrostis* spp and *Festuca* spp are found. Several salt-tolerant species may be found, like *Plantago coronopus*, *Armeria maritima* and *Plantago maritima*. A rather characteristic species combination on soft cliffs along the Channel is *Brassica oleracea* and *Silene maritima*. Several rare species may be found on Baltic soft cliffs, like *Linaria loeselii*, *Tragopogon heterospermus* and *Alyssum gmelinii*. Scrub communities with *Rubus* sp., *Ulex* sp., *Prunus spinosa* can develop op long-time stable parts of the cliffs. On seepage areas *Phragmites australis*, *Salix* ssp and *Alnus glutinosa* may settle. *Rumex rupestris, Apium graveolens, Sonchus maritimus* and *Sonchus arvensis* grow together on soft cliffs of the western most coasts of the UK, France and Spain.  Coastal soft cliffs are a much rarer habitat than hard cliffs along the Atlantic coasts and in the northern and Baltic coast, but are relatively common on the southern and eastern shores of the Baltic Sea, with some large examples in the Wolinski National Park in Poland. More rarely soft cliffs are found in the Wadden Sea (for example the red cliffs of Sylt) and along the Channel coasts.  Indicators of good quality:   * diversity in micro-habitats, resulting in rich structural diversity * diversity between cliffs in different localities and along the altitudinal gradient * absence of invasive species   Characteristic species:  *Flora:**Armeria maritima,* *Brassica oleracea, Calamagrostis epigejos*, *Equisetum arvense, Hieracium umbellatum*, *Plantago coronopus*, *Petasites hybridus*, *Petasites spurius*, *Plantago maritima, Silene vulgaris subsp. maritima, Tussilago farfara* |
| B3.4b Mediterranean and Black Sea soft sea cliff | This habitat is formed by coastal soft cliffs and rocks (clays, friable sands, shales and glacial deposits) that are poorly resistant to the natural processes of erosion on the coasts of the Mediterranean and Black Sea, and in the southern Atlantic parts of Europe (northwards up to Porto, Portugal). These cliffs are subject to frequent slumps and land slips caused by erosion (e.g. waves, rain, winter storms, and groundwater percolating through the cliffs). The soft-sea cliffs frequently form borders with hard cliffs, giving rise to more complex habitats. On most soft cliff sites there are a range of micro-habitats formed by the fracture water streaming down the rocks, plus mosaics from open rocks and small patches of grassland and shrubs. In comparison to many coastal cliffs formed by granite, limestone and chalk, soft lithologies often form low, shallow, sloping cliffs which are more easily colonized by vegetation. However, the soft cliffs also erode much quicker than hard cliffs and vegetation is therefore restricted to pioneer stages in many places. Soft cliffs may support scrub similar to that on dunes with species like *Hippophae rhamnoides*, *Juniperus* spp. and *Crataegus monogyna*. On the western Black Sea coast many steppe and halophytic species, like *Camphorosma monspeliaca*, *Matthiola odoratissima* and *Peganum harmala*, may inhabit the chalk deposits over the sea. The single Black Sea locality of *Hippophae rhamnoides* outside the Danube Delta also occurs on soft sea-cliffs. Soft-sea cliffs are threatened by some natural causes such as slumping and landslips, which are sometimes of a cyclical nature. They can also be damaged through insensitive cliff top management and artificial drainage. Other threats include tourist development of the coastal area, pollution and nitrification of the coastal cliffs, and increase of non-typical ruderal species.  Indicators of quality:   * High species and micro-habitat richness * Presence of rare and/or threatened species * Low number of nitrophilous ruderals and alien species * Absence of human infrastructure on the top of coastal cliffs   Characteristic species:  Flora: *Camphorosma monspeliaca, Crataegus monogyna, Hippophae rhamnoides*, *Juniperus spp., Matthiola odoratissima*, *Peganum harmala*  Fauna: *Puffinus yelkouan, Oenanthe pleshanka* |
| C1.1a Permanent oligotrophic waterbody with very soft-water species | Oligotrophic waters of sandy plains and rocky substrates (granites, gravel, stones, till, moraines) containing very few minerals. The substrates are covered by a thin layer of detritus. The water is carbon deficient and very poorly buffered (low alkalinity). The water is weakly acid to circumneutral. Concentrations of nitrogen and phosphorus are very low and in the oligotrophic range. The water is clear sometimes humic (brown) but always with a very low concentration of chlorophyll. The vegetation is low in species diversity and dominated by aquatic isoetids, i.e. submerged plants with a small rosette of stiff leaves and an extended root system. Aquatic isoetids are adapted to low carbon availability (low pH) by taking up carbon from the sediment through their extended root system, by an adapted carbon fixation (C4), and by re-using carbon-dioxide produced during respiration. The vegetated layer extends from the littoral to lower parts of the sub-littoral zone. The vegetation and its substrate are mechanically influenced by water movement, ice sheets and wind exposition. Sometimes these oligotrophic water bodies can be almost totally unvegetated. In the temperate, Atlantic zone the characteristic isoetid vegetation occurs in lakes fluctuating in water levels where they may be semi-permanent in the summer periods (Arts, 2002; Dierssen, 1996). Apart from the dominant isoetid aquatic macrophytes (i.e. *Isoëtes* spp.), other plants may be present in addition (Rørslett & Brettum 1989). Important accompanying isoetid species are *Lobelia dortmanna, Subularia aquatica* in Northern Europe, *Eriocaulon aquaticum* in Northern-Atlantic Europe or *Luronium natans* and *Isolepis fluitans* in Western Europe zones. *Subularia aquatica* also extends into the mountainous areas of Iberia in this habitat type (Molina et al., 1999).  Many large lakes in northern Europe represent this type or the more mesotrophic type C1.1b in terms of water chemistry and abundant isoetid vegetation. Occurrence and abundance of other growth forms vary according to shore and bottom material, topography, exposition and fetch. Exposed shores have sparse stands of aquatic vegetation, in sheltered bays vegetation has clear zonation, but the stands are still open (Mäkirinta 1978, Rintanen 1982, Toivonen & Lappalainen 1980). The lower limit of submerged vegetation reaches typically the depth of 3-6 meters, sometimes close to 10 meters. Due to postglacial history deeper lakes host some glacial relict crustaceans and vertebrates, including salmonid fish and a critically endangered fresh water seal (*Pusa hispida saimensis*). Large lakes have diverse waterfowl populations and are important parts of bird migration routes  Main differences between this habitat type and the C1.1b is that this one is constantly in the oligotrophic range and therefore is generally poorer than C1.1b in species and communities. Indicators of good quality isoetid species are the most characteristic species of this habitat.  The following characteristics may be used as indicators of a favourable quality:  • Large stands of isoetid species;  • Absence or very low abundance of peat mosses;  • Absence or very low abundance of water plants from eutrophic and alkaline waters;  • Low abundance of water plants with other growth forms than the isoetid growth form, e.g. floating or emerged plants e.g. *Potamogeton* species or *Sparganium* *angustifolium* stands or helophytes (*Phragmites australis, Eleocharis* spp., *Equisetum fluviatile, Carex* spp.);  • Long-term habitat stability, with no rapid successional trends (e.g. no trends in acidification or eutrophication);  • Low concentrations of nutrients and chlorophyll (approximately P < 15 μg/L and chlorophyll < 3 μg/L.);  • pH weakly acid to circumneutral ( pH 5.5 - 7), alkalinity < 0.5 meq/L. (Note: Chemical and physical parameters are only indicative, they may change in different geographical area and climatic conditions).  • Thin layer of detritus (no accumulation of organic mud);  • No/ little impact from acidification or regulation;  • Absence or very low abundance of submerged or floating mats of macrophytes e.g. *Juncus bulbosus*;  • Occurrence of conspicuous populations of salmonid fish, but population of roach (*Rutilus rutilus*) and other Cyprinidae low.  Characteristic species:  Flora. Vascular plants: Boreo-atlantic: *Plantago uniflora* (syn. *Littorella uniflora*), *Lobelia dortmanna, Isoëtes echinospora, I. lacustris, Eriocaulon aquaticum. Potamogeton* *epihydrus, P. polygonifolius, Eleocharis acicularis, Myriophyllum alterniflorum, Juncus bulbosus*; Boreal: *Subularia aquatica, Ranunculus reptans, Eleocharis acicularis*; Atlantic: *Isoëtes boryana, I. velata* subsp. *tenuissima*; In the Atlantic presence of other soft-water species e.g. *Luronium natans* and *Isolepis fluitans*. Mosses: *Warnstorffia procera, W. trichophylla, Scorpidium scorpioides*. Macroalgae: *Nitella opaca, N. flexilis, N. transluncens.* Phytobenthos: *Eunotia naegelii, E. incisa,Tabellaria flocculosa, T. binalis, Navicula parasubtilissima.* Phytoplankton: typical of this habitat are the algae of the class *Chrysophyceae* that often tend to be the dominant in the phytoplankton, common species of other classes are *Spondylosium pulchellum, Bambusina borreri, Micrasterias truncata, Euastrum binale* var. *gutwinskii.*  Fauna. Macroinvertebrates: *Glaenocorisa propinqua, Sigara scotti, Arctocorisa germari.* Odonata: *Lestes dryas*. Diptera: *Pseudochironomus prasinatus, Pagastiella orophila, Telmatopelopia nemorum, Zalutschia humphrisiae.* Trichoptera: *Molanna albicans*. Amphipoda: *Gammarus lacustris, Gammaracanthus lacustris.* Mysida: *Mysis relicta*. Vertebrates: Fish of family *Salmonidae* (e.g. *Coregonus* spp., *Salmo* spp., *Salvelinus* spp., *Thymallus* spp.), *Osmarus eperlanus, Lota lota, Sander lucioperca, Perca fluviatilis, Esox Lucius*. Birds: *Gavia arctica, G. stellata, Anas* spp., *Aythya* spp., *Bucephala clangula, Larus fuscus, Mergus merganser, M. serrator, M. albellus, Melanitta* *nigra, Pandion haliaëtus.* Mammals: *Lutra lutra, Pusa hispida* subsp. *saimensis* (in Finland). |
| C1.1b Permanent oligotrophic to mesotrophic waterbody with soft-water species | Oligotrophic to mesotrophic waters of sandy plains and rocky substrates (granites, gravel, stones, till, moraine, clay) containing few minerals. Over large parts of the lake the sediment is covered by a thin layer of detritus and accumulation of mud is sparse. The water layer is carbon deficient and poorly buffered (low alkalinity). The water is weakly acid to circumneutral. Concentrations of nitrogen and phosphorous are low and in the oligotrophic to mesotrophic range. The water is clear, sometimes humic (brown) with a low concentration of chlorophyll. The vegetation is low to moderate in species diversity and is dominated by soft-water species. This soft-water vegetation consists mainly of communities dominated by the isoetid species *Plantago uniflora* and other soft-water species with other growth forms like *Myriophyllum alterniflorum*, *Potamogeton polygonifolius* and *P. gramineus*. Several soft-water species including *Baldellia ranunculoides* subsp. *ranunculoides*, *B. ranunculoides* subsp. *repens* and *Luronium natans* are atlantic and are absent from the boreal zone. In the temperate Atlantic zone boreal and atlantic species overlap. As a consequence, soft-water lakes are relatively richer in species in the temperate atlantic zone. Similar habitats in coastal dune slacks, with *Plantago uniflora* (= *Littorella uniflora*) as characteristic species, are considered part of habitat B1.8a. In soft-water lakes the vegetated layer extends from the littoral to lower parts of the sub-littoral zone. The littoral zone has fluctuating water levels and the littoral vegetation might be semi-permanent in the summer period. The vegetation and its substrate are mechanically influenced by water movement, ice sheets and wind exposition. Many large lakes in northern Europe represent this type or the more oligotrophic type C1.1a in terms of water chemistry and abundant isoetid vegetation. Occurrence and abundance of other growth forms (elodeids, aquatic mosses, sometimes also *Nitella* stands, nymphaeids and helophytes) vary according to shore and bottom material, topography, exposition and lake area exposed to wind and subsurface currents. Exposed shores have sparse stands of aquatic vegetation, in sheltered bays vegetation has clear zonation, but the stands are still open. The lower limit of submerged vegetation reaches typically the depth of 3-6 meters, sometimes close to 10 meters. Due to postglacial history deeper lakes host some glacial relict crustaceans and vertebrates, including salmonid fish and a critically endangered fresh water seal (*Pusa hispida* subsp. *saimensis*). Large lakes have diverse waterfowl populations and are important parts of migration routes. This habitat type must not be confused with oligotrophic to mesotrophic ponds only periodically flooded, which is instead typical of the Mediterranean area and dominated by isoetid species of *Isoëtetalia* and *Nano-Cyperetalia* (class *Isoëto-Nanojuncetea*). The vegetation of these habitats is composed of a contribution of annual and ephemeral species. These drier habitats are not part of the habitat described here, but belong to types C1.6b "Mediterranean temporary waters" and C3.5b "Periodically exposed shores with stable, mainly mesotrophic sediments with pioneer and ephemeral vegetation"*.*  Indicators of good quality:   * Large stands of soft-water species * Absence or very low abundance of peat mosses * Absence or very low abundance of water plants from eutrophic and alkaline waters * Low abundance of water plants with large floating leaves (Nymphaeids) or emergent plants (e.g. *Phragmites australis*, *Typha* spp., *Equisetum fluviatile,* *Carex* spp.) * Long-term habitat stability, with no rapid successional trends (e.g. no trends in acidification or eutrophication) * Low concentrations of nutrients and chlorophyll (approximately P < 40 μg/L and chlorophyll < 5 μg/L) * pH weakly acid to circumneutral ( pH 5.5 - 7.5) * Alkalinity 0.1 – 2 meq/L * Thin layer of detritus (no accumulation of organic mud) over large parts of the lake * Occurrence of conspicuous populations of salmonid fish, but population of roach (*Rutilus rutilus*) and other *Cyprinidae* low   *Note: Chemical and physical parameters are only indicative, they may change in different geographical area and climatic conditions.*  Characteristic species:  Vascular plants: Boreo-atlantic species: *Plantago uniflora* (*=Littorella uniflora*), *Lobelia dortmanna*, *Isoëtes echinospora*, *I. lacustris*, *Eleocharis acicularis, E. multicaulis, E. palustris, Juncus bulbosus, Lycopodiella inundata, Myriophyllum alterniflorum, Ranunculus flammula, R. reptans, Sparganium angustifolium, S. gramineum, Subularia aquatica, Potamogeton gramineus, P. polygonifolius, Samolus valerandi, Callitriche hamulata, C. palustris*; Atlantic species: *Eleogiton fluitans, Pilularia globulifera, Baldellia ranunculoides* subsp. *ranunculoides, B. Baldellia ranunculoides* subsp. *repens, Luronium natans, Hydrocotyle vulgaris, Ranunculus ololeucos, Deschampsia setacea*; Mediterranean-atlantic species: *Antinoria agrostidea, Baldellia alpestris, Juncus heterophyllus, J. emmanuelis*  Macroalgae: *Nitella opaca, N. flexilis, N. transluncens*  Mosses: *Fontinalis* spp. (e.g. *Fontinalis hypnoides*, *F. antipyretica*), *Fossombronia foveolata, Riccardia* spp*., Scapania* spp*., Warnstorfia exannulata, W. procera, W. trichophylla, Scorpidium scorpioides, Calliergon megalophyllum*  Phytoplankton: *Chrysophyceae; Bambusina borreri, Closterium lunula, Desmidium swartzii, Euastrum binale* var. *gutwinskii, E. oblongum, Micrasterias rotata, M. truncata, Pleurotaenium ehrenbergii, Spondylosium pulchellum, Staurodesmus convergens, Tetmemorus granulatus, Xanthidium antilopaeum.*  Phytobenthos*: Eunotia rhomboidea, E. incisa, Tabellaria flocculosa, T. binalis, Navicula heimansii, Anomoeoneis vitrea.*  Fauna:Macroinvertebrates: *Glaenocorisa propinqua, Sigara scotti, Arctocorisa germari*; Diptera: *Dicrotendipes tritomus, Psectrocladius psilopterus, Parakiefferiella bathophila, Pagastiella orophila; Chaoborus flavicans, Hygrotus novemlineatus*;Odonata: *Lestes dryas*; Trichoptera: *Molanna albicans*;Amphipoda: *Gammarus lacustris, Gammaracanthus lacustris;* Mysida: *Mysis relicta*.; In the sediments *Limnodrilus hoffmeisteri, Spirosperma ferox, Potamothrix hammoniensis.*  Vertebrates: Fish*: Salmonidae (e.g. Coregonus* spp., *Salmo spp., Salvelinus spp., Thymallus spp.), Osmerus eperlanus, Lota lota, Sander lucioperca, Perca fluviatilis, Esox Lucius*; Birds*: Gavia arctica, G. stellata, Anas spp., Aythya spp., Bucephala clangula, Larus fuscus, Mergus merganser, M. serrator, M. albellus, Melanitta nigra,* Pandion haliaetus*;* Mammals*: Lutra lutra, Pusa hispida* subsp. *saimensis* (in Finland). |
| C1.2a Oligotrophic to mesotrophic waterbody with Characeae | Water bodies belonging to this habitat are characterized by the occurrence of stonewart beds (*Characeae* family, so-called *Chara*-lakes). The waters are most often permanent, clear sometimes humic (brown) freshwater lakes and can be either mesotrophic or oligotrophic, either deep or shallow. The sediments are generally mineral (sand or clay) or lightly organic. The alliances *Charion vulgaris* and *Nitellion syncarpo-tenuissimae* are representative of more basic and nutrient rich (sometimes even eutrophic) waters. The waters are mostly rich in calcium (Ca > 20 mg/L) and are circumneutral to alkaline, moderately to highly buffered. The alliance *Nitellion flexilis* may occur in acid waters. In some cases this habitat type may be in contact with the habitat C1.2b (Mesotrophic to eutrophic waters with floating and/or submerged angiosperms). In Eastern Europe, *Lychnothamnus barbatus* may occur in this habitat; it is a rare species having its northern distribution in Poland and Lithuania.  Charophytes communities are usually poor in species diversity and are often represented by monospecific or very species-poor stands where one species is dominating. The stands may form an open or continuous and closed vegetation bed. The habitat includes pioneer vegetation types or vegetation types in an early successional stage. The habitat conditions that favour the development of Stonewart vegetation include: bare sandy or clayish substrate (e.g. after periodically dredging), relatively high influence of wind that contribute to maintain the lake surface without vegetation, dynamic water levels and periodical emergence of parts of the water body, high light conditions in early spring.  Temporary waters are included as far as related to *Charion vulgaris* vegetation type. It also includes calcium-rich marl and calcium supersaturated lakes, instead Chara-dominated communities of brackish waters belong to *the Charion canescentis* alliance and those are included in C1.5 (Permanent inland saline and brackish waters).  Aquatic vascular plants can accompany the *Chara* species, however stonewarts are largely dominating this habitat type.  Indicators of good quality:   * Large stands of *Chara* species * Absence or very low abundance of plant species characteristic of eutrophic waters * Low abundance of plant species with other growth forms than the *Chara* growth form, e.g. rooting or floating plants such as *Potamogeton* spp. or *Lemna* spp. * Low concentrations of nutrients and chlorophyll (approximately P < 30 μg/L and chlorophyll < 7 μg/L) * Low turbidity and clear water due by low concentrations of chlorophyll and suspended detritus and sediments in the water column * pH weakly acid to circumneutral to alkaline (usually pH 6-8) * A thin layer of detritus (no accumulation of organic mud).   *Note: Chemical and physical parameters are only indicative, they may change in different geographical area and climatic conditions.*  Characteristic species: Flora: Macro-algae: *Chara globularis, C. aspera, C. aculeolata, C. contraria, C. delicatula, C. hispida, C. rudis, C. vulgaris, C. intermedia, C. polyacantha, C. tomentosa, N. hyalina, N. tenuissima, N. syncarpa, Nitellopsis obtusa, Lychnothamnus barbatus.* |
| C1.2b Mesotrophic to eutrophic waterbody with vascular plants | This habitat type includes lakes, pools and stretches of rivers and broad streams with very slow-flowing water, which are naturally mesotrophic to eutrophic. The water is usually clear or brown (humic) with low to moderate concentration of chlorophyll and sediments suspended in the water column. The water is normally buffered to highly buffered and rich in basic ions with a pH typically circumneutral to basic. The sediment is rich in nutrients and might be partially organic and muddy. The habitat supports dense beds of aquatic macrophytes more or less rich in species. Macrophytes can disappear when pollution causes nutrient levels to rise further and the system enters the hypertrophic state. Aquatic macrophyte growth forms include floating and submerged forms. Depending on the water depth, the successional stage and the trophic status these waters can be colonized by communities dominated by *nymphaeid* species (such as *Nymphaea* spp., *Nuphar lutea, Nymphoides peltata*)*,* rooted hydrophytes (*Potamogeton* spp., *Myriphyllum* spp., *Najas spp., Vallisneria spiralis*), freely floating hydrophytes(*Ceratophyllum* spp., *Utricularia* spp., *Hydrocharis morsus-ranae,* *Stratiotes aloides* and *Lemna* spp.). Typical of pools and shallow waters are the communities dominated by aquatic species of the genus *Ranunculus* (syn. *Batrachium*) and *Callitriche*.  Most of the species populating this habitat type are critical to phosphorus concentrations in the water. Optimal conditions of this habitat are represented by a high nutrient content in the sediment (in the mesotrophic to eutrophic range) and a low nutrient content in the overlying water (with optimal values of phosphorus below 1 µmol/L over the growing season).  Beds of *Nymphaea lotus* var. *thermalis* in their natural distribution area are also part of this habitat. *Nymphaea lotus* is an East-African and Southeast-Asian species, however *N. lotus* var. *thermalis* is endemic to the thermal water of PeÅ£a River in Transylvania, Romenia.  Temporary flooded shores and emergent macrophytes stands are excluded from this habitat type and are instead included in other habitats C3.5a (Periodically exposed shores with stable, mainly eutrophic sediments with pioneer and ephemeral vegetation), C3.5b (Periodically exposed shores with stable, mainly mesotrophic sediments with pioneer and ephemeral vegetation) and C5.1a (Tall helophyte dominated freshwater vegetation), C5.1b (Small helophyte dominated freshwater vegetation).  Indicators of good quality:   * Dense beds of submerged and floating macrophytes * Relatively high species diversity of submerged and floating macrophytes * Absence or very low abundance of floating and submerged algae beds (FLAB) * Low abundance of emergent species indicators of a process of succession or eutrophication (e.g. *Phragmites australis*, *Typha* spp., *Sparganium* spp.*, Glyceria* maxima, *Schoenoplectus* spp., etc.) * Concentrations of nutrients and chlorophyll naturally in the range of mesotrophy and eutrophy (approximately P 20-100 μg/L and chlorophyll 5-40 μg/L) * Absence or very low abundance of exotic invasive species * Absence or very low abundance of species indicators of hypertrophic conditions (e.g. *Lemna gibba*, *L. minor, Spirodela polyrhiza,* etc.) * Not excessive turbidity of the water due to high chlorophyll concentrations and suspended detritus and sediments in the water column * pH weakly acid, to circumneutral to alkalinic (usually pH 6-8) * No excessive accumulation of organic mud and sediments. Occasionally a layer of detritus may occur in stands with *Nymphaeid* plants.   *Note: Chemical and physical parameters are only indicative, they may change in different geographical area and climatic conditions.*  Characteristic species:  Vascular plants: *Stratiotes aloides*, *Utricularia vulgaris*, *U. australis,* *Stuckenia pectinata, Potamogeton* spp. (e.g. *Potamogeton natans*, *P. coloratus, P. compressus, P. crispus, P. perfoliatus, P. pusillus, P. lucens,  P. acutifolius, P. berchtoldii, P. alpinus, P. friesii, P. obtusifolius, P. trichoides, P. nodosus, P. praelongus,* etc.), *Nymphaea alba, N. pumila, N. lotus var. thermalis* (only in Romania), *Nuphar lutea, N. pumila, Nymphoides peltata, Hydrocharis morsus-ranae, Ranunculus spp.* (*Ranunculus  circinatus, R. aquatilis, R. baudotii, etc.*), *Myriophyllum spicatum, M. verticillatum, M. sybiricum, Ceratophyllum demersum, Trapa natans, Najas marina*, *N. minor, N. flexilis, Groenlandia densa, Callitriche spp.* (e.g. *Callitriche palustris, C. stagnalis, C. hermaphroditica,* etc.), *Hottonia palustris, Wolffia arrhiza. Rare plant species are Aldrovanda vesiculosa, Caldesia parnassifolia, Luronium natans, Potamogeton rutilus, Najas tenuissima*  Bryophytes: *Riccia fluitans,* *R. rhenanan*, *Ricciocarpus natans*  Macroinvertebrates: This habitat hosts a very high diversity of macroinvertebrates (insects, crustaceans, worms , etc.), the most typical groups are *Odonata, Diptera, Decapoda, Amphipoda, Isopoda, Hemiptera, Bivalvia, Gasteropoda, Coleoptera, Tricladida, Hirudinea, Oligochaeta*.  Vertebrates: mammals: *Lutra lutra*; reptiles: *Natrix spp.* (*N. maura, N. megalocephala, N. natrix, N. tessellate*), *Emys orbicularis* (*includes several endemic subspecies*); amphibian: *Rana spp., Pelophylax* spp., *Bufo bufo, B. viridis*; birds: *Aythya ferina, A. fuligula, A. nyroca, Netta rufina, Anas strepera, A. platyrhynchos, Chlidonias hybrida, Larus ridibundus, L. minutus, Podiceps nigricollis,* *P. auritus, P. grisegena*, *P. cristatus,* *Tachybaptus rufficollis*, *Fulica atra*, *Himantopus himantopus, Galinulla chloropus, Cygnus olor, C. bewickii, C. colombianus, Ardea alba, A. cinerea, A. purpurea, A. ralloides, Phalacrocorax carbo,* etc. |
| C1.4 Permanent dystrophic waterbody | The term 'dystrophic' is applied to a water body that is usually shallow, rich in humus giving its water a brown colour, with variable amounts of nutrients (though the availability of nutrients in most cases is low), and with the deeper water often depleted of oxygen. Most boreal lakes and ponds have humic substances in the water, but only polyhumic ones (with colour >90 Pt mg/L) are recognized as dystrophic here, the humic substances in the water being derived from mires, wetlands or paludified forests. Oligo- (< 30) and mesohumic (30 – 90 Pt mg/L) lakes and ponds are included in types based on their trophic state (habitats C1.1a, C1.1b and C1.2a, C1.2b).  In most dystrophic lakes and ponds the water is acid, (pH 3-6), but some have a higher pH, often caused by eutrophication. Bottom sediments consist of organogenic mud and debris, and the soft bottom can be some metres thick. Shores consist usually at least partially of peat, representing bog and fen communities, often quaking due to overgrowth from pond margins to the open water. Dystrophic pools with a similar appearance occur also in raised bog systems but as the origin of those pools is usually related to the development of mire complexes, they are included in the D habitats. Small dystrophic ponds (usually <10 hectares) and pools are often in contact with swamps and mires, therefore the water near the shores is often characterized by overgrowth of fen and bog vegetation. Floating-leaved plants are constant, elodeids and isoetids sparse. *Potamogeton* species are often missing, due to low nutrient status and pH. Freely floating and drifting aquatic mosses (*Sphagnum* spp., *Warnstorfia* spp., *Drepanocladus* spp., *Fontinalis* spp.) can be abundant. *Utricularia minor* and *U. intermedia* are characteristic species. The cover of helophytes and vascular shore plants varies, typical species being *Carex lasiocarpa, C. rostrata, Phragmites australis, Equisetum fluviatile, Menyanthes trifoliata, Comarum palustre, Calla palustris* etc. Moss cover, often dominated by *Sphagnum* spp., is well developed on shores.  In boreal regions there are many larger lakes with polyhumic water. Beside peaty shores they have mineral bottoms and shores, often of till or glacifluvial origin. Floristically these lakes are close to habitat C1.1b maintaining sparse stands of helophytes (*Phragmites, Equisetum fluviatile, Schoenoplectus lacustris, Eleocharis palustris, Carex rostrata, C. lasiocarpa*), floating-leaved macrophytes (*Nymphaea alba, Nuphar lutea, N. pumila, Sparganium* spp.), elodeids (*Potamogeton perfoliatus, Myriophyllum alterniflorum*) and isoetids (I*soëtes* spp., *Subularia aquatica, Eleocharis acicularis*). Aquatic mosses are common. The vegetation of Lobelion dortmannae is typically occurring in this habitat type in oceanic Europe (e.g. Scandinavia and Ireland) but is absent in north-west European lowlands. Dystrophic water bodies are abundant in the boreal region with large mire areas, occurring typically on watersheds. They occur commonly in oceanic NW Europe as well but in continental Europe and southern Europe they are rare. Due to slow peat formation they are rare in northern boreal, arctic and alpine areas. Dystrophic lakes have deteriorated largely by forestry activities and drainage of peatlands for forestry, peat excavation etc., resulting in increase of humic substances, and in lowering of the water table. This has changed the bottom quality and depleted oxygen. Many lakes and ponds have also eutrophicated because of human habitation, construction activities and air-born nitrogen.  Indicators of good quality:   * Water body has natural hydrology and water chemistry, * The pH should be < 6, colour >90 Pt mg/L, * Catchment area has undisturbed hydrology and natural land cover, * Typical structure of vegetation and co-existence of Utricularids, aquatic mosses, floating-leaved plants, * Intact shore vegetation, * Low anthropogenic influence, in terms of drainage, construction activities, forestry, water exploitation, and eutrophication, * Absence of invasive alien species.   Characteristic species:  Flora: Vascular plants: *Sparganium minimum, S. angustifolium, S. emersum, Utricularia minor, U. intermedia, U. vulgaris, Juncus bulbosus, Myriophyllum alterniflorum, Potamogeton alpinus, P. perfoliatus, Isoëtes* spp. Close to the shores are characterized by helophytes growing on organic muddy sediments such as *Equisetum fluviatile, Comarum palustre, Calla palustris, Menyanthes trifoliata, Thelypteris palustris*. Generalist macrophytes such as *Nuphar* spp., *Nymphaea* spp., *Potamogeton natans, Phragmites australis, Typha angustifolia, T. latifolia, Schoenoplectus lacustris, Carex lasiocarpa, C. rostrata*, and mire plants, such as *Rhynchospora alba, Carex limosa, C. magellanica, Drosera longifolia, D. rotundifolia.*  Mosses: *Sphagnum cuspidatum, S. fallax, S. angustifolium, Calliergon* spp., *Warnstorfia* spp. (*W. procera, W. trichophylla), Fontinalis antipyretica, F. dalecarlica, Chiloscyphus polyanthos, Scapania* spp.  Algae : *Batrachospermum spp., Nitella flexilis, Chara* spp. (occassional).  Fauna: Birds: *Gavia stellata, Cygnus cygnus, Anas crecca*. Insects: *Chironomidae, Trichoptera, Odonata.* Mammals: *Castor fiber, Lutra lutra.* Amphibians: *Bufo* spp, *Triturus* spp., *Rana* spp. Fish: *Perca fluviatilis.* |
| C1.5 Permanent inland saline and brackish waterbody | This habitat type includes non-coastal brackish, saline or hypersaline lakes, ponds or pools. These water bodies may have been directly related to the sea in the past, but are currently separated from any sea influence. They develop in arid and semi-arid climatic conditions, in endorheic drainage basins (which are not connected to other water bodies such as rivers, and therefore the water does not drain to the sea), like in the Pannonian Basin or in smaller basins in the Mediterranean area. In these conditions permanent or temporary lakes become saline due to evaporation that concentrates dissolved salts that either have been introduced by rainwater or have been caught from substrata within the drainage basin. This habitat also includes saline intermittently flowing Mediterranean rivers, running on substrata with high salt content. These watercourses frequently dry out in summer, leaving shallow pools colonized by aquatic halophytes. Salinity and concentrations of chloride may vary from brackish to hypersaline water, depending on rain fall, evaporation rate and the basin substrate. In general brackish waters comply to a minimum salinity of 0.5‰. The water level may vary as well and can have high seasonal fluctuations up to the complete drying out in summer in the most arid and warm areas of Europe. Water is alkaline and highly buffered by bicarbonate (high alkalinity). Phosphorus- and sulphate concentrations can be relatively high (for submerged macrophyte vegetation), which may be related to high sulphur concentration in the sediment. The habitat represents a dynamic environment due to the variations in water quality and quantity as mentioned above. Species composition is largely determined by the presence of brackish water and the variability in salinity.  he vegetation growing in this habitat type is characterized by halophytes adapted to these circumstances. In general, the species composition is poor and the vegetation often consists of monospecific communities. Characteristic halophytes are *Najas marina, N. minor, Ruppia maritima, Batrachium* (=*Ranunculus*) *baudotii* and *Zannichellia palustris, Z. pedunculata, Z. obtusifolia*. Besides vascular plants, some stonewort are characteristic species, like *Tolypella nidifica, Chara canescens, Ch. baltica, Ch. aspera, Ch. intermedia* and *Ch. vulgaris*. Species with a broad habitat range may extend to these brackish waters, like *Lemna* spp. (L. gibba, L. minor, L. trisulca), *Potamogeton* spp. (*P. crispus, P. natans, P. pectinatus*), *Callitriche* spp. (*C. lenisulca, C. stagnalis, C. truncate* subsp*. fimbriata*), *Ceratophyllum demersum*, *Myriophyllum spicatum*, *Batrachium* spp., and *Nymphae alba*.  The shores of these saline water bodies are characterized by emergent vegetation dominated by macrophytes tolerant to brackish water, such as *Phragmites australis, Scirpus tabernaemontani, Bolboschoenus maritimus, Typha laxmannii, Cladium mariscus* and *Carex melanostachya*. However, such shore communities are included in habitat C5.4. Similar communities in coastal dune slacks are included under the habitats B1.8a or B1.8b. The habitat is important for several species of invertebrates and forms a feeding ground for birds. Because salt and ion concentrations are dependent on the evaporation rate, this habitat type is strongly related to climatic conditions. Therefore it is sensitive to climate change. Within Europe this habitat is rare. The largest sites are found in the Pannonian basin, for example the Neusiedler See.  Indicators of good quality:  The following characteristics may be used as indicators of a good quality:   * Minimum salinity around 0.5 ‰ * Natural high electrical conductivity of the water * No alteration of the natural salinity range * Aquatic vegetation and species characteristic of brackish water * Absence of overgrowing with shrubs and trees * No signs of eutrophication (no dominance of algae such as Cladophora sp., Enteromorpha sp., Vaucheria sp.) * No indicator of negative anthropogenic influence (e.g. regulation of the water level, chemical pollution)   Characteristic species:  Flora  Vascular plants: *Althenia filiformis, Althenia orientalis, Callitriche lenisulca, Callitriche stagnalis, Callitriche truncate subs. fimbriata, Myriophyllum spicatum, Najas minor, Najas marina, Potamogeton pectinatus, Ranunculus baudotii* (=*Batrachium baudotii*), *Ranunculus polyphyllus, Ruppia cirrhosa, Ruppia drepanensis, Ruppia maritima, Zannichellia palustris, Zannichellia obtusifolia, Zannichellia pedicellatae*  Macro-algae: *Ceramium diaphanum, Ceramium rubrum, Chaetomorpha linum, Chara aspera , Chara baltica, Chara canescens, Chara connivens, Chara galioides, Chara horrida, Chara intermedia, Chara tomentosa, Cladophora fracta, Enteromorpha intestinalis, Lamprothamnium papulosum, Tolypella nidifica, Tolypella hispanica, Tolypella salina, Ulva sp., Vaucheria sp.*  Fauna Macroinvertebrates: *Gammarus duebeni, Cordylophora caspia, Palaemonetes varians, Artemia spp, Daphnia magna, Alona elegans, Lestes macrostigma, Vertebrates: Aphanius fasciatus* |
| C1.6a Temperate temporary waterbody | This habitat type includes temporary freshwaters in the European temperate region. The associated plant communities seem not to be significant in the definition of the habitat which is mainly determined by hydrogeological and geomorphological conditions rather than by the biological component. These water bodies are characterized by large fluctuations of water level, which is related to the level of the underlying water table and to the amount of precipitation. In parts of the year, water is absent from these habitats and the plant and animal communities are mainly dependent by the seasonal hydrological regime, especially by the speed of drying out. The habitat can include a wide range of vegetation types, from wetland ones characterizing the areas where the water remains longer, to terrestrial ones in those areas where the water remains for a shorter time. The habitat includes the following distinct sub-types:  Turloughs have been described first as a habitat unique to Ireland but with a location also in Scotland and maybe Wales. However considering that this habitat is mainly determined by hydrological and geomorphological conditions it was recently recognized also in the Slovenian karst and other karstic areas of the temperate Europe and Mediterranean calcareous mountains. Turloughs are depressions of variable size developing on limestone, supporting vegetation and soils indicative of the prevalence of flooded conditions over at least part of the year. Flooding occurs annually in autumn mainly through springs and fissures in the underlying limestone though direct rainfall can have a secondary effect. Some turloughs in Ireland are affected by the tidal movements of coastal waters. In spring or summer draining often occurs through the same fissures or swallow-holes. Some turloughs can flood at any time within a few hours after heavy rainfall and subsequently may dry up again a few days later. This makes this habitat rather dynamic. The vegetation includes a range of vegetation alliances depending on flooding patterns, geomorphology, trophic status, grazing and climatic conditions. Mostly turloughs are grass- or sedge-dominated basins, which sometimes have a marsh or occasionally a permanent pond in the most depressed point. In the Burren, the high-water mark is often shown by *Potentilla fruticosa*. In Ireland the presence of the black moss *Cinclidotus fontinaloides* is a regular indicator of the location of a turlough. Moreover the habitat can includes rare wetland species such as the fen violet *Viola persicifolia*, the annual northern yellowcress *Rorippa islandica* and *Callitriche palustris*. In the Slovenian and Southern European karst systems, due to the different climatic and hydrological regimes, turloughs host mainly wet meadows. In these communities species such as *Lotus corniculatus, Centaurea jacea, Galium verum, Ranunculus acris, R. repens, Agrostis stolonifera, Achillea millefolium* are common. Turlough wetland communities can be classified into three main phytosociological classes: the *Scheuzerio palustris-Caricetea fuscae* of small-sedge communities, the *Molinio-Arrhenatheretea* including wet meadows and disturbed habitat communities, and the *Littorelletea uniflorae* lakeshore communities found on the margins of more permanent water bodies within turloughs. *Caricion davallianae* and *Potentillion anserinae* are the phytosociological alliances listed in the Habitats Directive as characteristic of this habitat. Aquatic and marsh communities often occur in the lower parts of turlough basins.  Lakes of gypsum karst is a very rare habitat, that includes small lakes that have developed by springs or spring complexes of active gypsum karst areas. The underlying rock might be gypsum or limestone, characterized by calcium sulphate and carbonate, respectively. Karst sinkholes might have a different shape and depth. They may appear as chains of funnel-shaped sinkholes and small hollows. They usually accumulate water but also fall dry periodically. The lakes are characterized by pronounced fluctuations of water level as well as high concentrations of calcium sulphate. Since lakes of gypsum karst significantly differ in shape, size, age and origin, their vegetation can be quite diverse. Older sinkholes can develop in lakes or bogs or into a terrestrial wet meadows vegetation. Younger ones can have a diverse vegetation including submerged and free-floating aquatic macrophytes. In general the vegetation is well adapted to fluctuating water levels (including semi-permanent conditions) and relatively high sulphate levels. Therefore, a number of alliances of the Littorelletea might be found in these habitats: *Subularion aquaticae, Deschampsion litoralis, Lobelion dortmannae, Littorellion uniflorae, Hyperico elodis-Sparganion*.  Indicators of good quality:   * The periodical alternation of wet-and-dry regimes * The absence of heavy anthropogenic activities that can alter the hydrogeological system (e.g. water capitation and drainage) * The absence of communities and species indicating an excessive nitrification or disturbance such as ruderal and exotic species   Characteristic species:  The species of vascular plants that can occur in this habitat type are many and are usually not exclusive of this habitat. Therefore some species can be considered diagnostic of the habitat only in combination with the geomorphological and hydrogeological conditions.  Vascular plants: *Viola persicifolia, Potentilla fruticosa, Rorippa islandica Callitriche palustris, Subularia aquatica, Deschampsia setacea, Lobelia dortmanna, Littorella uniflora, Hypericum elodis, Sparganium gramineum, Chara* spp., *Lotus corniculatus, Centaurea jacea, Galium verum, G. palustre, Ranunculus acris, R. repens, Agrostis stolonifera, Achillea millefolium, Juncus inflexus, J. effusus, Eleocharis palustris, Carex acuta, C. davalliana, C. paniculata, C. vesicaria, Lysimachia vulgaris, Trifolium fragiferum, Thalictrum flavum, Filipendula ulmaria, Mentha longifolia, Glyceria notata, G. fluitans, Alopecurus rendlei, Hordeum secalinum.*  Bryophytes: *Cinclidotus fontinaloides, Fontinalis antipyretica, Drepanocladus* spp., *Calliergon* spp.  Macroinvertebrates: insects, crustaceans, flatworms and snails are often abundant. Species frequently reported are *Cleon dipterum, C. simile, Bithynia tentaculata, Lymnea peregra, L. palustris, L. stagnalis, Polycelis nigra, Chydorus sphaericus, Daphnia pulex, D. longispina, Diaptomus castor, D. cyaneus, Cyclops agilis, Ostracoda* spp. *Gammarus* spp., *Asselus* spp.*, Hydroporus palustris, Porhydrus lineatus, Eurycercus glacialis, Eurycercus lamellatus, Hydra* spp.*, Hygrotus quinquelineatus, Berosus signaticollis, Hygrotus impressopunctatus, Helophorus* spp.*, Tanymastix stagnalis, Agonum lugens, A. livens, Badister meridionalis, Blethisa multipunctata, Pelophila borealis, Beetle species, Agonum lugens, Philonthus furcifer, Chirocephalus* spp.  Vertebrates: When turloughs retain some water all year, they may be important bird haunts, e.g. *Anser albifrons*, *Cygnus cygnus*, *Anas* spp. and many waders can occur in winter. Amphibians such as *Triturus* spp., *Bombina* spp., *Bufo* spp., *Hyla* spp. and *Rana* spp. can use this temporary water bodies for reproduction during spring. |
| C1.6b Mediterranean temporary waterbody | These are shallow to very shallow temporary pools, existing only in winter and early spring, and seasonally wet depressions, mostly oligotrophic, in the Mediterranean and warm Atlantic part of Europe, and in Northern Africa.  They are colonised by pioneer ephemeral freshwater vegetation with above-ground growth visible for only a short part of the year,  just 1-3 months. The predominant life forms are annual amphiphytes (Mediterranean spring annuals/therophytes), germinating in the aquatic phase and reproducing in the terrestrial ecophase, such as species of *Juncus, Lythrum* and*Elatine* or semi-terrestrial geophytes such as species of *Isoetes* and *Serapias*. Ephemeral vegetation types constituted by these plant species occur on water-saturated or submerged acidic sands or calcium rich soils, which completely dry out in spring. In some cases ephemeral vegetation is also developed in the flush habitats on rock outcrops, where seasonal surface runoff creates temporarily wet conditions in the patches of rock debris. The communities are classified in the order Isoetalia, covering the alliances Isoetion, Cicendion, Lythrion tribracteati, Preslion cervinae and Agrostion salmanticae. This habitat is very important for invertebrates (especially branchiopods and dragonflies) and amphibians (newt and frogs, like species of *Triturus, Bufo, Rana* and *Hyla*).  Indicators of quality:  • Distinct vegetation zonation related to the water level fluctuations  • Natural hydrological regime of the catchment with no significant hydrological impact by e.g. water extraction as indicated by pipes, dams, removal of soil/gravel and with conditions adequate for the survival and persistence of typical species  • High insolation of the habitat without excessive shading by scrub or forest vegetation  • Relative abundance of Mediterranean annual and geophytic species  • Substrate with no excessive disturbances (e.g. excessive trampling)  • Clear water with no eutrophication  • Absence of evidence(s) of primary or secondary succession (e.g. encroachment of shrubs, tall helophytes) and or floating species (pleuston)  • No garbage and waste dumping  • No impact of pesticides and pollutants  • Not significant presence of nitrophilous or ruderal species or invasive neophytes  Characteristic species:  Vascular plants: *Aira elegantissima*, *Agrostis pourretii*, *Baldellia ranunculoides*, *Bellis annua*, *Briza minor*, *Centaurium maritimum*, *C. spicatum*, *Chaetopogon fasciculatus*, *Callitriche brutia*, *C. truncata*, *Cicendia filiformis*, *Crassula tillaea*, *C. vaillantii*, *Crypsis aculeata*, *C. alopecuroides*, *Cyperus michelianus*, *Damasonium alisma*, *D. bourgaei*, *D. polyspermum*, *Elatine gussonei*, *E. macropoda*, *Eryngium corniculatum*, *Exaculum pusillum*, *Herniaria glabra*, *Illecebrum verticillatum*, *Isoetes duriei*, *I. heldreichii*, *I. azorica*, *I. histrix*, *I. setacea*, *I. velata*, *Isolepis setacea*, *Juncus bufonius*, *J. capitatus*, *J. foliosus*, *J. pygmaeus*, *J. tenageia*, *Lotus conimbricensis*, *L. angustissimum*, *L. parviflorus*, *Lythrum castellanum*, *L. flexuosum*, *Lythrum thymifolia*, *L. tribracteatum*, *Marsilea batardae*, *M. strigosa*, *Mentha cervina*, *M. pulegium*, *Nananthea perpusilla*, *Ophioglossum lusitanicum*, *Pilularia minuta*, *Ranunculus batrachioides*, *R. dichotomiflorus*, *R. lateriflorus*, *R. muricatus*, *R. revelieri*, *R. trilobus*, *Serapias cordigera*, *S. lingua*, *S. neglecta*, *S. vomeracea*, *Sisymbrella aspera*, *Solenopsis corsica*, *S. laurentia*, *S. minuta*.  Bryophytes: *Calliergon cuspidatum*, *Drepanocladus fluitans*, *Eurhynchium striatum*, Riccia spp.,  Fauna : Amphibians : Salamandra spp, Triturus spp, Discoglossus spp, Alytes spp., Pelobaates spp, *Pelodytes punctatus*, *Pelodytes ibericus*, Bufo spp, Hylas pp, *Rana perezi*, Rana kl. grafi. Branchiopods: Branchypus spp, Chirocepalus spp, *Linderiella massiliensis*, Streptocephalus spp, Tanymastigites spp, *Lepidurus apus*, *Triops cancriformis*, Cyzicus spp, *Imnadia yeyetta*. |
| C1.7 Permanent lake of glaciers and ice sheets | Glacier lakes are formed as a consequence of melting of a glacier or icesheet, typically bordering to melting glaciers. In some cases these waterbodies can occur under the glacier. Glacier lakes are formed in depressions or crevices filled by melting water. In areas without depressions melting water runs as subglacial brook or river, and later discharges to alpine brooks or rivers (type C2.2a, and C.3.5d). Glacier lakes are often dammed by a rock threshold or a moraine ridge. If water volume increases, the lake can outburst through the damming.  Permanent or almost permanent ice formations are characteristics of glacier lakes, constituting of continuous ice sheets that may cover the entire surface for all the year or recede to part of the lake during summer, being accompanied or replaced by floating ice blocks. They may locally, seasonally or permanently, extend to the whole depth of the lake. Glacier lakes are mainly abiotic environments. Benthic and planktonic microalgae form ultraoligotrophic communities consisting of cold-adapted species; usually lakes are without any higher vegetation. If high mountain lakes or brooks are nearby, some aquatic mosses, macroalgae and macroinvertebrates may invade glacier lakes. In some cases also fish and waterfowl spreads to glacier lakes, particularly in water bodies on lower elevation or in coastal areas. A good example is the Jökulsárlón glacier lagoon in Iceland where fishes drift in from the sea along with the tides. Glacier lakes are also in contact with various other arctic and alpine habitats, usually unvegetated or with very sparse vegetation. Typical adjacent habitats are rocks, screes, boulder and gravel fields, moraine ridges or sandur-formations. Permanent glacier lakes occur in Europe only in a few countries, a majority of them in Iceland and Norway, Because of the small size of glaciers in the Alps the habitat is very rare there.  Water bodies can also be formed under the glacier. A special type of these water bodies occurs in Iceland where large glaciers (particularly Vatnajökull) lie above active volcanoes. Volcanic activity can melt large quantities of water under the ice, resulting in large-scale outburst of melting water with mud, gravel and stone. Several glacier lake outburst floods (GLOFs) are known from Iceland during the last centuries. An example is the outburst of the volcano Grimsvötn, situated under the Vatnajökull ice cap, in the 1990s. Also Myrdalsjökull is famous for these catastrophic events, called jökulhlaup in Icelandic.  Indicators of good quality:   * Long-term stable hydrology, reflected in a balance between accumulation of ice and melting of the glacier   Characteristic species:  Benthic and planktonic algae: mostly cyanoprokaryotes (*Nostoc* spp., *Lyngbya*, *Oscillatoria* spp., *Leptolyngbya*, *Planktothrix rubescens, Tolypothrix* spp., ), diatoms (*Achnanthes, Cyclotella, Cymbella, Pinnularia*), and green algae (*Botryococcus braunii, Mougeotia, Closterium*). *Mesotaenium berggrenii* and *Chlamydomonas nivalis*,belonging to a community of ice and snow algae, can occur in melted snow and icy slush in glacier lakes. |
| C2.1a Base-poor spring and spring brook | Springs are habitats where groundwater discharges to earth surface or to a water body. Their microclimate, hydrology, water volume, chemistry and discharge type (rheocrene, limnocrene, and helocrene springs), and consequently animal and plant communities, are very variable. Sometimes springs are dominated by abiotic features, sometimes their biotic communities are very rich (particularly helochrenes with moss carpets, specialized plants and macroinvertebrates). Springs are usually small-sized but in some cases large complexes (up to several hectares) of pools, vegetation patches and moist seepage areas occur. As compared to other moist habitats spring habitats are characterized by low temperature, small annual fluctuation in the water temperature, and often by high content of oxygen in the water. These features are most representative in cold stenothermic springs where mean temperature is only a few degrees above 00C and the annual amplitude is very small. The pH of base-poor springs is typically from slightly acid, form pH > 5.5 to circumneutral or slightly alkaline. The diverse physical structure and the water chemistry are main determinants for spring biota, the former particularly to macroinvertebrates, the latter to bryophytes. Through groundwater, rich in nutrients and oxygen, springs have often locally enriching influence to adjacent habitats, for example to headwater streams or to mire, meadow or forest habitats. On the other hand, adjacent habitats, for example forest, can have strong influence on springs and spring brooks, both by shadowing and as a source of allochthonous material. The stenothermic springs in cold (arctic, alpine) areas are dominated by mosses, while cover of vascular plants (such as *Saxifraga* spp., *Koenigia islandica*, *Epilobium hornemanni*) is low or zero. In montane and subalpine springs vascular plants, representing alpine and arctic floristic elements, are more common, but in most cases moss communities prevail. In lowland springs vascular plants can be abundant. Due to their characteristic microclimate, with a low temperature during the growing season, springs can accommodate disjunct (often relict) occurrences of northern and alpine species. However, in northern locations, they can maintain also occurrences of species with southern origin, due to unfrozen water and soil during wintertime. Spring habitats are sensitive to disturbances, because they are affected by changes in their close surroundings but also in their catchment areas. Many springs have been destroyed or deteriorated in quality due to a range of activities related to groundwater abstraction, utilisation of spring brooks, forestry, clearing of agricultural land, soil and rock excavation, and construction activities. Threats include eutrophication and chemical contamination too. In arctic, alpine and north boreal areas spring habitats have remained to large extent in natural condition, in lowlands many of them have been destroyed or their quality declined.  Indicators of good quality:   * Natural hydrology and water chemistry in springs and spring brooks, * Low anthropogenic influence (drainage, water exploitation, forestry, agriculture, eutrophication etc.) in springs, their surroundings and catchment areas, * Presence of plants and animals adapted to spring conditions, including threatened species, * High cover of mosses and specialized vascular plants, * Rich macro-invertebrate fauna, * Low cover of encroaching tall grasses and shrubs. * Absence of invasive alien species.   Characteristic species:  Flora: Vascular plants: *Cardamine amara, Montia fontana, Epilobium alsinifolium, E. nutans, E. hornemannii, E. obscurum, E. palustre, Carex acutiformis, C. paniculata, C.remota, C. vaginata, Cardamine flexuosa, Chrysosplenium alterniflorum, C. oppositifolium, Circea alpina, C.* x *intermedia, Crepis paludosa, Impatiens noli-tangere, Myosotis stolonifera, Petasites frigidus, Poa remota, Saxifraga aizoides, Saxifraga stellaris, Stellaria alsine, Veronica nevadensis*.  Mosses: *Brachythecium rivulare, Bryum weigelii, Bryum schleicheri, Calliergon cordifolium, Chiloscyphus polyanthos, Cratoneuron filicinum, Mniobryum, Philonotis fontana, Philonotis tomentella, Pohlia wahlenbergii, Rhizomnium, Plagiomnium, Scapania uliginosa, Scapania undulata, Sphagnum riparium, Sphagnum squarrosum, Sphagnum teres, Warnstorfia exannulata*.  Fauna: Birds: *Cinclus cinclus*.  Invertebrates: *Plecoptera,Trichoptera, Diptera (Chironomidae,Simulidae), Gammarus* spp., *Asellus aquaticus, Pallasea quadrispinosa, Cladocera.* |
| C2.1b Calcareous spring and spring brook | Calcareous springs, spring brooks and tufa cascades of karstic rivers differ from base-poor springs (C2.1a) and spring brooks due to their hard water, caused by the high calcium content. Consequently, the pH is clearly alkaline, (pH 6.5-8.5), and the specific conductivity high. This habitat occurs in areas of calcareous bedrock and soils. It is a naturally rare and nowadays declined habitat, particularly in most of the lowland areas in Europe. In montane and alpine areas calcareous springs are more common, and have remained intact to a greater extent. Calcareous springs are usually occurring as small patches. Tufa waterfalls and cascades are characteristics of watercourses in karstic areas of Europe, especially in the Dinaric Alps. The tufa-deposition and later the travertine formation are organogenic processes dependent by the organisms (bacteria, algae, mosses and plants) growing on the substrate. The periphyton produces mucopolysaccharides in which crystals of calcium carbonates (CaCO3) are trapped. This phenomenon is pronounced in many karstic areas and is very sensitive to natural or anthropogenic changes in water chemistry. In northern, geologically young springs tufa formations are not well-developed, but calcareous gyttja (organic mud) is common in sediments. Calcareous springs, spring brooks and cascades are species-rich habitats with abundant cover of mosses. Beside species in common with base-poor springs (type C2.1a) there is a number of calcium-demanding mosses and vascular plants. A high dominance of the moss *Cratoneuron commutatum* is often typical. Threats for this habitat type are the same as in base-poor springs; in lowland areas many calcareous springs have been destroyed by forestry and clearing of agricultural land.  Indicators of good quality:   * Natural hydrology and water chemistry in springs and spring brooks, * Low anthropogenic influence (drainage, water exploitation, forestry, agriculture, eutrophication etc.) in springs, their surroundings and catchment areas, * Presence of plants and animals adapted to spring conditions, including threatened species, * High cover of mosses and specialized vascular plants, * Absence of invasive alien species.   Characteristic species:  Flora  Vascular plants: *Arabis soyeri, Cardamine* spp., *Carex atrofusca, C. saxatilis, C. flava* aggr., *C. capillaris, C. capitata, C. appropinquata, C. acutiformis, C. paniculata, Cochlearia pyrenaica, Deschampsia argentea, Epilobium davuricum, Epilobium* spp., *Equisetum scirpoides, E. variegatum, Pinguicula vulgaris, Juncus biglumis, J. triglumis, Montia fontana, Oenanthe divaricata, Saxifraga aizoides.*  Bryophytes: *Aneura pinguis, Brachythecium rivulare, Bryum pseudotriquetrum, Catoscopium nigritum, Cinclidium stygium, Cinclidotus fontinaloides, Cratoneuron commutatum, C. falcatum, C. filicinum, C. decipiens, Eucladium verticillatum, Gymnostomum recurviroste, Marcantia* spp., *Meesia* spp., *Oncophorus* spp., *Paludella squarrosa, Pellia* spp., *Philonotis calcarea, Philonotis* spp., *Scorpidium revolvens, S. cossoni, Sphagnum* spp. (*S. wanstorfii, S. subsecundum*), *Tomentypnum nitens, Warnstorfia* spp.  Algae: *Chara* spp. (*C. fragilis, C. aspera*). |
| C2.2a Permanent non-tidal, fast, turbulent watercourse of montane to alpine regions with mosses | This habitat type includes small, shallow, fast-running and turbulent streams of montane and alpine regions of Europe. The water is highly oxygenated and rather cold during all seasons with temperatures rarely higher than 10°C in summer. The sediments consist almost exclusively of rocks and boulders, because the fast current does not allow the deposition of finer sediments. Vascular plants can occasionally occur in this habitat, especially in those parts of the riverbed where the current is slower and there is temporary accumulation of finer sediments. However no stable vascular plant community can be considered typical of this habitat type. Therefore the habitat does not include any vascular plant alliances, instead, lichens and bryophyte communities with high moss abundance are very characteristic of this habitat. The lichen and bryophytic vegetation is usually rather low in species number, on the contrary the fauna can be very rich including mainly stenothermic species of rheophile fauna.  Indicators of good quality:   * Occurrence of stenothermic and rheophile fauna * High water velocity * Thin layer of algae covering the rocks, a thick layer of algae could be symptom of eutrophication in place * Absence of fine and organic sediments * Dominance of aquatic lichens and mosses * Natural hydrology   Characteristic species:  Algae*: Phormidium autumnale, Cladophora* spp., *Hydrurus foetidus, Bangia atropurpurea, Diatoma* spp.*, Gomphonema olivaceum, Melosira varians, Chamaesiphon polonicus, C. amethystinus, Tolypothrix distorta, Navicula* spp.*,* Nitzschia spp.*, Cocconeis* spp.*, Spirogyra* spp.*, Mougeotia* spp.*, Zygnema* spp.*, Oocardium stratum, Vaucheria* spp.*, Hildenbrandia rivularis, Lemanea fluviatilis, Audouinella hermannii, Heribaudiella fluviatilis, Surirella ovata, Closterium leibleinii, Staurastrum punctulatum.*  Lichens: *Verrucaria* spp., *Porina clorotica, Dermatocarpon luridum*  Bryophytes: *Scapania undulata, Cratoneuron* spp.*, Blindia acuta, Brachythecium rivulare*, *B. plumosum*, *Bryum* spp., *Dichodontium pellucidum,* *Fontinalis antipyretica, Hydrogrimmia mollis, Hygrohypnum molle, H. smithii, Jungermannia exsertifolia, Schistidium rivulare, Cinclidotus fontinaloides, C. riparius, Philonotis fontana, Pohlia wahlenbergii, Rhacomitrium fasciculare, Platyhypnidium riparioides.*  Macroinvertebrates: *Mollusca* (e.g. *Ancylus fluviatilis*), *Turbellaria*, *Crustacea* (*Cyclops* spp., *Attheyella* spp.*, Bryocamptus* spp.*, Maraenobiotus* spp., *Hypocamptus* spp., *Moraria* spp., *Parastenocaris* spp., *Potamocypris* spp.*, Cavernocypris* spp.*, Cryptocandona* spp.), *Ephemeroptera* (e.g. *Baetis alpinus, B. lutheri, B. melanonyx*)*, Trichopetera* (e.g. *Hydropsyche instabilis, Potamophylax cingulatus, Rhyacophila* spp*., Sericostoma pedemontanum*)*, Ephemeroptera* (e.g. *Epeorus alpicola, E. sylvicola, Rhithrogena loyolaea, R. alpestris, Ecdyonurus alpinus, Oligoneuriella rhenana*)*, Odonata* (e.g. *Baetis alpinus, B. rhodani, Calopteryx splendens, C. virgo, C. haemorrhoidalis*)*, Plecoptera* (e.g. *Dictyogenus fontium, Protonemura ausonia, P. caprai, P elisabethae, P. brevistyla, Nemoura mortoni, N. obtuse, Leuctra rosinae, L. festai, L. teriolensis, Isoperla rivulorum, Perlodes intricatus, Siphonoperla montana, Chloroperla susemicheli*), *Diptera* (e.g. *Diamesa* spp., Chironomus spp., *Orthocladius* spp., *Eukiefferiella* spp., *Tvetenia calvescens, Prosimulium* spp., *Simulium* spp., *Dicranota* spp., *Rhypholophus* spp., *Tricyphona* spp., *Thaumalea* spp.)  Vertebrates: Fish: *Salmo trutta, Cottus gobio, Thymallus thymallus;* Birds: *Cinclus cinclus* |
| C2.2b Permanent non-tidal, fast, turbulent watercourse of plains and montane regions with Ranunculus spp. | The habitat includes river stretches with a stony, gravelly or shingly river bed with an average flow velocity over 0.2 m/sec. Main physical differences between this habitat type and C2.3 (Permanent non-tidal, smooth-flowing watercourses) are the higher flow velocity and the bigger grain size of the sediments. These two habitats, as well as the  habitat C2.2a (Permanent non-tidal, fast, turbulent watercourses of montane to alpine regions with moss communities) may be related as segments of the same stream or river. These stretches of rivers are usually natural and unaltered. The natural hydrological regime is variable, alternating periods of low water level (but never completely dry) and floods. This regime promotes a cyclic development of the vegetation, the coexistence of various microhabitats, the self-purification due to the high oxygen level. This habitat is characterized by patches of stone beds devoid of any plant species, patches of aquatic mosses attached to stones and patches of submerged rooting macrophytes. Characteristic submerged macrophytes are *Potamogeton alpinus*, *P. polygonifolius*, *Ranunculus fluitans*, and *Callitriche hamulata*. Also *Potamogeton pectinatus* occurs in this habitat with long and narrow leaves floating in the water stream, but might be considered as a species that characterizes less optimal circumstances. Once the water become deepand slowly flowing, *Nuphar lutea* and other species of the genus *Potamogeton* become more characteristic. Emergent amphibian plants such as *Berula erecta*, *Apium nodiflorum*, *Hippuris vulgaris*, *Butomus umbellatus*, *Schoenoplectus lacustris*, *Sagittaria sagittifolia* and *Sparganium emersum* can also develop in more shallow and illuminated parts of this habitat. Due to the strong current these emergent plants usually develop in this habitat their submerged growth forms with leaves adapted to the water movement. Usually, vegetation cover of the habitat does not exceed 30% of the total area of a river stretch. The vegetation can include also species with a wide abiotic range such as *Groenlandia densa*, *Zannichellia palustris*, *Myriophyllum spicatum*, *Nuphar lutea*. Species variation is dependent on flow velocity, water depth, sediment type, shading and nutrient richness. Surface water is speedily flowing and rich in oxygen. These are important favorable circumstances for benthonic macroinvertebrates and fish communities.  Indicators of good quality:   * Flow velocity exceeds 0.2 m/sec * Riverbed is mainly stony, pebbly or gravelly, with few finer sediments (sand) * No accumulation of fine (silt and clay) and organic sediments * Hydrological regime is natural as well as morphology is unaltered * No or limited occurrence of exotic species * Limited development of emergent species * No or limited formation of floating mats of organic residuals.   Characteristic species:  Vascular plants: *Ranunculus aquatilis*, *R. circinatus*, *R. trichophyllus*, *R. fluitans*, *R. peltatus*, *R. penicillatus* subsp. *penicillatus*, *R. penicillatus* subsp. *pseudofluitans*, *Berula erecta*, *Butomus umbellatus*, *Callitriche cophocarpa*, *C. hamulata*, *Glyceria fluitans*, *Myriophyllum alterniflorum*, *Potamogeton alpinus*, *P. berchtoldii*, *P. coloratus*, *P. gramineus*, *P. perfoliatus*, *P. natans*, *P. nodosus*, *P. polygonifolius*, *Rorippa amphibia*, *Sagittaria sagittifolia*, *Schoenoplectus lacustris*, *Sparganium angustifolium*, *S. emersum*, *S. erectum*, *Veronica beccabunga*, *V. anagallis-aquatica.*  Bryophytes: *Fontinalis antipyretica*, *F. dalecarlica*, *Hygrohypnum* spp., *Rhynchostegium ripariodes*, *Scapania undulata*, *Sphagnum denticulatum.*  Algae: *Batrachospermum* spp., *Cladophora* spp., *Hildenbrandia rivularis*, *Thorea ramosissima*, *Chantransia* sp., *Lemanea* spp., *Diatoma* spp., *Hydrurus foetidus, Bangia atropurpurea, Diatoma* spp.*, Gomphonema* spp.*, Chamaesiphon* spp., *Navicula* spp.*, Nitzschia palea, Cocconeis* spp.*, Spirogyra* spp.*, Mougeotia* spp.*, Zygnema* spp.*, Oocardium stratum, Vaucheria* spp.*, Audouinella hermannii, Heribaudiella fluviatilis, Surirella ovata, Closterium leibleinii, Staurastrum punctulatum.*  Lichens: *Dermatocarpon* spp., *Verrucaria* spp., *Porina clorotica.*  Macroinvertebrates: *Turbellaria*, *Hirudinea,* *Mollusca* (e.g. *Ancylus fluviatilis, Unio crassus*, *Margaritifera margaritifera*, *Theodoxus fluviatilis*,), *Crustacea* (e.g. *Astacus astacus*, *Austropotamobius pallipes, Potamon fluviatile*, *Copepoda, Gammarus* spp., *Echinogammarus* spp.); extremely developed in this habitat are aquatic insects of the groups *Plecoptera,* *Trichoptera,* *Ephemeroptera, Odonata* and *Diptera.*  Vertebrates: fish: *Lampetra fluviatilis*, *L. planeri*, *Coregonus lavaretus*, *Cottus gobio*, *Salmo trutta*, *S. salar*, *Thymallus thymallus*, *Aspius aspius*, *Esox lucius*, *Perca fluviatilis, Leuciscus* spp.*, Phoxinus phoxinus, Barbus* spp.; amphibians: Rana spp., *Salamandrina terdigitata*, Reptiles: Natrix spp.; mammals: *Castor fiber*, *Lutra lutra*, *Mustela lutreola*; birds: *Cinclus cinclus*. |
| C2.3 Permanent non-tidal, smooth-flowing watercourse | This habitat includes permanent watercourses with non-turbulent water and their associated pelagic and benthic animal, algal and plant communities. The habitat includes slow-flowing rivers, streams, brooks, rivulets, rills and also relatively fast-flowing rivers with laminar flow. The bed is typically composed of sand or mud. Features of the river bed, uncovered by low water or permanently emerging, such as sand or mud islands and bars are treated as littoral zone (C3) and are not included in this habitat. This habitat includes stretches of streams and river at mid and low-altitude with an average flow velocity below 0.2 m/sec. Main physical differences between this habitat type and C.2.2b (Permanent non-tidal, fast, turbulent watercourses of plains and mountain regions with *Ranunculus* ssp.) are the lower flow velocity and the smaller grain size of the sediments. These two habitats may be related as segments of the same stream or river. The water is mesotrophic and buffered.  The vegetation is mainly constituted by rooted and floating Euro-Asiatic macrophytes, mainly with potamid, batrachid and utricularid growth forms, which belong to the *Potamogetonion* and *Batrachion fluitantis* communities. Potamid vegetation can be accompanied in slowly flowing parts of the river bed by nymphaeid species such as *Nymphaea* *alba* and *Nuphar lutea*. Also amphibian macrophytes may occur in this habitat with their aquatic form. Vegetation cover of the habitat, usually, does not exceed 30% of the total area of a river stretch.  Indicators of good quality:   * Morphologically unaltered river bed and banks * Natural hydrological regime * Avoid of dominance of algae and floating algae beds (FLAB) * No or limited formation of floating mats of organic residuals * No or limited occurrence of exotic species * Limited extension of nymphaeid vegetation or species indicating high eutrophication   Characteristic species:  Vascular plants: *Ranunculus aquatilis*, *R. circinatus, R. trichophyllus,* *Berula erecta,* *Butomus umbellatus,* *Callitriche* spp. (e.g. *C. hamulata, C. cophocarpa*), *Helosciadium nodiflorum, Mentha aquatica,* *Nasturtium officinale, Potamogeton berchtoldii, P. perfoliatus, P. crispus, P. polygonifolius, P. gramineus, P. pusillus, P. lucens, P. pectinatus, P. natans, P. nodosus, P. coloratus, Rorippa amphibia, Sagittaria sagittifolia, Scirpus lacustris, Sium latifolium, Sparganium emersum, S. erectum, Veronica beccabunga, V. anagallis-aquatica, Zannichellia palustris.*  Bryophytes: *Drepanocladus* spp., *Fontinalis antipyretica*, *F. hypnoides*, *Rhynchostegium ripariodes*, *Warnstorfia* spp.  Macroinvertebrates: *Potamon fluviatile*, *Austropotamobius pallipes* and benthic invertebrates of the orders *Ephemeroptera,* *Trichoptera, Odonata, Plecoptera, Amphipoda, Isopoda, Arhynchobdellida.*  Vertebrates: *Salmo trutta*, *S. salar, Cotus gobio, Leuciscus souffia, Squalius cephalus, Barbus barbus, Perca fluviatilis, Lampetra fluviatilis, Coregonus lavaretus, Thymallus thymallus, Aspium aspium, Esox lucius, Castor fiber, Lutra lutra*, *Salamandrina terdigitata, Triturus cristatus, T. carnifex, T. alpestris, Rana* spp. |
| C2.4 Tidal river, upstream from the estuary | This habitat includes portions of large rivers subject to the tide, upstream from the estuary. The water level is subject to tidal influence, but the water is mainly freshwater or slightly brackish (1-2 psu).  Several aquatic macrophytes and helophytes are characteristic of this habitat, and some of them are endemic to specific river floodplains. In this habitat, the submerged aquatic vegetation is especially developed in shallow parts of the river system, where the water level is only about 20 cm at low tide. Here, submerged macrophytes can form extensive beds. The banks are covered by extensive helophyte vegetation, usually dominated by *Phragmites australis* that is tolerant to periodical water table fluctuations*.* More characteristic for the lower zones are *Schoenoplectus triqueter* and *Bolboschoenus maritimus*. The helophyte dominated vegetation growing on the permanently flooded part of the beds is included in this habitat, however the emergent vegetation growing on the periodically flooded banks, with characteristic species like *Leucojum aestivum* and *Senecio fluviatilis*, is included in the habitat type C5.1.Some endemic species occur in tidal freshwater areas, like *Oenanthe conioides* and *Deschampsia wibeliana* in the Elbe floodplain, and *Caltha palustris* ssp. *araneosa*  in the Scheldt, Rhine-Meuse and Elbe floodplains.  Vegetation zonation is highly dependent on flooding frequency. In sheltered parts of the tidal creeks, which almost never dry completely, *Nuphar lutea, Potamageton pusillus* and *Potamageton perfoliatus* may locally dominate. *Potamogeton pectinatus, Zannichellia palustris* ssp. *palustris, Sagittaria sagittifolia, Veronica anagallis-aquatica, Veronica catenata* and *Sparganium emersum* sometimes also occur in or near the gullies. Special (semi)aquatic species that occur in tidal freshwater habitats are those of the genus *Elatine*. Although extreme rare and not completely associated with tidal freshwater habitats, *Elatine hydropiper* and *Elatine triandra* occur in this system in The Netherlands.  Tidal freshwater wetlands have become scarce in Europe because of drastic human alterations of estuarine geomorphology. The habitat is restricted to the Atlantic and North Sea coast of Europe, where tidal fluctuation is relatively large. In the current situation, the main tidal freshwater wetlands are distributed directly upstream from the estuaries of the Thames, Trent (UK), Weser (DE), Elbe (DE/NL), Rhine-Meuse (NL), Scheldt (B), Garonne, Loire, Seine, Charente (FR) and Mondego (PT).  Indicators of good quality:   * Submerged, open fields of sediment-rooted aquatic macrophytes * Absence of or only limited alterations of estuarine hydromorphology * Tidal amplitude unchanged * Freshwater to slightly brackish water * Good water quality in terms of nutrient content and water clarity supporting submerged macrophyte growth   Characteristic species:  Vascular plants: *Bolboschoenus maritimus,* *Caltha palustris* ssp. *araneosa*, *Deschampsia wibeliana*, *Elatine hydropiper*, *Elatine triandra, Leucojum aestivum, Najas marina, Najas minor, Nasturtium officinale, Oenanthe conioides, Potamogeton nodosus, Potamogeton perfoliatus, Schoenoplectus triqueter, Senecio fluviatilis, Senecio paludosus, Sparganium emersum, Vallisneria spiralis, Veronica anagallis-aquatica, Veronica catenata, Zannichellia palustris.*  Fish: *Alosa fallax* |
| C2.5a Temperate temporary running watercourse | This habitat type includes temporary freshwater streams and rivers in the European temperate region. These water bodies are characterized by strong fluctuations in water level, which includes dry periods, alternating with long periods of running water. These fluctuations in water level are related to the level of the underlying water table and the amount of precipitation. In the United Kingdom the term ‘chalk streams’ is used to describe watercourses developing on chalk rock formations. This very soft and porous geological substrate acts as temporary reservoir. More than 80 % of the annual stream discharge originates from the aquifer in these chalk-based systems. The slow release of water from the aquifer provides a relatively stable hydrological regime despite the concentration of rainfalls in some seasons. Chalk streams can be subdivided into different hydrological categories. Only the winterbourne ones have a natural dry period each year and are considered part of the habitat C2.5a Temperate, temporary running waters. Chalk streams and rivers that never dry out are not included in this habitat. The seasonal cycle of wetting and drying results into characteristic plant communities that have adapted to these situation. The main channels are often dominated in spring by aquatic *Ranunculus* beds, consisting mainly of *Ranunculus peltatus* or *R. penicillatus* subsp. *pseudofluitans*. Note that *Ranunculus fluitans* is not typical of this habitat, because require more stable water level. Grasses and herbs are dominating the shores and accompanying marshes. Those include a number of annual species that appear in autumn after re-wetting of the shores. These temporary streams differ from Mediterranean temporary rivers mainly for the duration of the completely dry period (that is shorter) and for the absence of clearly Mediterranean floristic elements. If the dry period is prolonged and the hydrologic conditions very irregular these temporary streams could also scarcely vegetated.  England is usually considered to have the major part of properly defined ‘chalk streams’ of Europe. They are located in and down-stream of areas of outcropping chalk. It is unclear which other countries have similar streams, but surely temporary streams with similar hydrology they occur also in other karst areas of Europe and on substrates averagely permeable such as turbidite deposits rich in calcareous elements. In former times in United Kingdom, ‘chalk streams’ were connected to floodplains and wet meadows, representing systems with a high biodiversity and luxurious plant growth. Nowadays they are generally highly modified systems.  Indicators of good quality:   * The periodical alternation of wet-and-dry regimes * The absence of heavy anthropogenic activities that can alter the hydrogeological system (e.g. water capitation and drainage, artificial shores for flood defence) * The absence of communities and species indicating an excessive nitrification or disturbance such as ruderal and exotic species * Water course connected to floodplains and wet meadows   Characteristic species:  Vascular plants: *Alopecurus geniculatus*, *A. aequalis*, *Berula erecta*, *Callitriche* spp., *Helosciadium nodiflorum*, *Glyceria notata*, *G. fluitans*, *Ranunculus peltatus*, *R. penicillatus* subsp. *pseudofluitans*, *Mentha aquatica*, *Myosotis scorpioides*, *Nasturtium officinale*, *Veronica anagallis-aquatica*, *V. catenata, V. beccabunga*.  Bryophytes: *Drepanocladus* spp., *Fontinalis antipyretica*, *F. hypnoides*, *Rhynchostegium ripariodes*, *Warnstorfia* spp.  Vertebrates: *Salmo trutta*, *S. salar, Thymallus thymallus, Salamandrina terdigitata, Triturus cristatus, T. carnifex, T. alpestris, Rana* spp., *Pelophylax* spp.  Macroinvertebrates: *Potamon fluviatile*, *Austropotamobius pallipes*. Benthic invertebrates can also be present if the dry period is not too long. |
| C3.5a Periodically exposed shore with stable, eutrophic sediments with pioneer or ephemeral vegetation | This habitat type includes periodically exposed shores of rivers or islets of accumulated sediment in river channels, drying-out oxbows, lakes and fishponds. The same habitat conditions also occur in disturbed habitats strongly affected by humans such as ditches and other wet places in villages or shallowly inundated and drying out arable land. However these anthropogenic habitats represents degradations of other habitat types and therefore do not deserve protection. Soils are muddy or sandy-muddy, usually with a high concentration of nutrients from natural sedimentation or from human input, for example on arable land and near agricultural farms.  Vegetation growing in such environments is dominated by annual herbs, mainly of the genera *Bidens, Chenopodium* and *Persicaria.* In the Mediterranean areas where the drying out is more rapid the vegetation in the same habitat can be dominated also by perennial stoloniferous species tolerant to prolonged flooding such as *Cynodon dactylon,* *Polypogon viridis,* *Panicum repens, Paspalum* spp*.*  Depending on the successional stage, soil nutrient status and the speed of the draw-down the vegetation can be short and open, or very dense and up to 1.5 m tall (especially if dominated by annual plants of the class *Bidentetea*). The stands are usually species-poor, often with a single dominant species, but can be also species-rich, especially in open, frequently disturbed stands on river shores.  In contrast to habitat C3.5b, this habitat occurs in environments with quick draw-down and drying out, or on more nutrient-rich sediments. In environments with slower draw-down, low-growing vegetation belonging to C3.5b can appear first and develop into tall-growing stands of C3.5a in a later successional stage.  Indicators of good quality:   * Occurrence in natural environments such as shores of unregulated rivers or natural lakes * Occurrence of rare wetland species * Low incidence of neophytes * Low occurrence of shrubs   Characteristic species:  Flora  Vascular plants: *Alopecurus aequalis, Bidens cernuus, B. radiatus, B. tripartitus, Corrigiola littoralis, Echinochloa spp., Oxybasis chenopodioides (syn. Chenopodium chenopodioides), O. glauca (syn. Chenopodium glaucum), O. rubra (syn. Chenopodium rubrum), Persicaria dubia, P. foliosa, P. hydropiper, P. lapathifolia, P. minor, Potentilla supina, Pulicaria vulgaris, Cyperus distachyos, Cyperus fuscus, Cynodon dactylon,* *Polypogon viridis, Panicum repens, Ranunculus sceleratus, Rumex maritimus, Tephroseris palustris, Xanthium orientale* subsp. *italicum, Sisymbrium supinum.*  Exotic species naturalized: *Abutilon theophrasti,* *Bidens connatus, B. frondosus, Paspalum dilatatum, P. disticum, Aster squamatus, Ludwigia peploides, Ludwigia grandiflora, Amorpha fruticosa.*  Fauna  It can be used by pond terrapins for sun-bath (hermoregulation) during Summer  Birds: Ardeids (feeding grounds when flooded), breeding habitat *Sterna albifrons, Sterna hirundo, Charadrius dubius,* ducks  Insects: Insects present during the drawdown phase with e.g. Scarabidae (*Hoplia caerulea*) and Orthoptera (*Tetrix spp*) |
| C3.5b Periodically exposed shore with stable, mesotrophic sediments with pioneer or ephemeral vegetation | This habitat type is found along the periodically emergent shorelines of rivers, on exposed bottoms of permanent lakes and ponds, in wetlands at the edges of arable lands and rarely in ephemeral flush habitats. In rivers and lakes, the timing of exposure of their shoreline depends on the precipitation seasonality and on the time of snowmelt. This habitat type includes also artificial ponds drained in summer in intervals of several years as a part of their management. This habitat type must not be confused with Mediterranean vernal pools, which are instead included in the habitat type C1.6b. The habitat types here considered is characterized by pioneer ephemeral vegetation developing especially in summer and autumn. Plants growing in these environments are mainly annual, low-growing and competitively weak species from various families. Well-represented genera include *Cyperus, Elatine, Juncus, Ranunculus, Spergularia* and *Veronica*. Vegetation is usually short and open, and its cover increases with successional stage. Some stands are dominated by single species while others are co-dominated by several species. In some cases, especially on exposed pond bottoms and on river shores, the successional stage with short-growing ephemeral wetland species is followed, especially after water draw-down, by a stage with tall-growing annuals such *Bidens, Chenopodium, Persicaria* and *Rumex maritimus*. This succession results in a change of this habitat type into the habitat type C3.5a.  Indicators of good quality:   * Occurrence in natural environments such as shores of unregulated rivers, natural lakes, pools or ephemeral flush habitats * Occurrence of rare wetland species * Absence or low incidence of competitive, tall-growing and nutrient-demanding wetland herbs * Absence or low incidence of neophytes   Vascular plants: *Blackstonia acuminata, Carex bohemica, Centaurium pulchellum, Centunculus minimus, Cerastium dubium, Coleanthus subtilis, Corrigiola littoralis, Cyperus fuscus, C. michelianus, Elatine alsinastrum, E. hexandra, E. hydropiper, E. orthosperma, E. triandra, Eleocharis acicularis, E. ovata, Fimbristylis annua, Glinus lotoides, Gnaphalium uliginosum, Gnaphalium luteo-album, Gypsophila muralis, Hypericum humifusum, Illecebrum verticillatum, Isolepis setacea, Juncus bufonius, J. bulbosus, J. capitatus, J. ranarius, J. sphaerocarpus, J. tenageia, Koenigia islandica, Limosella aquatica, Lindernia procumbens, Ludwigia palustris, Lythrum hyssopifolia, L. tribracteatum, Mentha pulegium, Montia arvensis, Myosurus minimus, Plantago major subsp. intermedia, Potentilla norvegica, P. supina, Pulicaria vulgaris, Pycreus flavescens, P. glomeratus, Radiola linoides, Ranunculus flammula, R. lateriflorus, R. ophioglossifolius, R. sardous, Sagina apetala, S. nodosa, Samolus valerandi, Schoenoplectus supinus, Solenopsis minuta, Spergularia echinosperma, S. kurkae, S. rubra, Tillaea aquatica, Verbena supina, Veronica anagalloides, V. catenata, V. scardica*  Bryophytes: *Anthoceros agrestis, A. punctatus, Leptobryum pyriforme, Physcomitrella patens, Physcomitrium eurystomum, P. pyriforme, P. sphaericum, Riccia cavernosa, R. ciliifera, R. crystalline, R. huebeneriana*  Vertebrates: *Rana* spp., *Bombina* spp., *Bufo* spp., *Triturus* spp., *Hyla* spp., *Natrix natrix, N. tessellata, N. maura,* *Sterna albifrons*, *S. hirundo, Charadrius dubius, Himantopus himantopus, Recurvirostra avosetta, Vanellus vanellus.*  Macroinvertebrates: *Nematodes, Lumbricus* spp., *Hirudo medicinalis, H. troctina, H. verbana, Planorbis* spp., *Unio* spp.*, Anodonta* spp.*, Lepidurus apus, Triops cancriformis, Anostraca*. |
| C3.5c Periodically exposed saline shore with pioneer or ephemeral vegetation | The habitat includes periodically flooded, saline and muddy, nutrient-rich shores and dried-up bottoms of saline standing water bodies, with low to moderate cover of short salt-adapted plant species, mostly from the *Poaceae* and *Cyperaceae* families. These include mainly annual plants, developing during the exposure phase, as well as perennial plants tolerant to temporary total flooding and brackish conditions. Typically the habitat is dominated by dwarf-grasses of the genus *Crypsis* (including *Heleochloa*).  The habitat is distributed over lowlands of the continental parts of Europe and arid Mediterranean regions. These ephemeral communities develop mostly on the bottom of small temporary brackish and saline lakes and pools. During the summer the bottom of these water bodies dry-up, colouring white from the salts. The vegetation often starts to grow only in the end of summer or in autumn. Besides, the habitat type occurs on riverbanks of some large rivers, like the Danube and Sava, in regions with a continental climate where there are some processes of salinization. The same plant communities can temporary occur in some artificial localities, such as fishponds, dams, or abandoned and flooded fields.  The dominant species in the continental regions (e.g. the Pannonian basin and adjacent territories) are *Crypsis alopecuroides, Crypsis (Heleochloa) schoenoides,* *Crypsis (Heleochloa) aculeata*, *Cyperus (Acorellus) pannonicus* and *Polypogon monspeliensis*. These species are accompanied by annual and some perennial species from the class *Bidentetea tripartiate* (habitat C3.5a), while also transitions towards saline inland marshes and steppes (classes *Festuco-Puccinellietea*, *Thero-Salicornietea*; habitats E6.1, E6.2, E6.3) are found. Ephemeral communities with *Salicornia* ssp. in general are found on less eutrophic sites, often with higher salinity. In the Mediterranean region the communities of the alliance *Verbenion supinae* are by most authors considered part of the class *Isoeto-Nanojuncetea* (habitat C3.5b), but in some communities of this alliance the species of *Crypsis* are a characteristic species. Here they grow together with *Chenopodium chenopodioides*, *Fimbristylis bisumbellata*, *Glinus lotoides*, *Polypogon maritimus, Heliotropium supinum*, *Samolus valerandi*, and *Verbena supina*.  Typically the habitat does not develop during years with less suitable conditions. The areas covered by these communities may vary each year in size and location. Similar plant communities occur along the coast, but in that case they are in most cases considered part of coastal salt marshes (habitat A2.5d) or dune slacks (habitat B1.8b).  Indicators of good quality:   * Natural relatively high concentration of salt in the soil * Natural high electrical conductivity of the water * No alteration of the natural salinity range * Exotic species absent or rare (e.g. *Xanthium spinosum*, *Paspalum disticum, P. diatatum, Bidens* spp.) * Absence of emergent plants, shrubs and trees * No signs of eutrophication nor dominance of ruderal species * No indicator of negative anthropogenic influence (e.g. regulation of the water level, chemical pollution   Characteristic species:  Vascular plants: *Centaurium pulchellum, Chenopodium chenopodioides, Chenopodium glaucum, Corrigiola telephiifolia, C. littoralis, Coronopus squamatus, Cressa cretica,* *Crypsis aculeata, C. alopecuroides, C. schoenoides, Cyperus flavescens, C. pannonicus, Digitaria debilis, Eleocharis carniolica,* *Euphorbia chamaesyce, Fimbristylis bisumbellata, F. dichotoma, Glinus lotoides, Heliotropium supinum, Juncus articulatus, J. bufonius, J. hybridus, J. gerardii, J. tenageja, Lepidium latifolium, Lythum hyssopifolium, L. tribracteatum, Lotus tenuis, Panicum debile, Peplis portula, Persicaria lapathifolia,* *Paspalum distichum, Polygonum* *salsugineum, Polypogon maritimus, P. monspeliensis, Pulicaria paludosa, Pulicaria sicula, Samolus valerandi, Spergularia maritima, S. salina, Trifolium fragiferum, Verbena supina* |
| C3.5d Unvegetated or sparsely vegetated shore with mobile sediments in montane and alpine regions | The habitat includes the bed and banks of rivers and streams from alpine to mountain (and partially sub-montane) belts and of the northern boreal area. The habitat is highly dynamic because it is characterized by periodical floods and frequent and considerable variation of speed and intensity of the water current, which however remains always rather high.  The sediment of the habitat includes mainly gravel deposits and banks of alluvial material, characteristically poor in organic materials and nutrients. The vegetation types occupying these gravel deposits include pioneer vegetation and subsequent early stages in the colonization sequence, with plants  specialised to survive in this habitat, having narrow leaves and elastic stems adapted to or tolerant of submersion and rapid changes of the water current: for example *Myricaria germanica,* and species of *Epilobium Salix, Agrostis, Elimus, Poa.* An important feature is that the vegetation stays in its pioneer stage and is ephemeral but eventual succession leads to willow scrub.  Indicators of good quality:   * Natural hydrological cycle of spates * Suitable geological substrate which is easily erodible * High water velocity * Pioneer vegetation with absence or sporadic abundance of nitrophilous species * No high abundance of exotic invasive species * No negative anthropogenic influence (gravel extraction, regulation of the water regime, construction of artificial banks)   Characteristic species:  Vascular plants:  *Agrostis gigantea, Arabis alpina, Astragalus alpinus, Calamagrostis pseudophragmites, C. stricta, Cerastium alpinum, Chaerophyllum hirsutum,, Chondrilla chondrilloides,Deschampsia alpina, D. cespitosa,Epilobium roseum, E. fleischeri, E. dodoneii, E. latifolium, Equisetum variegatum,   Erigeron acer* ssp. *angulosus,Festuca vivipara, Gnaphalium uliginosum,  Hieracium staticifolium, Hippophae rhamnoides, Luzula spicata, Lotus corniculatus, Myricaria germanica,Myosoton aquaticum, Myosotis scorpiodes, Oenanthe crocata,  Ptychotis saxifraga,  Petasites hybridus, P. kablikianus, Poa  trivialis, Poa palustris, Ranunculus repens, Rumex scutatus, Stellaria nemorum, Saxifraga aizoides, Scrophularia canina, Trifolium saxatile,*Usually only juveniles or small shrubs of *Salix daphnoides, S. elaeagnos, S. lapponum, S. hastata, S. glauca, S. myrsinifolia, S. phylicifolia, S. purpurea, Elymus fibrosus, Elymus transbaicalensis, Elymus kronokensis* subsp. *subalpinus, Cotoneaster cinnabarinus, Papaver lapponicum, P. dahlianum.*  Bryophytes: *Brachytecium rivulare*, *Bryum intermedium, B. klinggraeffii, Ceratodon purpureus, Dichodontium pellucidum, Hygrohypnum luridum, H. ochraceum, Hypnum lindbergii, Pohlia drummondii, P. fillum, Polytrichum juniperinum, Pseudoleskea incurvata, Racomitrum canescens* s.l.*, Tortella inclinata, T. tortuosa.*  Lichens: *Rhizocarpon* spp. (yellow lichens on rocks)  Macroinvertebrates: Larval stages of *Odonata, Ephemeroptera, Plecoptera* and *Trichoptera* characterize the benthic communities of riverbeds while nymph and adult stages of the same species can be found on the river banks. Other characteristic species are *Ancylus fluviatilis, Pisidium casertanum, Unio crassus, Crenobia alpina, Hyles hippophaes, Proserpinus proserpina.*  Vertebrates: *Castor fiber, Arvicola sapidus, Myotis blythii, Locustella fluviatilis, Sterna hirundo, Riparia riparia, Burhinus oedicnemus, Coracias garrulous, Anthus campestris, Milvus migrans. Ardeids, breeding passerine* and *migrating waders* can also occur. |
| C3.5e Unvegetated or sparsely vegetated shore with mobile sediments in the Mediterranean region | This habitat includes silt, sandy and gravel banks and shores of flowing and standing water bodies of the Mediterranean areas. The rivers can be intermittently flowing (completely dry during the summer or left with some pools) or constantly flowing but with abundant exposed sandy or gravel sediments exposed during the summer. This category includes Mediterranean lake-bottoms or edges with mobile sediments (silt, sand or gravel) temporarily exposed by fluctuations of the water level, wind or wave action.  In the Mediterranean region, the climatic conditions are characterized by annual precipitation patterns that are high during autumn and winter but low during summer. Thus, many streams have developed spatial and temporal discontinuities of flow regime. Flow is interrupted during the summer dry period, but even energetic flow is observed during the wet season from late autumn to early spring. During the wet season, high precipitation lead to floods and consequent disturbances, such as sediment disturbances or even changes in the morphology of the stream channel. These seasonal differences in hydrological condition imply the need for specially adapted taxa to persist in this habitat. At the same time this habitat can host many plant species that require different moisture conditions (from humid to very dry). The high evaporation rate on certain geological substrates during summer can cause the accumulation of salts and oxides, therefore also species tolerant to brackish soil can occur. In some cases the geological substrate is very rich in salt and salt crusts are formed with the drying of the riverbed. In this specific case the dominant vegetation is tolerant to high salt concentrations and the habitat belong to the types C1.5 (Permanent inland saline and brackish waters) and C3.5c (Periodically exposed saline shores with pioneer and ephemeral vegetation). Despite the similarities with temporary running waters in temperate regions, there are differences in the timing and dynamics of nutrient inputs.  The grain size of sediments depends by the water regime and the history of water bodies both in flowing and standing waters and influence the plant species composition of the communities occupying this habitat type. These areas could be either completely unvegetated or occupied by vascular plant communities including pioneer vegetation and subsequent early stages of colonization. Often these areas are neighbouring with riverine forests and scrub of *Salix* spp., *Populus* spp., *Tamarix* spp.*,* *Nerium oleander* and *Vitex agnus-castus.*  Indicators of quality:   * Natural hydrology * Suitable geological substrate (easily erodible) * Pioneer vegetation with absence or sporadic abundance of nitrophilous species * No communities of exotic invasive species * No negative anthropogenic influence (sediment extraction, regulation of the water regime, construction of artificial banks)   Characteristic species:  Vascular plants: *Andryala integrifolia,* *A. ragusina,* *Arenaria montana* subsp. *intricata, Artemisia campestris, A. alba, Asperula purpurea, Astragalus onobrychis, Bothriochloa ischaemon, Centranthus ruber, Chenopodium botrys, Chondrilla juncea, Cynodon dactylon, Cyperus fuscus, Dittrichia viscosa, Dorycnium hirsutum, Elymus repens, Epilobium dodonei, Erucastrum nasturtiifolium, Euphorbia rigida, Festuca duriotagana, Forsskaolea tenacissima*, *Galium corrudifolium, Glaucium flavum, Helichrysum* spp. *Latuca viminea, Lotus tenuis, L. creticus, Melilotus albus, Micromeria graeca, Mercurialis tomentosa, Oenothera* spp., *Ononis ramosissima, Paspalum distichum* (alien species in most Europe), *P. vaginatum, Plantago sempervirens, Reseda valentina, Santolina*spp. (including endemic species such as *Santolina etrusca, S. insularis,* etc.)*, Saponaria officinalis, Satureja montana, Scrophularia canina, Seseli tortuosum*, *Silene inaperta,* *Teucrium flavum, Thalictrum foetidum.*  Invertebrates: Very few groups of invertebrate occupy this habitat type and usually only those that have a short life cycle and that can leave the water body before the level of the water become critic. Among insects *Heteroptera* and *Coleoptera*.  Vertebrates: These habitats are usually not populated by fish or other characteristic vertebrates however several species of small mammals, amphibians, reptiles and birds can seasonally frequent this habitat using it for food and water resource or during the reproductive season. Often these areas are important feeding grounds for migrating water birds.  *Note:* Most species that occur in this habitat type are not exclusive of it, they normally occur on every habitat characterized by mobile sediments (pebbles, gravel and sand) of the Mediterranean areas. However species assemblages (vegetation communities) may be characteristic of this habitat type. |
| C5.1a Tall-helophyte bed | Habitat description Communities of tall helophytes characteristically occupy a zone from shallow water to upper parts of the geolittoral belt along lakes and rivers. Further they are found in nutrient-rich terrestrial sites on waterlogged ground. In marshes and large lakes tall helophytes, such as *Phragmites australis* or *Typha angustifolia*, together with other emergent herbs (e.g. *Thelypteris palustris*) can overgrow accumulations of plant residues and form with their rhizomes and roots floating carpets and islets on the water surface. This habitat often represents the shore component of the habitat types C1.1a, C1.1b, C1.2a, C1.2b and C1.4 and therefore is in contact with them. The habitat includes wide and dense stands along eutrophic water bodies, as well as tall-helophyte stands occurring as wide belts along larger oligo- and mesotrophic lakes. These communities have poor water exchange with the open water area, and show clear accumulation of organic material. Tall helophytes include grasses (*Phragmites australis*, *Glyceria maxima*, *Scholochloa festucacea*), bulrushes (*Schoenoplectus* spp., *Bolboschoenus* spp.), cattails (*Typha* spp.), horsetail (*Equisetum fluviatile*), often accompanied by some broad-leaved emergent herbs (*Rumex hydrolapathum*, *Cicuta virosa*, etc.).  Reed bed vegetation belongs to the most productive European plant communities in terms of annual production of biomass. Shoot height is often 2-3 m, sometimes much higher. Because of competitive ability of tall helophytes, their stands are species-poor and often dominated by one species or by a few co-dominants. Main determinants for dominant species are substratum, water depth, duration of flooding anoxic periods, herbivory and human influence. Dominants grow in vigorous clones, and chance may play an important role in the arrival and establishment of potential dominants. Cover and composition of understorey vary according to the trophic state, substratum, succession stage, and disturbance (grazing, mowing, water level fluctuations, eutrophication, in the north also ice erosion). Grasses and herbs dominate in understorey, aquatic plants and shore mosses can occur, but are usually not abundant. An exception form initial phases towards mire succession, in which mosses may have a high cover.  Besides growing in the littoral zone of natural standing waters, reed beds grow also in anthropogenic standing water, like canals, stagnant dykes and reservoirs. Further, they are abundant alongside running waters in wetter parts of flood plains, and in rivers and streams. Both organic and mineral soils are colonized. In the northern boreal region helophyte stands are sparse and low due to the harsh climate and frozen soil, in arctic in alpine area they are lacking.  Also reed bed stands along brackish to freshwater coastal waters are included in this habitat, like those on the shores of the Baltic Sea and Black Sea or reed beds in the freshwater influenced parts of estuaries along the Atlantic and Mediterranean coasts. As their functioning and species composition may somewhat differ from more inland stands, these coastal examples may be considered as a separate subtype of habitat C5.1a.  Reed bed vegetation has been influenced strongly by human activities. Earlier helophyte stands were largely grazed and mowed, resulting in lower vegetation. Eutrophication and cessation of shore grazing has led in many places to increase of reed beds and their density but with a higher abundance of nitrophilous species. Excessive nitrogen and prolonged anoxic condition of the sediments have in some cases caused dying of reed beds. Reed beds are also impacted by regulation of water levels, construction activities, clearing of agricultural land, boating and other recreational activities. Losses of reed beds are locally caused by herbivory (coypu, muskrats).  Indicators of good quality:   * Reed beds with natural hydrology and water and substrate chemistry * Typical structure of vegetation and natural species pool (species poor stands) * Anthropogenic impacts low in terms of construction activities, eutrophication, drainage etc. * Natural density of helophyte stands, not enhanced biomass or density due to eutrophication * Absence of invasive alien species (also Glyceria maxima in the northern part of its range) * No or low abundance of ruderal and nitrophilus (tall-herb) species (Urtica dioica, Calystegia sepium, Bidens spp., Chenopodium spp., Amaranthus spp.) * No or low abundance of shrubs and climbing plants (e.g. Salix spp., Populus spp., Sambucus nigra, Vitis vinifera, Humulus lupulus) * Low cover of tall species from drier habitats (e.g. Cirsium spp., Galega officinalis, Eupatorium cannabinum, Sambucus ebulus) * Presence of characteristic breeding birds * Presence of characteristic insect fauna   Characteristic species:  Flora, Vascular plants: *Acorus calamus, Alisma plantago-aquatica, Bolboschoenus laticarpus, B. maritimus, Butomus umbellata, C. rostrata, Calystegia sepium, Carex pseudocyperus,Cicuta virosa, Eleocharis palustris, Equisetum fluviatile, Eupatorium cannabinum, G. spicata, Glyceria fluitans, Glyceria maxima, Iris pseudacorus, Lythrum salicaria, Oenanthe aquatica, Phalaris arundinacea, Phragmites australis, Rumex hydrolapathum, Sagittaria sagittifolia, Schoenoplectus corymbosus, S. lacustris, S. tabernaemontani, Scolochloa festucacea, Solanum dulcamara, Sparganium erectum, S. neglectum, Typha angustifolia,T. domingensis, T. latifolia, T. laxmannii, T. minima, T. shuttleworthii*  Frequently accompanying species are also *Lycopus europaeus, Lysimachia vulgaris, Lythrum salicaria, Mentha aquatica, Rumex hydrolapatum, Sium latifolium, Thelypteris palustris, Cicuta virosa. Mosses: Drepanocladus spp., Campylium* spp*., Calliergon* spp., in paludified stands also *Sphagnum* spp.  Fauna, Birds: *Acrocephalus arundinaceus, A. scirpaceus, A. melanopogon, A. schoenobaneus , Alcedo atthis, Ardea cinerea, Aythya nyroca, Botaurus stellaris, Circus aeruginosus, Egretta garzetta, Fulica atra, Gallinula chloropus, Panurus biarmicus, Podiceps cristatus*. |
| C5.1b Small-helophyte bed | This habitat is characterized by the dominance of small and amphibious helophytes in oligotrophic to eutrophic water bodies. It is represented by shallow littoral zones of lakes, ponds and rivers subjected during the year to periodical and repeated changes of the water level. In both standing and running waters the small and amphibious vegetation may survive for short periods (1 to few seasons) and decline rapidly due to either exceptional flooding or succession towards tall helophyte-dominated vegetation. However, water bodies with a natural dynamic usually maintain a balanced proportion of small and tall helophyte vegetation. This habitat type has an important function for fauna, by offering shelter to benthic invertebrates, fish and amphibians and food to several species of birds. The general productivity of this habitat is lower than that of habitat C5.1a. In warmer parts of Europe during late summer this habitat may dry out and form transitions towards the habitat types C3.5a and C3.5b. Some amphibious species such as *Alisma* spp., *Glyceria* spp., *Hippuris vulgaris*, *Sagittaria sagittifolia*, *Sparganium* spp., typically growing in this habitat, have developed a dimorphism of the leaves (floating and terrestrial leaves) as an adaptation to the water level fluctuation and the water current. Also some small and medium size *Cyperaceae*, such as *Eleocharis* spp. and *Bolboschoenus* spp., are typical of this habitat type in standing water. This habitat usually represents the shore component of aquatic habitats (types C1.1a, C1.1b, C1.2a, C1.2b and C1.4) and therefore is in contact with them. Vegetation of small helophytes of the alliance *Carici-Rumicion hydrolapathi*, with species like *Calla palustris*, *Comarum palustre*, *Menyanthes trifoliata*, usually grows on organic muddy sediments of dystrophic and mesotrophic water bodies with relatively stable water levels.  Indicators of good quality:   * Natural hydrology and chemistry of water and substrates * Typical structure of vegetation (species poor stands) * Anthropogenic impacts low in terms of construction activities, eutrophication and regulation of the water level. * No or low occurrence of tall helophytes, and nitrophilous species (e.g. *Ranunculus sceleratus*, *Bidens* spp., *Chenopodium* spp., *Amaranthus* spp.) * Low cover of species from drier habitats (e.g. Ranunculus repens, Potentilla reptans, Agrostis stolonifera) * No occurrence of invasive alien species (e.g. *Ludwigia* spp.)   Characteristic species:  Flora, Vascular plants: *Alisma gramineum, A. lanceolata, A. plantago-aquatica, Alopecurus aequalis, Berula erecta, Bolboschoenus glaucus, B. yagara, B. planiculmis, Butomus umbellatus, Calla palustris, Comarum palustre, Eleocharis mamillata, E. palustris, E. uniglumis, Glyceria fluitans, G. nemoralis, G. notata, G. spicata, G. declinata, Helosciadium bermejoi, H. nodiflorum, Hippuris vulgaris, Juncus subnodulosus, Leersia oryzoides, Menyanthes trifoliata, Nasturtium officinale, Oenanthe aquatica, Rorippa amphibia, Sparganium emersum, S. erectum, Sagittaria sagittifolia, Veronica beccabunga, Veronica anagallis-aquatica.*  Mosses: *Fontinalis antipyretica* |
| C5.2 Tall-sedge bed | Communities generally dominated by tall sedges typically of the order *Magnocaricetalia*. *Cladium mariscus* communities are only partly included here. When they develop in calcareous fens they are part of the habitat type D4.1c. The optimal belt for tall sedge vegetation is the geolittoral zone, the area above the mean water level, but subjected to periodical flooding and water saturated for most of the year. Tall sedge communities are usually species-poor, often dominated by one species and accompanied by few characteristic species. Some of the above mentioned dominant species have clear preferences related to climate, substrate, hydrology and trophic level of the habitat.  The primary productivity of these communities is high, but clearly lower than for non-sedges tall helophytes included in the habitat C5.1a.  Tall sedge communities occur also along running waters or in wet and moist depressions of alluvial and karst plains. In the hydro-series they are later replaced by drier wet meadows and riparian shrub vegetation. They grow as fringe vegetation along lakes and ponds, often in mixture with tall reedy helophytes and forbs (habitat C5.1a). In low-productive lakes, particularly in northern Europe, *Carex rostrata, C. lasiocarpa* and *C. aquatilis*, with *Equisetum fluviatile,* are substituting taller reeds in water fringe helophyte vegetation. Such stands are very species poor, sometimes monospecific. However stands dominated by *Carex rostrata* and *C. lasiocarpa* in calcareous fens and bogs belong to the habitats D4.1c  Many tall sedges have an effective clonal growth: some species grow in large tussocks raising some tens of centimetres above the substrate. Wet hollows between tussocks, with accumulation of plant remains, are often occupied by small aquatic and emergent herbs and grasses (e.g. *Galium palustris s.l.*, *Lycopus europaeus, Ranunculus trichophyllus*, *Scutellaria galericulata*, *Lemna* spp., *Utricularia* ssp.), aquatic mosses and hepatics (*Calliergon* spp.*, Drepanocladus aduncus, Riccia* spp.*, Ricciocarpos natans*). Various mixtures of herbs and grasses often indicate unstable successive states after disturbances.  Tall sedge communities have been earlier used for cattle grazing and mowing, and many have been converted to arable land and pasture. They are largely impacted by water level regulation, construction activities and eutrophication. In recent past eutrophication and decline of grazing has often led to the increase of tall reeds in the lower part of tall sedge communities, and to increase of shrubs and trees in the upper part. Tall plants from drier positions can also invade sedge-dominated stands. In dynamic alluvial landscapes this habitat may exist more sustainable, occupying slightly different sites over different years. In other sites it can only be maintained for longer times by mowing.  Indicators of good quality:   * Natural water and flooding regime * No alteration of substrate chemistry * Species poor stands dominated by sedges * Low cover of annuals, ruderal and/or nitrophilous species * Low anthropogenic impacts in terms of construction activities, eutrophication, drainage etc. * No enhanced biomass due to eutrophication or replacement by tall reedy vegetation * Absence of invasive alien species (e.g. *Impatiens glandulifera, Bidens frondosa, Ludwigia spp., Fallopia* spp., etc.) * Shrubs and trees occur in low cover and do not show increasing trends * Low cover of tall herbs from drier positions and other habitats (e.g. *Calystegia sepium, Eupatorium cannabinum,* *Valeriana officinalis, Cirsium* spp., etc.)   Characteristic species:  Vascular plants: *Calamagrostis canescens, C. purpurea, Carex acuta, C. acutiformis, C. appropinquata, C. aquatilis, C. buxbaumii, Carex cespitosa, C. diandra, C. distica, C. elata, C. hispida, C. juncella,  C. lasiocarpa, C. lyngbyei* (Iceland), *C. melanostachya,* *C. paniculata, C. pseudocyperus, C. randalpina, C. riparia, C. rostrata, C. reuteriana, C. rhynchophysa, C. vesicaria, C. vulpina, Cladium mariscus, Cyperus* *longus*, *Phalaris arundinacea.* Frequently accompaning species are *, Lycopus europaeus, Lythrum salicaria, Mentha aquatica, Rorippa amphibia, Oenanthe aquatica, Glyceria spp., Equisetum fluviatile, Solanum dulcamara,* in the Mediterranean area also some *Juncus* species mayoccur in this habitat (e.g. *J. effuses* and *J. inflexus*).  Bryophytes: *Drepanocladus spp*. (mainly *D. aduncus*)*, Campylium spp., Calliergon spp.,* in paludified stands also *Sphagnum spp.*  Vertebrates: *Rana spp., Hyla spp., Bombina* spp., *Bufo spp.*, *Natrix spp., Hierophis viridiflavus* (Mediterranenan area). If this habitat is close to rivers or lakes can be important bird haunts. The species of the family *Ardeidae* are rather frequent.  Invertebrates: *Nematoda*, *Lumbricus* spp., *Odonata*, *Larinioides* spp., *Dolomedes fimbriatus, D. plantarius, Argiope* spp. |
| C5.4 Inland saline or brackish helophyte bed | This habitat includes helophytes beds developing in inland saline or brackish lakes, ponds and other standing or slowly flowing waters (such as saline Mediterranean rivers) subjected to dry out during summer. The habitat may include, depending by the hydrological regime, emergent communities dominated by species tolerant to brackish or saline conditions such as *Bolboschoenus maritimus, Typha laxmannii, Typha domingensis, Phragmites australis, Schoenoplectus tabernaemontani, Schoenoplectus triqueter,* or communities dominated by tall rushes, such as *Juncus maritimus, Juncus acutus* and *Juncus subulatus.* The communities are species-poor and often mono-dominant. Similar communities in dune slacks are considered part of habitats B1.8a or B1.8b.  In warmer and continental parts of Europe, during the hot summer, the water level in the wetlands may decrease and the water may even completely disappear. Several species inhabiting this habitat, especially reed, may survive even under such hypersaline conditions. *Bolboschoenus maritimus* is the most widespread middle tall helophyte on the water margins of wetlands with different levels of salinity, growing in a range from freshwater to hypersaline water. These communities mainly inhabit the water fringes, but when a wetland dries out during the year, they may expand and cover the whole bottom of a lake or pond.  This habitat is typically in contact with the habitats C1.5 (Permanent inland saline and brackish waters), C3.5 (Periodically exposed saline shores with pioneer and ephemeral vegetation) and E6 (inland salt steppes). It is distributed in the arid continental and Mediterranean parts of Europe.  Indicators of quality:   * Minimum salinity around 0.5 ‰ * Natural high electrical conductivity of the water * No alteration of the natural salinity range * Dominance of halophytic emergent species rather than freshwater emergent species * Absence of overgrowing with shrubs and trees * No signs of eutrophication and dominance of ruderal species * No indicator of negative anthropogenic influence (e.g. regulation of the water level, chemical pollution)   Characteristic species:  Flora:  Vascular plants: *Aster tripolium*, *Bolboschoenus maritimus, Carex melanostachya., Carex extensa, Carex distachya, Cirsium brachycephalum, Juncus acutus, Juncus gerardii, Juncus maritimus, Juncus subulatus, Lotus tenuis, Melilotus dentatus, Mentha pulegium, Phalaris arundinacea, Phragmites australis, Puccinellia distans, Puccinellia limosa, Puccinellia peisonis, Schoenoplectus litoralis, Schoenoplectus pungens, Schoenoplectus tabernaemontani, Schoenoplectus triqueter, Scorzonera parviflora, Typha domingensis, Tripolium pannonicum, Typha laxmannii*  Fauna:  Invertebrates: *Lestes macrostigma, Scirpophaga praelata*  Vertebrates: *wintering ducks (e.g. Anas crecca, Anas acuta, Ana platyrhynchos, Netta rufina), Anser anser, wintering and migrating waders (e.g. Gallinago gallinago, Himantopus himantopus), Rallidae* |
| C6.1 Underground standing and running waterbody | The habitat includes running or standing water bodies that develop under the ground surface. In many cases these water bodies are part of cave systems. Groundwater systems in soil are not included here. The underground water body is a result of impermeable layers below the body that enables accumulation of water. Water can also be captured between two impermeable layers (artesian water). This habitat most often develops on limestone bedrock. By dissolution of limestone, the water creates underground caves that can be filled with water. Specific animals are adapted to these conditions, such as *Proteus anguinus* the only cave-dwelling chordate species found in Europe. It is an entirely aquatic animal, as it eats, sleeps, and breeds underwater. This animal is most notable for its adaptations to a life of complete darkness: eyes are undeveloped and the animal is blind, while its other senses, particularly smell and hearing, are acutely developed. It has also no pigmentation in its skin. Underground water bodies are an important source for drinking water, and in that sense threatened by pollution. This habitat type can be connected with other habitats developing above the ground surface, like temporary flooded habitats, turloughs, poljes and others karst structures.  Indicators of good quality:   * Unaltered stalactites, stalagmites or other carbonate concretions testifying an active karst phenomenon * No groundwater capture or canalization * Presence of invertebrate and vertebrate species typical of this habitat * No touristic use of the cave   Characteristic species:  This habitat type is characterized by the almost total absence of photosynthetic organisms except for those that grows in the transitional part with the external environment.  Invertebrates: many species of invertebrate that populate the underground systems can be also found on the surface water and soil, however they present adaptations to the underground life (often miniaturization, lost of pigments, eyes, morphological simplification). Very common are planarians, oligochaetes (e.g. *Lumbriculida* and *Tubificida*), molluscs (e.g. *Congeria kuscerii* in Bosnia and Herzegovina, Croatia, Slovenia), springtails (e.g. *Bessoniella, Pseudosinella*), diplurans (e.g. family *Campodeidae*), troglobiotic species of beetles, centipedes (e.g. *Lithobius matulicii* from Bosni and Herzegovina), millepedes, troglobiotic spiders and related groups , crustaceans such as copepods (e.g. *Cyclopoida* and *Harpacticoida*), ostracods, malacostracans (e.g. a variant of *Gammarus lacustris* in Norway), cirolanids, asellids. Specific of underground water bodies is the crustacean order *Bathynellacea* and the family *Ingolfiellidae*. Big crustaceans include the genus *Troglocaris* (*Troglocaris* *anophthalmus* in the Balkans and Italy).  Vertebrates: Also some amphibious species are adapted to this habitat, such as *Proteus anguinus*, cave salamanders (including *Atylodes genei*) and 7 species of the genus *Speleomates* (*S. ambrosii, S. flavus, S. imperialis, S. sarrabusensis, S. italicus, S. strinatii, S. supramuntis*), 6 of those are endemic of restrict areas of the Italian Peninsula. |
| D1.1 Raised bog | In raised bogs, the water table level is elevated  by a few centimeters to metres above that of mineral rich ground water of surrounding areas and consequently there is an ombrotrophic (rain-fed) nutrient regime. The peat layer is often several metres thick and mainly composed of *Sphagnum* remains, highly water saturated with the water table close to the surface. High acidity (pH < 4.5) and low mineral content characterize the peat and pore water. Typically there is a pattern of alternation between micro  habitats (hummocks, lawns, carpets, hollows) that relate to topography, hydrology and peat formation. Hummock-hollow patterning can be irregular in flat plateau bogs, where hummocks remain low. In concentric and eccentric raised bog complexes, hummock-hollow patterning shows a distinct orientation perpendicular to the slope and water flow. Open water pools of secondary origin, i.e. developed on the peat after hummock ridge formation, are often found and provide important aquatic microhabitats. Raised bog habitats are most typical in central parts of raised bog complexes (EUNIS habitat X04) but they are also found in mixed complexes with D3.2 Aapa mires. Mire complex patterns may also be completely missing and often raised bog habitats are found as small undrained remnants of historically degraded bog complexes. Raised bogs differ from D1.2 Blanket bogs by being restricted to basins rather than blanketing over variable terrain. The lagg zones of raised bog complexes are considered under D2.2a Poor Fens.  Trees (*Pinus sylvestris, Betula pubescens*) are found only sparsely on hummocks and *Sphagnum* mosses dominate the ground layer of vegetation. In hummocks, *Sphagnum fuscum* is the most characteristic species, especially in boreal and continental areas. Other typical hummock species are *S. rubellum, S. magellanicum, S. capillifolium, S. angustifolium, Dicranum bergeri*  and *Polytrichum strictum*. Dwarf-shrub species *Andromeda polifolia, Betula nana, Calluna vulgaris, Empetrum nigrum, Erica tetralix, Ledum palustre, Vaccinium microcarpon, V. oxycoccos, V. uliginosum* are characteristic on hummocks, while only few herbs (*Drosera rotundifolia*, *Rubus chamaemorus*) and sedges (*Carex pauciflora, Eriophorum vaginatum*) are found. The wet hollows may have continuous carpets of *Sphagnum* or sometimes muddy peat surfaces void of mosses or with some cover of hepatics or *Warnstorfia fluitans*. Typical species include *Sphagnum cuspidatum, S. balticum, S. jensenii, S. majus, S. tenellum* among mosses and *Carex limosa, Scheuchzeria palustris, Rhynchospora alba* among vascular plants. Also forest mosses like *Pleurozium schreberi, Hylocomium splendens, Dicranum polysetum* and lichens like *Cladonia spp.* and *Certraria islandica* are found on hummocks.  Raised bogs are widely distributed from central European mountain areas to north-boreal regions, being most prominent in the hemi-boreal to south-boreal zones. The pattern of dominance and features of micro-habitat patterning vary over different climatic zonation belts.  Indicators of good quality:   * Under natural conditions, the water table is close to surface in hollows and it can be readily observed in small pit dug in peat surface except during prolonged drought. * There is a gradual and logical continuum between dominant vegetation and the composition of recently (decades to centennial) formed peat, indicating that modern vegetation is forming typical *Sphagnum* peat. * Species composition differs between hummocks and hollows in a regionally characteristic way and there are no large patches of lichens or hummock mosses such as *Polytrichum strictum* in the hollows. * Ombrotrophic and acidophilic *Sphagnum* mosses and other characteristic species comprise substantial elements in vegetation. * Number of species or diversity indices of vegetation are not good indicators since raised bogs are naturally species poor habitats, while harboring unique species assemblages. * Occurrence of trees is limited to scattered individuals on hummocks. Drainage ditches are one main factor to cause decline of quality of raised bogs but their occurrence alone does not always indicate poor quality.   Characteristic species:  Flora: Vascular plants: *Andromeda polifolia, Betula nana, Calluna vulgaris, Carex limosa, Carex pauciflora, Drosera rotundifolia*, *Empetrum nigrum,* *Erica tetralix, Eriophorum vaginatum, Ledum palustre, Melampyrum pratense, Pinus sylvestris, Rhynchospora alba, Rubus chamaemorus, Scheuchzeria palustris, Trichophorum cespitosum, Vaccinium microcarpon, Vaccinium oxycoccos, V. uliginosum, V. vitis-idaea*  Mosses: *Aulacomnium palustre, Cladopodiella fluitans, Calypogeia sphagnicola, Dicranum bergeri, Dicranum leioneuron, Dicranum polysetum, Dicranum scoparium, Gymnocolea inflata, Hylocomium splendens, Leucobryum glaucum, Mylia anomala, Odontochisma sphagni, Pleurozium schreberi, Polytrichum strictum, Sphagnum angustifolium, Sphagnum balticum, Sphagnum capillifolium, Sphagnum compactum, Sphagnum cuspidatum, Sphagnum rubellum, Sphagnum lindbergii, Sphagnum magellanicum, Sphagnum papillosum, Sphagnum fuscum, Sphagnum majus, Sphagnum jensenii, Sphagnum tenellum,  Warnstorfia fluitans*  Lichens: *Cetraria islandica, Cladonia rangiferina, Cladonia arbuscula, Cladonia stellaris, Cladonia stygia.*  Fauna: Birds: *Pluvialis apricaria, Grus grus, Tringa glareola,* *Tringa nebularia, Numenius arquata, Anthus pratensis, Motacilla flava, Tetrao tetrix, Vanellus vanellus*  Insects: *Boloria spp., Carsia sororiata, Coenonympha tullia, Colias palaeno, Pyrgus centaureae* |
| D1.2 Blanket bog | This habitat comprises the rain-fed (ombrotrophic) main surfaces of blanket bog complexes (EUNIS-type X28) typical of thick peat, more than 1m deep and commonly 2-4m, on flat, gently sloping or undulating terrain in an Atlantic to Subatlantic climate where there is high and quite consistent precipitation (minimum of 1200 mm and 160 days of rain). It is most extensive in the Inited Kingdom, Ireland, the British Isles and along the west-coast of Norway. Blanket bogs are predominantly treeless and the mire surface usually has less distinct surface patterning than D1.1 Raised bogs. However, irregular alternation of small pools, hollows and hummocks with distinct species assemblages can occur and blanket bogs can bear some resemblance to raised bogs especially on flat terrain. The peat-building element of the habitat is *Eriophorum vaginatum* and Sphagna with *Sphagnum capillifolium, S. magellanicum* and *S. fuscum* typical and often forming extensive carpets over undulating terrain. *Calluna vulgaris, Vaccinium myrtillus, V. vitis-idaea, Empetrum nigrum* and*Erica tetralix* provide a sub-shrub element on drier hummocks with large hypnoid mosses and *Racomitrium lanuginosum.*  In flat areas, wet surface types become more characteristic with abundance of *S. papillosum, S. tenellum, S. compactum, S. magellanicum, S. rubellum* and *S. imbricatum,* accompanied by *Narthecium ossifragum, Trichophorum cespitosum* and *Eriophorum angustifolium*. Low-altitude Atlantic blanket bogs are characterized by abundance of *Molinia caerulea, Trichophorum cespitosum* and, in the extreme west where there is a strongly oceanic climate, even *Schoenus nigricans*.  Indicators of quality:   * upper layers of peat kept permanenlt wet by rain * *Sphagnum* carpet extensive * absence of artificial ditches or gullies or signs of burning * no indications of erosion or drying * absence of trees * absence of alien species like *Rhododendron*   Characteristic species  Vascular plants: *Calluna vulgaris, Carex limosa, Deschampsia flexuosa, Drosera rotundifolia, Erica tetralix,  Eriophorum vaginatum, E. angustifolium, Huperzia selago, Juncus bulbosus, Molinia caerulea, Narthecium ossifragum, Potentilla erecta, Rubus chamaemorus, Schoenus nigricans, Trichophorum cespitosum, Utricularia intermedia, Utricularia minor, Vaccinium uliginosum, V. itis-idaea, Rhynchospora alba*, *Carex panicea*, *Myrica gale*, *Pedicularis sylvatica*, *Polygala serpyllifolia*, *Pinguicula lusitanica.*  Mosses: *Aulacomnium palustre,* *Campylopus atrovirens,* Cladopodiella fluitans, Gymnocolea inflata, *Leucobryum glaucum, Plagiothecium undulatum, Pleurozium schreberi, Racomitrium lanuginosum, Rhytidiadelphus loreus, Sphagnum papillosum, S. pulchrum, S. tenellum, S. compactum, S. cuspidatum, S. magellanicum, S. capillifolium, S. rubellum, S. fuscum, S. denticulatum, S. imbricatum, S. palustre, Warnstorfia fluitans (syn. Drepanocladus fluitans)*  Birds: *Calidris alpina, Circus cyaneus, Falco columbarius, Pluvialis apricaria* |
| D2.1 Oceanic valley bog | Oceanic valley bogs are essentially topogenous systems of permanently waterlogged, oligotrophic acid peats, maintained by a high ground water table seeping from impervious bedrocks or superficial deposits in low-relief landscapes of the oceanic parts of Europe, topographically completely isolated from other mire systems, though often embedded within landscapes of wet heath. The hydrological regime can be quite complex, with percolating waters sometimes channeled to a central soakway and outflow which has a more obviously soligenous character. The peat sustaining the valley bog habitat itself is usually thin, often less than 1.5m.  Although the valley mire flora may show some localised soligenous influence where water flow becomes more obvious, a poor-fen flora is typically sparse on the active surface and the usual dominants are peat-building *Sphagnum* species, which form a luxuriant carpet with a gentle hummock-hollow surface and bog pools in lower places. Compared with ombrogenous bogs, *Eriophorum vaginatum* and *Scirpus cespitosus* are very scarce and the usual monocotyledons are *Eriophorum angustifolium* and *Molinia caerulea*,both sometimes abundant, with *Rhynchospora alba* occurring around the pools. *Erica tetralix* and, on the gentle hummocks, *Calluna vulgaris* form a patchy canopy up to 3 dm tall and *Myrica gale* is locally abundant.  Among the associates, the most characteristic are *Narthecium ossifragum, Drosera rotundifolia* with, less commonly *D. intermedia* and *D. anglica*, *Potentilla erecta* and *Vaccinium oxycoccos.* Associated soakways may have vegetation resembling D2.3a Quaking mires with, for example, *Menyanthes trifoliata*, *Potamogeton polygonifolius* and *Hypericum elodes* or small sedges. Where valley mires occur within stretches of wet heath, grazing and burning often occur in the mire surrounds, but the high water table of healthy mires offers some protection against trespass of bigger herbivores .  Indicators of good quality:   * Water-table close to surface with wetter depressions and open pools. * Absence of man-made ditches or gullies * No patterns of erosion and drying * (Relatively high) species richness (in flora and fauna) * No indicators of ground-water eutrophication.   Characteristic species:  Vascular plants: *Calluna vulgaris, Drosera rotundifolia*, *Drosera intermedia, D. anglica, Erica tetralix, Eriophorum angustifolium, Molinia caerulea, Myrica gale, Narthecium ossifragum, Pinguicula lusitanica, Rhynchospora alba, Vaccinium oxycoccos* and in associated soakways *Menyanthes trifoliata*. *Potamogeton polygonifolius* and *Hypericum elodes.*  Mosses: *Sphagnum capillifolium, S. papillosum* with *S. magellanicum* and *S. pulchrum* local, *S. auriculatum, S. cuspidatum* and *S. recurvum* in pools.  Liverworts:  *Cephalozia connivens, C. macrostachya, C. bicuspidata,* *Cladopodiella fluitans, Kurzia pauciflora, Odontoschisma sphagni.*  Lichens:  *Cladonia arbuscula, C. impexa, C. uncialis.* |
| D2.2a Poor fen | Wide group of acidic (pH 3-5), minerotrophic mires, dominated by sedges and *Sphagnum* species. Poor fens occur in many different hydro-topographical situations and are typical components of the marginal lagg of raised bogs. In temperate Europe they also occur around mountain springs, in forest hollows, and in infertile fen-grassland complexes, but always on non-calcareous bedrock. Poor fens can also form the main type of usually small mire areas in weakly minerotrophic basins. Poor fens are the main transition type between D2.3a Quaking mires and D1.1 Raised bogs. Poor fens receive limited minerotrophic water input from upper catchments usually via non-distinct, diffuse flow paths. Poor fens can have unidirectional slope and lateral water flow but hummock-string patterning typical for D3.2 Aapa mires is missing.  Poor fens are characterized by continuous carpets of oligotrophic *Sphagnum* spp. combined with high abundance of sedges like *Carex canescens, Carex echinata, Carex nigra, Carex lasiocarpa, Eriophorum scheuchzeri, Trichophorum cespitosum.* Other abundant species areand *Andromeda polifolia, Betula nana, Dactylorhiza maculata, Eriophorum vaginatum, Potentilla erecta,* and *Vaccinium oxycoccos*. Also certain deep-rooted species more characteristic of D2.3a Quaking mires are frequent in poor fens, namely *Eriophorum angustifolium, Carex rostrata* and *Menyanthes trifoliata.* Ground layer is often dominated by *Sphagnum angustifolium, Sphagnum fallax, Sphagnum flexuosum, Sphagnum papillosum* and *Sphagnum magellanicum*, while other brown mosses can also be frequent, including *Straminergon stramineum, Polytrichum commune* and *Warnstorfia fluitans.* Higher degree of minerotrophic influence can be found only occasionally, as indicated by occurrence of e.g. *Sphagnum subsecundum, Sphagnum obtusum* or *Sphagnum teres.* In boreal zone, hummocks with *Sphagnum fuscum, Polytrichum strictum, Calluna vulgaris* and *Empetrum nigrum* are sometimes found in poor fens, with *Salix* spp., *Rhamnus frangula,* *Betula pubescens* or individual cranked pines (*Pinus sylvestris*).  Indicators of good quality:  Under natural conditions, water table is high also in summer and continuous carpets of mosses prevail with abundant sedges. Species diversity of vegetation is generally slightly higher than in D1.1 Raised bogs but clearly lower than in intermediate fens. In good hydrological condition there are no ditches that drain or disconnect water flow from the upper drainage area to the mire. Tree growth is limited to scattered individuals on hummocks or mire margins.  Characteristic species :  Vascular plants: *Andromeda polifolia, Betula nana, Carex canescens, Carex chordorrhiza, Carex diandra, Carex lasiocarpa, Carex limosa, Carex magellanica subsp. irrigua, Carex rostrata, Chamaedaphne calyculata, Dactylorhiza maculata, Drosera rotundifolia*, *Drosera longifolia, Epilobium palustre, Eriophorum angustifolium, Eriophorum scheuchzeri*, *Eriophorum vaginatum, Equisetum fluviatile, Huperzia selago, Juncus filiformis, Ledum palustre, Pedicularis palustris, Peucedanum palustre, Potentilla erecta, Rubus chamaemorus, Swertia perennis, Trichophorum cespitosum, Vaccinium oxycoccos*  Bryophytes*: Aulacomnium palustre, Calliergonella cuspidata, Sphagnum aongstroemii, Sphagnum angustifolium, Sphagnum fallax, Sphagnum fimbriatum, Sphagnum flexuosum, Sphagnum magellanicum, Sphagnum obtusum, Sphagnum palustre, Sphagnum papillosum, Sphagnum pulchrum, Sphagnum riparium, Sphagnum subnitens, Straminergon stramineum, Warnstorfia fluitans* |
| D2.2b Relict mire of Mediterranean mountains | Oligo- to mesotrophic mires of the montane and subalpine belts of Mediterranean mountains of the High Atlas (Morocco), Sierra Nevada and Corse, and of high mountains (above 1900 m altitude) of the Western Balkan peninsula. These mires occur on the edges of glacial lakes and around mountain streams, forming waterlogged ‘blankets’ in relatively flat areas with impermeable soils, where a peat layer has developed on siliceous bedrocks. The type is differentiated from mires and grasslands with a similar physiognomy in the Alps, Pyrenees and rest of the Balkan by the presence and dominance of narrow-endemic relict species, and by the lower frequency of Sphagnum species. The sites of this habitat in the South-European mountains are characterised by relative cold and humid conditions, creating a distinct green habitat in a dry landscape. Water supply and temperature vary relatively little during the year, compared to surrounding habitats. In the high mountains of the Balkan this habitat is covered by snow most of the year.  The mires are bordered by streams, springs and lakes on the lower edges, and by moist grasslands with *Nardus stricta* (E3.2b) on the drier edges. The habitat is dominated by *Carex nigra* ssp. *intricata* in the Sierra Nevada and Corse, and by *Carex nigra* var. *macedonica* in the Balkan. In Spain also *Festuca frigida* may dominate, while in Corse along streams *Trichophorum cespitosum* may be dominant. Common species in both Mediterranean regions are *Carex echinata, Carex nevadensis*, *Agrostis canina* and *Viola palustris*. Different characteristic endemic species  are found in the different regions. For several genera, vicariant endemic species are found in the different mountain regions. Such species are considered tertiary relicts. Examples in these mires are *Pinguicula nevadensis*, *Pinguicula corsica* and *Pinguicula balcanica*, and also *Narthecium reverchonii* (Corse) and *Narthecium scardicum* (Balkan). Some of the characteristic species also grow outside the mires, like *Pinguicula corsica* and *Narthecium reverchonii* along waterfalls on wet rocks. Together with the adjacent Nardus grasslands of E3.2b, these conspicuous habitats are called *Pozzines* in Corse and *Borreguiles* in the Sierra Nevada.  Indicators of good quality:  In wet conditions these grasslands are relatively stable. Desiccation causes a succession towards Nardus grasslands of E3.2b. Abandonment leads to the development of tall herb vegetation. The type may expand slowly by vegetation succession in open water. Indicators of good quality are:   * presence of endemic species * high vegetation cover * low cover of (encroaching) tall herbs and shrubs * situated in a gradient from water to drier grassland   Characteristic species:  Vascular plants:  Corsica: *Agrostis canina, Bellis bernardii,Bellium nivale  Carex echinata, Carex nevadensis, Carex nigra ssp intricata, Carex ovalis, Carex pallescens, Danthonia decumbens, Drosera rotundifolia, Juncus requienii,  Pinguicula corsica, Poa supina, Polygala serpyllifolia, Potentilla anglica ssp. nesogenes, Potentilla erecta, Ranunculus cordiger, Trichophorum cespitosum* (dom.), *Viola palustris*.  Sierra Nevada : *Agrostis canina ssp. granatensis, Carex echinata, Carex nevadensis, Carex nigra ssp intricata, Eleocharis quinqueflora, Festuca frigida, Gentiana pneumonanthe ssp. depressa, juncus alpestris, Leontodon microcephalus,  Pinguicula nevadensis, Ranunculus angustifolius ssp. alismoides, Veronica turbicola, Viola palustris.*  Balkan: *Calicocorsus stipitatus (=Wilemetia stipitata), Carex bulgarica,* *Carex nigra var. macedonica (= C. macedonica), Cirsium heterotrichum*, *Crocus veluchensis*, *Dactylorhiza cordigera* subsp. *bosniaca*, *Gentiana pyrenaica*, *Gentianella bulgarica*, *Leontodon riloensis, Narthecium scardicum, Pinguicula balcanica,* *Plantago gentianoides, Primula deorum*, *P. farinosa* subsp. *exigua*, *Gymnadenia* (*Pseudorchis*) *frivaldii, Silene asterias* (in Bulgaria often growing in *Calthion palustris*)*, Soldanella pindicola.* |
| D2.2c Intermediate fen and soft-water spring mire | These are weakly acidic (pH 5-6) minerotrophic mires with a plant species composition intermediate between D2.2a Poor fens and D4.1a Short-sedge rich fens and calcareous spring fens. Intermediate fens occur on sodden peats fed from upper catchments by diffuse seepage of non-calcareous ground water discharged via springs with an influence typically confined to soaks or small brooks.  They have unidirectional slope and lateral water flow but the kind of hummock-string patterning typical to D3.2 Aapa mires is missing or very limited. Intermediate fen vegetation can represent the general character of the main mire surfaces or be confined to more or less distinct patterns.  True rich fen indicator species (e.g. *Campylium stellatum, Philonotis calcarea, Scorpidium cossoni, Tomentypnum nitens*) are missing or very scarce, one distinction from calcareous types. Since the transition between poor and rich fen characters differs across the extensive range through temperate Europe, variations in species composition in different regions can be seen.  Intermediate fens are characterized by abundance of mainly short-sedges like *Carex canescens, C. echinata, C. nigra, C. panicea, Eriophorum scheuchzeri, Trichophorum alpinum*,while also poor fen species like *T. cespitosum* and *C. lasiocarpa* are found. Other vascular plants include *Cardamine pratensis, Dactylorhiza maculata, Molinia caerulea, Parnassia palustris, Potentilla erecta, Selaginella selaginoides, Tofieldia pusilla* and *Viola palustris.* Common mire species like *Andromeda polifolia, Eriophorum vaginatum* and *Vaccinium oxycoccos* are also abundant. The ground layer may have *Sphagnum contortum, S. subfulvum, S. subnitens, S. subsecundum, S. obtusum*, *S. teres* or *S. warnstorfii*, also poor fen *Sphagnum* species can be found, and species composition varies between regions*.* Characteristically, brown mosses are abundant, but calciphilous species are absent. Characteristic species include *Loeskypnum badium* and *Warnstorfia sarmentosa.* Also *Paludella squarrosa* and *Scorpidium revolvens* are sometimes found. Especially in soft-water springs, *Brachythecium rivulare, Bryum weigelii, Calliergon giganteum, Philonotis fontana, Plagiomnium spp., Rhizomnium spp.* and *Warnstorfia exannulata* are characteristic mosses and *Cardamine amara* and *Montia fontana* may characterize the spring influence among vascular plants. Hummocks with, for example, *Sphagnum fuscum, Polytrichum strictum, Calluna vulgaris* and *Empetrum nigrum* are sometimes found, with *Salix* spp., *Rhamnus frangula,* *Betula pubescens* or individual cranked *Pinus sylvestris*.  Indicators of good quality:   * Under natural conditions, the water table is close to the peat surface (5-20 cm) * carpets of mosses prevail with abundant short-sedges * Species diversity of vegetation is high reflecting transition between poor fens and rich fens * There are no ditches that drain or disconnect seepage or spring flow from the upper drainage area to the mire * Tree growth is limited to scattered individuals on hummocks or margins * Overgrowth by acidophilic *Sphagnum* spp. or by generalist tall sedges.   Characteristic species:  Vascular plants: *Agrostis canina, A. capillaris, Allium sibiricum*, *Andromeda polifolia, Betula nana, Calamagrostis stricta, Cardamine pratensis, Carex canescens, C. diandra, C. dioica, C. lasiocarpa, C. magellanica ssp. irrigua, Crepis paludosa, Dactylorhiza incarnata, D. maculata, D. traunsteinerii, Drosera rotundifolia*, *D. longifolia, Epilobium alsinifolium, E. palustre, Eriophorum angustifolium, E. scheuchzeri*,  *Equisetum palustre, Hammarbya paludosa, Huperzia selago, Juncus filiformis, Parnassia palustris, Pedicularis palustris, Potentilla erecta, Rhynchospora fusca, Salix herbacea, Selaginella selaginoides, Trichophorum  alpinum, T. cespitosum, Vaccinium oxycoccos, Viola palustris*  Mosses: *Aulacomnium palustre, Brachythecium rivulare, Bryum pseudotriquetrum, B. weigelii, Calliergon cordifolium, C. giganteum, Calliergonella cuspidata, Chiloskyphus polyanthos, Hamatocaulis vernicosus, Helodium blandowii, Hypnum pratense, Loeskypnum badium, Marchantia polyanthos, Mniobryum wahlenbergii, Paludella squarrosa, Plagiomnium medium, P. ellipticum, P. undulatum, Philonotis fontana, P. seriata, Pseudobryum cinclioides, Rhizomnium magnifolium, R. pseudopunctatum, Scapania paludicola, Scorpidium revolvens, Sphagnum aongstroemii, S. flexuosum, S. magellanicum, S. obtusum, S. papillosum, S. subnitens, S. subsecundum, S. teres, S. warnstorfii, Straminergon stramineum, Trichocolea tomentella, Warnstorfia fluitans, W. exannulata, W. sarmentosa* |
| D2.3a Non-calcareous quaking mire | Very wet mires with poor fen vegetation. Quaking mires include mires formed by terrestrialization of water bodies which involves formation of floating rafts of peat, typically proceeding from marginal areas towards basin centre, where primary open water pools can remain. Also included in this type are mires without neighbouring water bodies layer but similarly high water saturation leading to quaking conditions occurring in high water throughput percolation mires. The mire basin is always fed by minerotrophic ground water from the catchment area. There is no regular surface patterning connected to water flow. Water quality varies from acidic to moderately acidic. Vegetation is minerotrophic poor fen vegetation including intermediate fen communities (pH below 7). The lack of raised peat domes separate quaking mires from D1.1 Raised bogs, the lack of string patterning and slope from D3.2 Aapa mires and the lack of true rich fen indicator species (*Scorpidium* spp. et al.) from D4.1c Calcareous quaking mires.  Non-calcareous quaking mires are characterized by poor fen to medium rich vegetation including *Calla palustris*, *Carex limosa*, *Carex rostrata*, *Carex aquatilis*, *Eriophorum angustifolium*, *Equisetum fluviatile*, *Menyanthes trifoliata*, *Potentilla palustris*, *Rhynchospora alba*, *Scheuchzeria palustris* and *Utricularia intermedia* among vascular plants. *Sphagnum cuspidatum*, *Sphagnum platyphyllum*, *Sphagnum subsecundum*, *Sphagnum majus* and *Warnstofia spp.* are characteristic among bryophytes. Hepatics are sometimes abundant, most typically *Cladopodiella fluitans*. Floating peat rafts may also form surfaces elevated from water level with for example *Sphagnum fallax* and *Eriophorum vaginatum* or *Molinia caerulea*. When the floating peat raft becomes thick enough nearly ombrotrophic hummock like surfaces with e.g. *Sphagnum magellanicum*, *Andromeda polifolia* and *Vaccinium oxycoccos* can occurr. Even in such cases deep-rooted minerotrophic vascular plants like *Menyanthes trifoliata* can be found. Excluded are stands of vegetation fringing water bodies (see C3.2) unless the vegetation raft is sufficiently extensive to count as a habitat in its own right.  Indicators of good quality:   * water table always at surface; it can always be readily observed * packing density of peat is low, walk-on leads to characteristic yielding (quaking) * drainage ditches may affect quaking mires by lowering water level either permanently or increasing fluctuation and, thus, the likeliness of temporal drought or flooding with polluted water * deteriorating quality is indicated by loss of wet mire area associated species e.g. among birds, increase of trees and bushes, and of hummock vegetation   Characteristic species :  Vascular plants: *Andromeda polifolia, Calla palustris, Carex appropinquata, Carex chordorrhiza, Carex diandra, Carex lasiocarpa, Carex limosa, Carex pauciflora, Carex lepidocarpa, Carex vesicaria, Cicuta virosa, Drosera longifolia, Drosera intermedia, Drosera rotundifolia, Eriophorum angustifolium, Eriophorum gracile, Eriophorum vaginatum, Equisetum fluviatile, Hydrocotyle vulgaris, Menyanthes trifoliata, Molinia caerulea, Nuphar lutea, Pedicularis palustris, Potentilla palustris, Rhynchospora alba, Rhynchospora fusca, Rubus chamaemorus, Scheuchzeria palustris, Typha latifolia, Utricularia intermedia, Utricularia minor, Utricularia vulgaris, Vaccinium oxycoccos, Vaccinium uliginosum*  Bryophytes: *Calliergon cordifolium, Calliergon richardsonii, Calliergon giganteum, Calliergonella cuspidata, Scorpidium revolvens, Scorpidium scorpioides, Sphagnum angustifolium, Sphagnum fallax, Sphagnum denticulatum, Sphagnum cuspidatum, Sphagnum lindbergii, Sphagnum majus, Sphagnum rubellum, Sphagnum magellanicum, Sphagnum platyphyllum, Sphagnum riparium, Sphagnum pulchrum, Sphagnum squarrosum, Sphagnum subsecundum, Sphagnum teres, Straminergon stramineum, Warnstorfia exannulata, Warnstorfia fluitans*  Birds: *Tringa glareola* |
| D3.1 Palsa mire | This habitat type is consists of mires in the subarctic region with sporadic permafrost, most characteristically palsa mounds elevated by permafrost lenses. Palsa mires are found in the discontinuous permafrost zone of Iceland, northern Fennoscandia and arctic Russia, in areas with average annual temperature below -1 °C, with climatic optimum between -3 to -5 °C and annual precipitation below 450 mm. Typically, palsa mounds occur in groups in the central, thick-peated areas of palsa mires. Palsa mounds with dome shape are 10-100 m wide and 2-7m high. Other types are longitudinal string-form or extensive plateau- form palsas that reach 1-3 m high. Palsa mound summits are covered by *Sphagnum* peat that insulates heat so that the active layer of thaw is limited to 30-60 cm. The perennial frozen core of palsa mounds consists of frozen peat and silt material with ice lenses and crystals. Pounikko-type hummock ridges (D3.12) formed by seasonal frost action can be found particularly in marginal areas of palsa mires. Palsas can have different successional stages: young palsa formations have *Sphagnum* hummock vegetation, while older palsa mounds become dry and their exposed peat surfaces are subject to erosion that may lead to melting and partial collapse. Completely melted palsas result in the formation of thermokarst ponds.  The palsa mound summits provide dry microhabitats in palsa mires. Typical species growing on the palsa mounds include *Dicranum elongatum*, *Polytrichum strictum*, *Empetrum nigrum* and *Rubus chamaemorus* and many lichens.  Sides of palsa mounds often have abundant *Betula nana*, *Ledum palustris* and *Eriophorum vaginatum*. Palsa mires resemble D3.2 Aapa mires in hydrology and vegetation of the wet mire surfaces of areas between the palsa mounds, but regular hummock-string patterning is usually not found. Palsa mires are usually weakly minerotrophic and vegetation types overlap with those of D2.2a Poor fens and D2.3 Quaking mires. In the wet surfaces, *Sphagnum lindbergii*, *S. riparium, Eriophorum angustifolium* and *Carex rotundata* are typical dominant species.  Indicators of good quality:   * Under natural conditions, water table is very close to peat surface in fen areas between palsa mounds and carpets of mosses prevail with abundance of characteristic sedges. * There are no ditches that drain or disconnect water flow (seepage or overland flow) in the palsa mire complex. * Only few of the palsa mounds are melting and collapsing, indicating natural dynamics, while most palsa mounds remain frozen with intact peat cover. * Seasonal thaw of permafrost, the so called active layer, may reach 50-60 cm, while substantially deeper active layer approaching 1-m depth indicates melting and collapse.   Characteristic species:  Flora  Vascular plants: *Andromeda polifolia, Betula nana, Carex diandra, Carex lapponica, Carex lasiocarpa,*  *Carex limosa, Carex livida, Carex magellanica* ssp. *irrigua, Carex rariflora, Carex rostrata, Carex rotundata, Carex vesicaria, Chamaedaphne calyculata, Dactylorhiza maculata, Drosera rotundifolia*, *Drosera longifolia, Empetrum nigrum* ssp. *hermaphroditum, Epilobium palustre, Eriophorum angustifolium, Eriophorum scheuchzerii, Eriophorum russeolum, Eriophorum vaginatum, Equisetum fluviatile, Huperzia selago, Juncus stygius, Ledum palustre, Menyanthes trifoliata, Pinguicula villosa, Potentilla palustris, Rubus chamaemorus, Salix lapponum, Tofieldia pusilla, Trichophorum alpinum, Trichophorum cespitosum, Vaccinium oxycoccos, Vaccinium microcarpum, Vaccinium myrtillus, Vaccinium vitis-idaea*  Mosses: *Aulacomnium turgidum, Dicranella cerviculata, Dicranum elongatum, Dicranum fuscescens, Dicranum majus, Dicranum scoparium, Pleurozium schreberi, Pohlia nutans, Sphagnum angustifolium, Sphagnum balticum, Sphagnum fallax, Sphagnum flexuosum,Sphagnum fuscum, Sphagnum jensenii, Sphagnum lindbergii, Sphagnum magellanicum, Sphagnum papillosum, Sphagnum pulchrum, Sphagnum riparium, Sphagnum subsecundum, Straminergon stramineum, Warnstorfia fluitans, Warnstorfia exannulata, Warnstorfia procera*  Lichens: *Alectoria spp., Bryocaulon nigricans, Cladonia* spp.,  *Coelocaulon aculeatum, Ochrolechia* spp.  Fauna  Birds: *Anthus pratensis, Calcarius lapponicus, Calidris alpina, Carduelis flammea, Gallinago gallinago, Lagopus lagopus,  Limicola falcinellus, Limosa lapponica Luscinia svecica, Motacilla flava, Phalaropus lobatus, Philomachus pugnax, Pluvialis apricaria, Tringa glareola* |
| D3.2 Aapa mire | This habitat consists of minerotrophic main mire surfaces of the central parts of Aapa mire complexes in boreal Fennoscandia. Aapa mires include both topogenous and soligenous types with varying degrees of slope. The peat layer is usually relatively thin (< 2 m) and mainly composed of *Carex* peat and to lesser extent by remains of *Sphagnum* and other mosses. The peat is highly water saturated and water table is located very close to peat surface or above it leaving little space for aerobic rhizosphere. Peat and pore water are usually moderately to slightly acidic (with a pHof  4.5 to 5.5). Typically there is a regular pattern of alteration of variably wide wet *flarks* (wet hollows) or pools and narrow hummock strings that relate to topography, hydrology, peat formation and ice dynamics. Hummock string patterning is oriented perpendicular to slope and water flow. The strings act as dams to store water in the flarks. The string-flark pattern is dense on steep slopes, while nearly non-patterned aapa mires occur in flat terrains. Trees (*Pinus sylvestris, Betula pubescens*) are absent or sparsely found on hummock strings and are more abundant only near mire margins. *Sphagnum* and Amblysegiaceae mosses dominate the ground layer of vegetation, while hepatics growing on muddy peat and open water surfaces are common in the flarks. Aapa mires include subtypes ranging widely from nearly ombrotrophic poor fen vegetation to rich fen vegetation. However, aapa mires with true rich fen vegetation are assessed as part of D4.1c Calcareous quaking mires.  Wet flarks of aapa mires are characterized by abundance of sedges such as *Carex limosa, Carex rostrata*, *Carex chordorrhiza*, *Eriophorum angustifolium* and herbs such as *Equisetum fluviatile, Menyanthes trifoliata* and *Potentilla palustris.* Among typical carnivorous plants, *Drosera longifolia* and *Utricularia intermedia* are common in aapa mire flarks. Characteristic mosses include *Warnstorfia fluitans, Warnstorfia exannulata* and *Warnstorfia procera*, while quaking carpets of *Sphagnum majus, Sphagnum papillosum* and *Sphagnum pulchrum* are also common especially in southern range of aapa mires. The hummock strings are typically dominated by *Sphagnum* and sedges. Characteristic species are *Sphagnum angustifolium*, *Sphagnum fallax, Sphagnum flexuosum, Sphagnum magellanicum* and *Sphagnum papillosum* among mosses and *Carex lasiocarpa* and *Eriophorum vaginatum* arethe commonest sedges. The degree of minerotrophic influence strongly affects species composition and diversity of vegetation. With increasing minerotrophic influence (pH 5-6) typical species of wet flarks may include *Sphagnum platyphyllum, Utricularia minor* and *Carex livida*. In hummock strings, *Sphagnum subfulvum, Sphagnum subsecundum, Sphagnum teres, Sphagnum warnstorfii, Carex dioica, Molinia caerulea, Trichophorum alpinum, Selaginella selaginoides*  and *Tofieldia pusilla* are typical indicators of higher minerotrophic level. Sometimes strings have high hummocks with *Sphagnum fuscum* hummock vegetation, most typically in marginal areas and are often characterized by abundance of *Betula nana*.  Indicators of good quality:   * Under natural conditions, the water table is very close to peat surface in wet areas (flarks) between hummock strings, often forming open water surfaces. * There are no ditches that drain or disconnect water flow (seepage or overland flow) in the aapa mire complex. * Water quality reflects minerotrophy with moderately acidic pH values (4.5-6.5). * Minerotrophic sedges and bryophytes are abundant. * Trees are found only scatteredly in hummock strings and margins.   Characteristic species:  *Flora*  Vascular plants: Agrostis canina, *Andromeda polifolia, Betula nana, Calamagrostis stricta, Carex aquatilis, Carex buxbaumii, Carex chordorrhiza, Carex diandra, Carex dioica, Carex heleonastes, Carex lasiocarpa, Carex limosa, Carex livida, Carex magellanica* ssp. *irrigua, Carex nigra* ssp. *nigra, Carex rostrata, Carex rotundata, Chamaedaphne calyculata, Dactylorhiza incarnata* ssp. *incarnata, Dactylorhiza maculata, Drosera rotundifolia*, *Drosera longifolia, Empetrum nigrum* ssp. *hermaphroditum, Epilobium palustre, Eriophorum angustifolium, Eriophorum gracile, Eriophorum russeolum, Eriophorum vaginatum, Equisetum fluviatile, Huperzia selago, Juncus stygius, Menyanthes trifoliata, Molinia caerulea, Parnassia palustris, Pedicularis palustris, Pinguicula villosa, Potentilla palustris, Rubus chamaemorus, Salix lapponum, Salix myrtilloides, Scheuchzeria palustris, Selaginella selaginoides, Solidago virgaurea, Stellaria palustris, Tofieldia pusilla, Trichophorum alpinum, Trichophorum cespitosum, Utricularia intermedia, Utricularia minor, Utricularia vulgaris, Vaccinium oxycoccos*  Mosses: *Barbilophozia kuntzeana, Calliergon richardsonii, Cinclidium subrotundum, Cladopodiella fluitans, Gymnocolea inflata, Hamatocaulis vernicosus, Loeskypnum badium, Scorpidium revolvens, Sphagnum angustifolium, Sphagnum annulatum, Sphagnum compactum, Sphagnum fallax, Sphagnum flexuosum, Sphagnum jensenii, Sphagnum lindbergii, Sphagnum magellanicum, Sphagnum majus, Sphagnum papillosum, Sphagnum platyphyllum, Sphagnum pulchrum, Sphagnum riparium, Sphagnum subfulvum, Sphagnum subsecundum, Sphagnum warnstorfii, Straminergon stramineum, Warnstorfia fluitans, Warnstorfia exannulata, Warnstorfia procera, Warnstorfia sarmentosa*  *Fauna*  Birds: *Anser fabalis,  Anthus pratensis, Asio flammeus, Circus cyaneus, Cygnus cygnus, Emberiza schoeniculus, Falco columbarius, Falco subbuteo, Gallinago gallinago,* *Grus grus, Lagopus lagopus, Lanius excubitor, Limicola falcinellus, Lymnocryptes minimus, Motacilla flava, Numenius arquata, Numenius phaeopus, Phalaropus lobatus, Philomachus pugnax,* *Pluvialis apricaria, Tringa erythropus, Tringa nebularia, Tringa glareola*  Insects: *Boloria freija, Boloria frigga* |
| D4.1a Small-sedge base-rich fen and calcareous spring mire | This habitat includes calcareous fen vegetation of the lowlands and mountains of the European nemoral zone, and it also occurs more rarely in the boreal zone where calcareous substrates and the influence of base-rich water are scarce. Calcareous fens occur at sites with a permanently high water table, often near springs, and they are particularly common in areas with calcareous bedrock, especially in the mountain systems of central Europe. Water is rich in calcium, magnesium and bicarbonates and precipitation of calcium-carbonate and tufa formation is common, and also accumulation of organic matter due to permanently wet conditions which reduce decomposition processes. The soil has a high proportion of organic matter and is base-rich, but with limited availability of nutrients.  The vegetation of base-rich fens is dominated by small sedges such as *Carex davalliana, C.  flava, C. hostiana, C. lepidocarpa* and other short or medium-tall Cyperaceae such as *Blysmus compressus, Eleocharis quinqueflora, Eriophorum angustifolium* and *E. latifolium*. In some places these species typical of fens grow together with species characteristic of wet meadows on mineral soil such as *Anthoxanthum odoratum, Briza media, Caltha palustris, Cirsium palustre, C. rivulare, Cynosurus cristatus, Festuca rubra* agg., *Holcus lanatus, Lychnis flos-cuculi, Plantago lanceolata* and *Ranunculus acris.* Bryophytes are common, in some stands reaching a cover close to 100% and, in the moss layer, species of fens (e.g. *Bryum pseudotriquetrum, Campylium stellatum, Hamatocaulis vernicosus, Palustriella commutata* and *Scorpidium cossonii*) can grow together with species typical of mineral soils (e.g. *Cirriphyllum piliferum, Climacium dendroides, Plagiomnium affine* agg.*, Rhytidiadelphus squarrosus*), although the latter may be absent at some sites, especially in primary fens*.*  Small-sedge calcareous fens can be primary habitats developed around springs and seepages of calcium-rich water. Some of them can be several thousand years old and the long-term habitat continuity can be indicated by the occurrence of species such as *Primula farinosa, Salix rosmarinifolia* or *Triglochin maritimum*. At some sites, however, fens can be natural but only a few centuries old, and in other sites they can be secondary, developed on formerly forested land and be dependent on regular mowing. Many of them have been mown once a year without input of fertilizers for several centuries. Export of nutrients with hay has led to partial elimination of nutrient-demanding tall-growing species of wet meadows. Many of these species are still growing in these grasslands but their competitive ability is too weak to outcompete short-growing fen species. Small-sedge fens are most common and most diverse in the limestone massifs of the central European mountain systems, especially the Alps and the Carpathians.  In many places calcareous fen meadows have been damaged or destroyed by artificial drainage, which has caused mineralization of nutrients in the fen sediment and the spread of nutrient-demanding species of wet meadows or species of strongly-drained mesic meadows. To some extent they can be negatively influenced by livestock grazing as well.  Indicators of good quality:  In general, primary fens without species of wet meadows are more valuable than secondary fens. However, in some areas, especially in the lowlands, primary fens may not occur and in that case the secondary fens with meadow species have the highest conservation value.  ·      Stable hydrological regime  ·      Continued traditional management at secondary habitats  ·      Absence of overgrazing  ·      No encroachment of trees or shrubs  ·      No spread of tall-growing nutrient-demanding herbs  ·      Absence or low incidence of neophytes  Characteristic species:  Flora: Vascular plants: *Anthoxanthum odoratum, Aster bellidiastrum, Bartsia alpina, Blysmus compressus, Briza media, Caltha palustris, Carex davalliana, Carex flava, Carex hostiana, Carex lepidocarpa, Cirsium palustre, Cirsium rivulare, Crepis paludosa, Cruciata glabra, Cynosurus cristatus, Dactylorhiza incarnata, Dactylorhiza majalis, Eleocharis quinqueflora, Epipactis palustris, Eriophorum angustifolium, Eriophorum latifolium, Festuca rubra agg., Galium uliginosum, Holcus lanatus, Juncus alpinoarticulatus, Juncus effusus, Lathyrus pratensis, Lychnis flos-cuculi, Menyanthes trifoliata, Parnassia palustris, Pinguicula vulgaris, Plantago lanceolata, Primula elatior, Primula farinosa, Prunella vulgaris, Ranunculus acris, Scirpus sylvaticus, Selaginella selaginoides, Tofieldia calyculata, Trichophorum cespitosum, Triglochin palustris, Valeriana dioica, Valeriana simplicifolia*  Mosses: *Bryum pseudotriquetrum, Calliergonella cuspidata, Campylium stellatum, Cirriphyllum piliferum, Climacium dendroides, Cratoneuron filicinum, Hamatocaulis vernicosus, Palustriella commutata, Palustriella falcata, Plagiomnium affine* agg.*, Rhytidiadelphus squarrosus, Scorpidium cossonii, Thuidium philibertii* |
| D4.1b Tall-sedge base-rich fen | Tall-sedge base-rich fens are dominated by the tall to medium-tall graminoids *Cladium mariscus, Juncus subnodulosus, Schoenus ferrugineus* (in subcontinental areas) and *S. nigricans* (in Atlantic and Mediterranean areas). In some stands also *Phragmites australis* occurs, but it does not form dense stands. Small sedges and short-growing herbs also occur in places, but their number and abundance are smaller here than in small-sedge fens. Stands with *Cladium mariscus* can be very dense and species-poor.  These fens typically occur on flat landforms in lowlands and submontane areas near springs with base-rich water, especially where the bedrock is formed of limestone, chalk or marl. They are generally wetter than the other types of base-rich fens and their water table is high also in summer. In places, long-term inundation of the soil surface can result in the occurrence of muddy patches with sparse vegetation after draw-down, which are microhabitats of *Drosera anglica* and the moss *Scorpidium scorpioides*.  Tall-sedge base-rich fens occur across the entire European continent, but they are considerably more common in the Atlantic and boreal regions and in the lowland areas of Central Europe, where they are the main type of base-rich fens.  Based on the palaeoecological evidence, tall-sedge base-rich fens were more common in the Late Pleistocene and early Holocene than today in non-glaciated parts of Europe, but they changed into *Sphagnum* fens after landscape acidification or retreated as a result of terrestrialisation of wetlands in the course of natural succession. In the last two centuries many of these fens have been destroyed due to artificial drainage. Some of these fens are grazed or occasionally cut, but at many sites their vegetation is natural and does not depend on management.  Indicators of good quality:   * Stable hydrological regime * Absence of overgrazing * No encroachment of trees or shrubs * No spread of meadow or reed species   Characteristic species:  Flora: Vascular plants: *Carex davalliana, Carex lasiocarpa, Drosera anglica, Epipactis palustris, Eriophorum latifolium, Eriophorum angustifolium, Eupatorium cannabinum, Hydrocotyle vulgaris, Juncus subnodulosus, Lythrum salicaria, Mentha aquatica, Menyanthes trifoliata, Molinia caerulea, Parnassia palustris, Phragmites australis, Salix cinerea, Salix repens* agg., *Schoenus ferrugineus, Schoenus nigricans*  Mosses: *Bryum pseudotriquetrum, Palustriella commutata, Plagiomnium affine* agg., *Scorpidium scorpioides* |
| D4.1c Calcareous quaking mire | Very wet mires with rich fen vegetation of topogenic basins fed by calcareous ground water from the catchment. Water pH is always high (pH 6.5-8.5) due to high alkalinity. Calcium concentrations are typically very high (>20 mg/l) but sometimes lower, especially in boreal regions. Peat layer is usually relatively thin (0.5-2 m) but also sites with thicker peat layer occur, as depending on basin and catchment topography. Calcium precipitation can take place on peat surface. Water table is always close to peat surface and open water surfaces are common. Regular surface patterning can be absent, while irregular patterns of flarks, pools and hollows are common. In boreal region, typical string-flark patterning is common. In such cases, calcareous quaking mires differ from D3.2 Aapa mires by the abundance of calciphilous species, especially among bryophytes. This also is the main distinction from D2.3a Quaking mires.  Vegetation is strongly minerotrophic and characterized by abundance of Amblystegiaceae mosses, especially *Scorpidium scorpioides*. Other characteristic mosses include *Scorpidium revolvens, Scorpidium cossoni, Calliergon richardsonii* and *Pseudocalliergon trifarium*. In the boreal region, weaker minerotrophy indicating species like *Sphagnum contortum* and *Warnstorfia procera* can also be frequent. Vascular plant cover is characteristically sparse. Typical species include *Carex chordorrhiza, Carex diandra, Carex flava, Carex lasiocarpa, Carex limosa, Carex rostrata, Carex livida, Drosera longifolia, Equisetum fluviatile, Eriophorum gracile, Juncus stygius, Liparis loeselii, Menyanthes trifoliata, Pedicularis palustris, Potentilla palustris,* *Schoenus ferrugineus* and *Utricularia intermedia.* Sometimes sparse stands of *Phragmites australis* are found.  Indicators of good quality:  Under natural conditions, water table is close to surface and it can always be readily observed. Open water surfaces are common. Calcite precipitation takes place in richly calcareous situations, but when calcium levels are not supersaturated, precipitation can be absent. Rich fen mosses are abundant, although not necessarily forming continuous carpets. *Sphagnum* mosses are mainly absent from main mire surfaces, while they may be found in hummock strings or other isolated microsites. Vascular plant cover is sparse, leaving space and light for mosses.  Drainage ditches can affect calcareous quaking mires by lowering water level or by interrupting the inflow of calcareous water from the catchment. In such cases, rich fen mosses are rapidly lost and replaced by generalist species. Eutrophication by nitrogen deposition also threatens these habitats. Over growth e.g. by *Sphagnum subnitens* and *Calliergonella cuspidata* have been observed in high N deposition areas. General increase of vascular plant biomass can also indicate weakening of habitat quality.  Characteristic species:  *Flora*  Vascular plants: *Carex buxbaumii, Carex chordorrhiza, Carex diandra, Carex flava, Carex heleonastes, Carex jemtlandica, Carex lasiocarpa, Carex limosa, Carex livida, Carex viridula, Drosera longifolia, Drosera intermedia, Eriophorum angustifolium, Eriophorum latifolium, Eriophorum gracile, Equisetum fluviatile, Equisetum palustre, Juncus biglumis, Juncus stygius, Juncus subnodulosus, Juncus triglumis, Liparis loeselii,Menyanthes trifoliata, Pedicularis palustris, Phragmites australis, Potentilla palustris, Schoenus ferrugineus, Trichophorum alpinum, Triglochin maritimum, Triglochin palustre, Utricularia intermedia, Utricularia minor.*  Mosses: *Aneura pinguis, Bryum pseudotriquetrum, Calliergon richardsonii, Campylium stellatum, Catoscopium nigritum, Cinclidium stygium, Fissidens adianthoides, Hamatocaulis lapponicus, Hamatocaulis vernicosus, Leiocolea rutheana, Loeskypnum badium, Meesia longiseta, Meesia triquetra, Meesia uliginosa, Paludella squarrosa, Pseudocalliergon trifarium, Rhizomnium pseudopunctatum, Scorpidium cossoni, Scorpidium revolvens, Scorpidium scorpioides, Sphagnum contortum, Warnstorfia procera.* |
| D4.2 Arctic-alpine rich fen | Fens around springs and small rivers in the alpine belt of European mountains (the Alps, Pyrenees, Scandes, Scotland) and in the northernmost (arctic) part of Europe, including Svalbard and Iceland. They are found on open substrates that are constantly flushed by cold and base-rich water. The sites are extreme with respect to soil and microclimate. Cold water is constantly present in the root horizon and restricts ion uptake of plants. Frequent disturbances, a high amount of oxygen in the soil water as well as low productivity due to low temperature during the short vegetation period prevent any remarkable peat accumulation and peat layer is typically lacking or very thin (< 20 cm). If peat accumulation would increase, other fen habitats would develop. Solifluction and cryoturbation lead to disruption of plant roots and soil surface structures.  The vegetation substitutes at high altitudes and latitudes the *Caricion davallianae* vegetation of type D4.1. The vegetation consists of small sedges, rushes, small herbs and non-sphagnaceous (brown) mosses and includes many arctic-alpine species. Most characteristic are *Carex bicolor*, *Carex microglochin*, *Carex maritima*, *C. norvegica,* *Carex atrofusca*, *Carex frigida*, *Carex saxatilis,* *Carex vaginata*, *Carex aquatilis ssp. stans*, *Kobresia simpliciuscula, Scirpus pumilus, Juncus arcticus, Juncus alpinoarticulatus, Juncus castaneus, Juncus triglumis, Juncus biglumis, Saxifraga oppositifolia, Tofieldia pusilla*. Vegetation is usually polydominated. Bryophyte layer consist of hepatics (*Aneura pinguis*) and different brown mosses such as *Amblyodon dealbatus, Bryum pseudotriquetrum, Calliergon richardsonii, Campylium stellatum, C. polygamum, Catoscopium nigritum, Cinclidiun stygium, Paludella squarrosa, Philonotis calcarea, P. tomentella, Scorpidium cossonii, S. revolvens* (locally), *Tayloria lingulata, Tomentypnum nitens* and *Warnstorfia exannulata*. Within these sites appear species that can be treated as glacial relicts in the European mountains or surviving species during the Pleistocene glaciation in the boreal and arctic refugial areas. In high mountains outside the Alps, Pyrenees and Scandes, these habitats are depauperate and transitional to spring and small-sedge fen habitats.  These habitats exist in high-mountain or arctic areas and are threatened by direct human activities: tourism, construction of small power station, construction that cause erosion or snow slide, capture of springs, channelling of streams (water supply) etc. Global changes might change the precipitation and temperature regime and can change dramatically the species composition.  Indicators of good quality:   * Species richness and presence of diagnostic species * Absence of human intervention * Permanent water flow * Low productivity * Presence of mosses   Characteristic species:  Vascular plants: *Blysmus compressus, Carex atrofusca, Carex bicolor, Carex capillaris, Carex capitata, Carex davalliana, Carex demissa, Carex dioica, Carex maritima, Carex nigra, Carex norvegica,  Carex panicea, Carex paralella, Carex saxatilis, Carex vaginata, Carex frigida, Carex stans, Eleocharis quinqueflora, Equisetum variegatum, Juncus alpinoarticulatus, Juncus arcticus, Juncus castaneus, Juncus triglumis, Juncus biglumis, Kobresia simpliciuscula, Pinguicula vulgaris, Primula farinosa, Primula nutans, Primula scandinavica, Primula stricta, Scirpus cespitosus, Scirpus pumilus, Tofieldia pusilla, Trichophorum pumilum, Typha lugdunensis, Typha minima, Typha shuttleworthii*  Mosses: *Fissidens osmundoides, Meesia uliginosa, Oncophorus virens, Tayloria lingulata, Amblyodon dealbatus, Bryum pseudotriquetrum, Campylium stellatum, C. polygamum, Catoscopium nigritum, Philonotis calcarea, P. tomentella, Scorpidium cossonii, S. revolvens, Tomentypnum nitens* |
| E1.1a Pannonian and Pontic sandy steppe | Sandy steppe grasslands of the Pannonian and Pontic regions, dominated by drought-tolerant, tussock-forming perennial grasses such as *Festuca vaginata, Koeleria glauca* and *Stipa borysthenica*, in eastern Europe also by *Festuca beckeri.* Besides these grasses, perennial herbs are common in these grasslands, many of them with a deep root system developed as an adaptation to periodical drought events occurring on sandy substrates. Short-lived vernal therophytes, bryophytes and lichens are also frequent. Vegetation is sparse, with a maximum cover of 75%. These grasslands of the order *Festuco-Sedetalia acris* grow on poorer developed soils than the oceanic and sub-oceanic grasslands of habitat E1.9a. This type is also more continentally distributed (drier climate) and associated with higher soil pH often well above 7, because under continental conditions the soils are much less leached than in more Atlantic climate. In most cases they also have a higher species richness. Frequent occurring continental species are *Alyssum tortuosum, Astragalus arenarius, Dianthus arenarius, Dianthus serotinus, Erysimum canum, Euphorbia seguieriana, Gypsophila fastigiata, Helichrysum arenarium, Jurinea cyanoides* and *Secale sylvestre*.  Sandy steppes occur on sandy plains and dunes with variable content of exchangeable cations, both of acidic and basic reaction. On acidic sand, transitions to sub-oceanic sandy grasslands (E1.9b) occur, especially in the western parts of this habitat’s range. Soils are poor in humus, belonging to the Arenosol type. Pannonian and Pontic sandy steppe occurs in lowlands with a pronounced continental climate characterized by warm and dry summer and cold winter, often with very shallow snow cover combined with long periods of frost. The surface layer of sand can warm up quickly during sunny days in summer, while the sandy substrate has a low water-holding capacity resulting in drought stress. Extreme drought events occurring in return intervals of several years can result in changes in species composition and relative cover of dominant species.  There are two main areas of distribution of these continental sandy steppes in Europe. One is the Pontic region including the steppe and forest-steppe zone of Ukraine and southern Russia (alliance *Festucion beckeri*), extending to the Danube valley in Romania and Bulgaria. The other is the Pannonian region including the Great Hungarian Plain (Alföld) and some adjacent lowland and hilly regions. Here the highest concentration of these grasslands is in central Hungary on the plains between the Danube and Tisza rivers (alliance *Festucion vaginatae*). Apart from these vicarious alliances dominated by perennial tussock grasses, there are two therophyte-dominated alliances of initial disturbed sites, namely the *Sileno conicae-Cerastion semidecandri* in the range of the *Koelerion glaucae* and the *Bassio laniflorae-Bromion tectorum* in the range of the *Festucion vaginatae*.  Stands of the alliance *Koelerion glaucae* can be found also on base rich sand in some areas in Poland, eastern Germany and the middle Rhine valley in western Germany, as well as in the Southern Baltic region (Öland, Finish south coast), but there is some discussion whether such stands should be included under E1.1a or E1.9a. In the Red List typology they have been included in habitat E1.9a, as it was indicated by most national experts from these region that it was not possible to distinguish these vegetation types as different habitats. The habitat type is absent from western Europe, high mountains and more northern regions.  Sandy steppes were used for extensive grazing by domestic livestock, especially sheep. This land-use resulted in extension of their area at the expense of forest, however, after cessation of traditional management many former sand-steppe areas are becoming overgrown by encroaching shrubs and trees such as *Pinus sylvestris* and *Robinia pseudoacacia.*  Indicators of good quality:  In Europe sandy steppes contain several species of continental distribution that occur at the western limit of their distribution range. Most valuable are extensive stands of sand steppe on inland dunes or plains with open vegetation without alien or nutrient-demanding species. Sand steppe can develop on abandoned fields adjacent to preserved remnants of natural vegetation, however, alien species may be common in these secondary grasslands. The main threats to this habitat are overgrowing by trees and shrubs after cessation of grazing, spread of alien species such as *Robinia pseudoacacia* or *Asclepias syriaca*, and increasing dominance of nutrient-demanding species due to atmospheric deposition.  The following characteristics can be considered as indicators of good quality:  ·      Occurrence of rare species, especially those of continental distribution.  ·      Absence of nutrient-demanding and mesophilous species.  ·      Open character of vegetation.  ·      Absence of alien species.  ·      Absence of trees and shrubs.  ·      Large spatial extent of grassland stands.  ·      Continuation of traditional low-intensity grazing management.  Characteristic species:  *Flora*  Vascular plants: *Alkanna tinctoria, Alyssum montanum* subsp. *gmelinii, Alyssum tortuosum, Anchusa ochroleuca, Androsace septentrionalis, Artemisia campestris, Astragalus arenarius, Astagalus onobrychis, Astragalus varius, Bassia laniflora, Bromus tectorum, Carex ligerica, Centaurea arenaria* subsp. *tauscheri, Cerastium semidecandrum, Chondrilla juncea, Colchicum arenarium, Dianthus arenarius, Dianthus borbasii, Dianthus diutinus, Dianthus serotinus, Euphorbia seguieriana, Festuca beckeri, Festuca polesica, Festuca psammophila, Festuca tomanii, Festuca vaginata, Festuca wagneri, Gypsophila fastigiata, Gypsophila paniculata, Helichrysum arenarium, Hieracium echioides, Hieracium umbellatum, Holosteum umbellatum, Jasione montana, Jurinea cyanoides, Kochia laniflora, Koeleria glauca, Linaria genistifolia, Myosotis stricta, Onosma arenaria, Peucedanum arenarium, Pulsatilla pratensis* subsp*. pratensis, Secale sylvestre, Sedum acre, Sedum sexangulare, Sedum rupestre, Sedum urvillei, Silene conica, Silene chlorantha, Silene otites, Stipa borysthenica*, *Thymus serpyllum*, *Tragopogon floccosus, Veronica dillenii, Veronica praecox, Veronica verna.*  Bryophytes: *Abietinella abietina*, *Ceratodon purpureus, Racomitrium canescens* agg., *Syntrichia ruralis* agg.  Lichens: *Cetraria aculeata, Cetraria ericetorum*, *Cetraria islandica*, *Cladonia ciliata*, *Cladonia foliacea*, *Cladonia gracilis*, *Cladonia rangiformis, Cladonia scabriuscula, Diploschistes muscorum, Flavocetraria cucculata, Flavocetraria nivalis.*  *Fauna*  Reptiles: *Podarcis taurica.*  Insects: *Oedipoda caerulescens.* |
| E1.1b Cryptogam- and annual-dominated vegetation on siliceous rock outcrops | These open pioneer grasslands occur on shallow soils (Leptosols) at rock outcrops, on eroded slopes, or in disturbed patches within dry or mesic grasslands. Stands are usually of limited extent, in many cases occupying just a few square metres. This vegetation is dominated by vernal therophytes of the genera *Cerastium, Myosotis, Veronica* and others and succulent plants of the genera *Sedum* or *Sempervivum* (inclusive *Jovibarba*)*.* Hemicryptophytes are also common, especially the narrow-leaved tussock-forming species of *Festuca* and several xerophilous *Poa* species, but they are not the dominant component of this vegetation, except for some short-growing species such as *Scleranthus perennis*. Geophytes such as *Gagea sp. pl*. also occur in places. The richness of therophytes and geophytes increases when moving from northern and western to southeastern Europe. Bryophytes and lichens are also common and they can attain a very high cover in some places. Mosses are represented for example by *Ceratodon purpureus, Polytrichum piliferum* and *Syntrichia ruralis* agg., lichens by *Cetraria aculeata, Cladonia* *sp. pl*. and *Xanthoparmelia sp. pl*.  Shallow soils supporting this vegetation are well drained and dry out quickly, especially during summer periods of warm weather. Therefore vegetation has its phenological optimum in spring when moisture is still available due to lower evaporation rates. Most therophytes complete their life cycle within a short period of a few weeks prior to the peak of the seasonal development of hemicryptophytes, which helps them avoid competition for light. In contrast, most succulents are perennial and adapted to enduring summer drought period. However, they are more sensitive to disturbance, therefore more disturbed sites tend to contain more therophytes and less disturbed sites more succulents.  This vegetation is distributed throughout temperate and boreal Europe, but it is rarely found in extensive stands. It occurs across a broad altitudinal range from the lowlands to the subalpine belt. The type corresponds to the phytosociological order *Sedo-Scleranthetalia*, including the *Sedo-Poetalia glaucae*, which is by some authors separated as an order that occurs from the middle boreal to the arctic zone. Phytosociological literature distinguishes several alliances confined to different European regions, which are geographical vicariants with distinct species composition. A specific subtype of this habitat is found in the supratemperate, very humid belt of Madeira (over 1400 m a.s.l.), where *Thymus micans* dominates open pioneer communities on shallow soils and rocks, derived from hard volcanic substrate. Another specific subtype occurs on and around acidic outcrops in middle and northern Fennoscandia and Iceland (the *Veronico-Poion glaucae*).  Indicators of good quality:  These grasslands are confined to stressed or disturbed sites. Due to their small spatial extent, individual stands can be entirely destroyed, but they can regenerate if suitable conditions return. Sites on the rock outcrops near lookout points can be negatively affected through frequent trampling by tourists. On the other hand, disturbance-dependent stands occurring in patches among closed grasslands may become overgrown by tall perennial species if disturbance (e.g. grazing) ceases. Therophytes typical of this vegetation can also occur in human-made habitats such as roadsides, railway banks or quarries, where they form communities with ruderal and nutrient demanding species; such sites are not included in this habitat type and are of lower conservation interest.  The following characteristics can be considered as indicators of good quality:  ·      Long-term habitat stability  ·      High species richness of therophytes and succulents  ·      Occurrence of rare species  ·      Dependence on naturally stressful conditions or natural disturbance rather than human-induced disturbance  ·      Absence of tall, nutrient-demanding and ruderal species  Characteristic species:  *Flora*  Vascular plants: *Aira caryophyllea*, *Aira praecox*, *Anthoxanthum odoratum, Anthyllis vulneraria, Arabidopsis thaliana, Arenaria serpyllifolia* agg., *Campanula rotundifolia, Cardaminopsis petraea, Cerastium glutinosum, Deschampsia flexuosa, Dianthus deltoides, Dianthus pinifolius, Draba daurica, Echium vulgare, Erigeron politus, Erophila verna, Erysimum hieracifolium, Festuca nigrescens* subsp*. microphylla, Festuca ovina, Gagea bohemica, Galeopsis bifida, Galium normanii, Hieracium alpinum* agg.*, Hieracium pilosella, Hypericum perforatum, Jasione heldreichii, Jasione montana, Lappula deflexa, Lotus corniculatus, Lychnis alpina, Micropyrum tenellum, Minuartia greuteriana, Myosotis ramosissima, Myosotis stricta, Poa alpina, Poa bulbosa, Poa glauca, Poa nemoralis, Poa perconcinna, Poa xerophila, Potentilla argentea* agg.*, Potentilla crantzii, Potentilla nivea, Potentilla tabernaemontani, Roegneria borealis, Rumex acetosella, Saxifraga adscendens, Saxifraga oppositifolia, Scleranthus annuus* agg., *Scleranthus perennis, Sedum acre, Sedum album, Sedum anglicum, Sedum annuum, Sedum brevifolium, Sedum pyrenaicum, Sedum rupestre, Sedum sexangulare, Sempervivum arachnoideum, Sempervivum montanum, Silene rupestris, Silene uniflora* subsp*. uniflora, Solidago virgaurea, Thymus micans, Trifolium arvense, Veronica dillenii, Veronica fruticans, Veronica verna*  Bryophytes: *Ceratodon purpureus, Dicranum sp. pl.,* *Hypnum cupressiforme*, *Pleurozium schreberi, Pohlia nutans, Polytrichum juniperinum, Polytrichum piliferum, Racomitrium canescens* agg., *Syntrichia ruralis* agg.  Lichens: *Alectoria sp. pl*., *Cetraria aculeata*, *Cladonia arbuscula* agg., *Cladonia foliacea*, *Cladonia furcata*, *Cladonia pyxidata*, *Nephroma sp. pl*., *Peltigera rufescens*, *Thamnolia vermicularis, Xanthoparmelia conspersa.*  *Fauna*  -- |
| E1.1d Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops | This habitat includes low-grown, open herbaceous communities on very shallow, skeletal soils over limestone, dolomite, gypsum, serpentine or other base-rich bedrock types. Short-lived vernal therophytes and succulents are the dominant life forms among the vascular plants. The therophyte synusia is often rich in species, however, it is subject to considerable inter-annual dynamics in total abundance and species composition, which depends on specific weather conditions of each year. Typical therophytes include those of the genera *Alyssum, Androsace, Arabis, Arenaria, Cerastium, Erophila, Thlaspi* and *Veronica*. Succulents are represented by various species of *Sedum* and *Sempervivum* (including *Jovibarba*). Geophytes such as *Allium* are also typical. Perennial grasses and forbs are regularly present in this vegetation, but usually with a low cover.  This habitat is one of the few types in Europe, where non-vascular plants typically reach similar or higher cover and often also higher small-scale species richness than the vascular plants. There are many medium-sized to tiny cushions or lawns of acrocarpous mosses, mainly from the family Pottiaceae. Lichens are represented by several larger lobate or fruticose species, but mainly by soil-covering crusts. These crustose species are often colourful, like *Fulgensia* spp. (yellow), *Psora decipiens* (red), *Toninia sedifolia* (bluish) and *Squamarina lentigera* (bright white) and form the so-called coloured lichen synusia.  This habitat usually occurs in small patches on rock outcrops or in slightly disturbed places within calcareous grasslands. Disturbance can be by soil erosion on outcrops and steep slopes, by grazing or trampling. The soils are usually very shallow Lithic, Skeletic, Rendzic, Calcaric or Dolomitic Leptosols, developed on various types of limestone, dolomite or gypsum. In some places, especially on the Balkan Peninsula, this vegetation develops also on ultramafic bedrock (serpentines), which are also base-rich, but with an increased amount of Mg2+ rather than Ca2+ cations.  This habitat is distributed from the submediterranean to the hemiboreal zones of Europe. In southern Europe it occurs mainly at higher altitudes, while similar sites at lower altitudes support annual vegetation with different species composition, dominated by Mediterranean annual species. Compared to the rocky grasslands of type E1.1g, which typically cover larger areas on slopes, the stands of E1.1d normally grow in more or less plain patches where the erosion is reduced and thus tiny annuals and cryptogams can survive. While such situations in most parts of Europe occur only as small patches within dry grasslands, the so-called alvars in the hemiboreal zone of Europe (mainly the Swedish islands of Öland and Gotland as well as Western Estonia) display this habitat as landscape-dominating feature, partly extending over many square kilometres as in the Great Alvar of Öland. Here, pre-Cambrian limestone flatrocks that are covered only partly and very thin with fine soil, which is subject to strong frost action in winter, create an extraordinary habitat, rich in specialised species, including even some endemic taxa.  While human land use has slightly increased the spatial extent of this habitat type (through clearing forest and creating artificial rocks, such as wall tops), the majority of stands of E1.1d are natural.   Indicators of quality:  These grasslands occur at sites disturbed by natural erosion, grazing, or due to human impact such as trampling. Although very frequent or intense disturbance may be detrimental, especially if coupled with nutrient enrichment, slight disturbance is positive because it reduces overgrowing by competitively stronger grasses and herbs. Some occurrences of this habitat, especially those occurring outside rock outcrops or steep slopes, would decline in the absence of disturbance.  The following characteristics can be considered as indicators of good quality:  ·      Long-term habitat stability  ·      High species richness  ·      Occurrence of rare species  ·      Dependence on naturally stressful conditions or natural disturbance rather than human-induced disturbance  ·      Absence of tall, nutrient-demanding, ruderal and alien species  Characteristic species:  Flora  Vascular plants: *Acinos arvensis, Aethionema saxatile, Allium schoenoprasum* var*. alvarense, Allium sphaerocephalon, Alyssum alyssoides, Androsace elongata, Androsace septentrionalis, Arabidopsis thaliana, Arabis auriculata, Arenaria leptoclados, Arenaria serpyllifolia, Artemisia rupestris, Asperula tenella, Cerastium brachypetalum, Cerastium pumilum, Crepis tectorum* subsp*. pumila, Erophila spathulata, Erophila verna, Festuca oelandica, Galium oelandicum, Helianthemum oelandicum* subsp*. oelandicum, Globularia vulgaris, Gypsophila fastigiata, Hieracium x dichotomum, Holosteum umbellatum, Hornungia petraea, Jovibarba globifera, Medicago minima, Minuartia mesogitana, Petrorhagia saxifraga, Poa bulbosa, Poa compressa, Poa perconcinna, Potentilla argentea* agg.*, Potentilla tabernaemontani, Satureja suaveolens, Saxifraga tridactylites, Sedum acre, Sedum album, Sedum sediforme, Sedum sexangulare, Silene uniflora* subsp*. petraea, Sisymbrium supinum, Taraxacum* sect. *Erythrosperma, Thlaspi ochroleucum, Thlaspi perfoliatum, Trigonella monspeliaca, Valeriana tuberosa, Valerianella locusta, Veronica arvensis, Veronica praecox.*  Bryophytes: *Abietinella abietina*, *Athalamia hyalina*, *Barbula convoluta, Bryum caespiticium, Bryum elegans, Ceratodon purpureus, Didymodon fallax, Didymodon ferrugineus, Didymodon rigidulus, Distichium capillaceum, Ditrichum flexicaule, Encalypta rhaptocarpa, Encalypta streptocarpa, Encalypta vulgaris, Homalothecium sericeum, Syntrichia ruralis* agg., *Tortella inclinata, Tortella rigens, Tortella tortuosa, Trichostomum crispulum, Weissia brachycarpa.*  Lichens: *Bacidia bagliettoana*, *Cladonia convoluta*, *Cladonia foliacea*, *Cladonia furcata, Cladonia pocillum, Cladonia rangiformis, Cladonia symphycarpia, Fulgensia bracteata, Fulgensia fulgens, Leptogium schraderi, Mycobilimbia lurida, Peltigera didactyla, Peltigera rufescens, Psora decipiens, Squamarina cartilaginea, Squamarina lentigera, Toninia sedifolia.* |
| E1.1e Perennial rocky grassland of the Italian Peninsula | This endemic habitat includes open grasslands with participation of dwarf shrubs, occurring in the interior of the Italian Peninsula. Both in their structure and floristic composition they are transitional between the Temperate dry grasslands and Mediterranean garigues. Hemicryptophytes (including perennial grasses and herbs) predominate, but dwarf shrubs and other chamaephytes are also common. Hemicryptophytes usually prevail on gentle slopes, where vegetation tends to be denser, while chamaephytes are more common on steeper slopes. Therophytes and geophytes also occur in this vegetation, especially in disturbed places, but they are not dominant. A certain number of endemic *taxa* is typically represented in this habitat type.  These grasslands are developed from the supra-Mediterranean to the meso-Temperate bioclimatic belts, with their optimum in the latter and in its sub-Mediterranean variant. In most cases it is secondary vegetation developed in potential habitats for deciduous forests with *Quercus cerris, Q. pubescens s.l.*, *Ostrya carpinifolia*, or for mixed forests with *Quercus ilex.* Soils are shallow, developed usually in patches between rocky outcrops. They belong to the type of Lithic, Skeletic, Rendzic, Calcaric or Dolomitic Leptosols. Parent rocks are various calcareous sediments including limestones.  These dry grasslands are confined to the Italian Peninsula, where their range extends from the Northern to the Southern Apennines including some occurrences in Sicily. They are generally species-rich, and dependent for their long-term conservation on grazing by domestic livestock. Cessation of grazing may lead to encroachment of shrubs and trees and decline of this habitat type. In some areas the habitat was destroyed by plantation of trees, especially pines. A specific subtype of this vegetation belonging to the alliance *Alyssion bertolonii*, with unique species composition and a rich chamaephytic component, occurs on neutral or basic soils of serpentine outcrops and ophiolithic substrata with neutral or alkaline pH, with a distribution restricted to Tuscany, Liguria and Piedmont (Northern Apennines).  Indicators of good quality:  • Long-term habitat openness  • No encroachment of shrubs and trees  • Extensive grazing  • High species richness  • Occurrence of rare and endemic species  • Absence of tall, nutrient-demanding, ruderal and alien species  Characteristic species:  Vascular plants: *Alyssoides utriculata, Alyssum bertolonii, Alyssum diffusum, Anthyllis vulneraria subsp. praepropera, Armeria denticulata, Artemisia alba, Asperula aristata subsp. scabra, Asperula purpurea, Asphodeline lutea, Bromus erectus, Centaurea ambigua, Centaurea aplolepa subsp. ligustica, Centaurea rupestris, Centaurea triumfetti, Cephalaria leucantha, Convolvulus cantabrica, Coronilla valentina, Crepis lacera, Cytisus spinescens, Dianthus ciliatus, Dianthus garganicus, Eryngium amethystinum, Erysimum pseudorhaeticum, Euphorbia myrsinites, Euphorbia spinosa, Festuca inops, Festuca robustifolia, Genista desoleana, Genista januensis, Globularia bisnagarica, Globularia meridionalis, Helianthemum oelandicum, Hippocrepis glauca, Hyssopus officinalis subsp. aristatus, Inula montana, Iris pseudopumila, Jurinea mollis, Koeleria splendens, Linum tommasinii, Matthiola fruticulosa, Melica transsylvanica, Minuartia laricifolia subsp. ofiolitica, Osyris alba, Phleum ambiguum, Phlomis fruticosa, Pimpinella saxifraga, Plantago holosteum, Rhamnus saxatilis subsp. infectoria, Ruta graveolens, Salvia officinalis, Satureja montana, Scorzonera villosa subsp. columnae, Silene otites, Stipa austroitalica subsp. austroitalica, Stipa dasyvaginata subsp. apenninicola, Stipa etrusca, Teucrium polium, Thymus longicaulis, Thymus striatus var. ophioliticus, Thymus vulgaris, Trinia glauca.* |
| E1.1g Perennial rocky grassland of Central Europe and the Carpathians | These open to relatively closed perennial grasslands occur on outcrops and steep slopes of mostly calcareous but also siliceous rocks. They are dominated by graminoids such as *Bromopsis pannonica, Bromus riparius, Carex humilis, Festuca dalmatica, Festuca pallens* and various species of *Sesleria* and *Stipa*. Perennial herbs are common, whereas other life forms such as chamaephytes, therophytes and geophytes occur with various abundance, although they are found in most stands. The participation of annuals increases significantly in the southern parts of the habitat’s range because of the stronger Mediterranean influence. From the phytogeographical point of view, these grasslands combine central European species with numerous submediterranean, continental steppic and de-alpine species. Especially on limestone or dolomite these grasslands can be species-rich and contain some species with narrow geographic ranges. Phytosociologically, this habitat type corresponds to the order *Stipo pulcherrimae-Festucetalia pallentis* (class: *Festuco-Brometea*).  These grasslands are distributed at low hilly and submontane areas of the Bohemian Massif, Alps, Carpathians, and low mountains and hilly lowlands of the northern and central Balkan Peninsula. Westwards the habitat reaches North-East France and adjacent Belgium, Germany and Switzerland. At many sites these grasslands represent natural vegetation, but in some places they developed as secondary vegetation of deforested areas on shallow soils. Especially on dolomite slopes continuous weathering of the parent rock into gravel particles maintains constant soil erosion which limits encroachment of woody plants and keeps the landscape open. On limestone and dolomite slopes there is often a distinct contrast in vegetation on slopes of different aspect. South-facing slopes harbor more open vegetation, often with less than 50% cover, with dominance of narrow-leaved tussock grasses and aromatic semi-scrubs. In contrast, north-facing slopes support denser grasslands dominated by various species of *Sesleria* that contain several species typical of higher altitudes of the Alps or the Carpathians which have scattered and in many cases probably relict occurrences at lower altitudes. Soils are various subtypes of Leptosol.  Most of these grasslands occur in naturally treeless areas on steep and naturally eroded slopes that are difficult to access and unsuitable for agriculture. These grasslands are very stable and usually are not directly endangered unless they are destroyed by quarrying. However, secondary grasslands on less steep slopes were traditionally maintained by grazing, especially by goats. When grazing ceases, they are subject to encroachment of shrubs and trees.  Indicators of good quality:  Most valuable stands occur at sites with long historical continuity which contains steno-endemic species and species with isolated occurrences, in many cases probably of relict origin. Indicators of good quality include:  ·         Occurrence of endemic or rare species, or species at isolated localities far from their continuous range.  ·         No signs of spread of mesophilous species or development of dense grassland.  ·         No signs of encroachment of trees and shrubs.  ·         In secondary grasslands continuation of grazing by goats or sheep.  Characteristic species:  *Flora*  Vascular plants: *Achillea ageratifolia, Achillea clypeolata, Achillea coarctata, Achillea nobilis, Acinos arvensis, Agropyron cristatum, Allium albidum, Allium cupani, Allium flavum, Allium moschatum, Allium sphaerocephalon, Alyssum alyssoides, Alyssum montanum* subsp*. montanum, Alyssum saxatile, Anthemis carpatica, Anthericum ramosum, Anthyllis montanta, Anthyllis vulneraria, Artemisia alba, Asperula capitata, Asperula cynanchica, Asperula purpurea, Asphodeline lutea, Asphodelus albus, Asplenium ruta-muraria, Asplenium septentrionale, Asplenium trichomanes, Aster oleifolius,  Astragalus onobrychis, Astragalus wilmotianus, Bromopsis cappadocica, Bromopsis pannonica, Bromus moesiacus, Bromus squarrosus, Carduus collinus, Carex caryophyllea, Carex humilis, Centaurea atropurpurea, Centaurea reichenbachii, Centaurea triniifolia, Chrysopogon gryllus, Clypeola jonthlaspi, Convolvulus cantabrica, Coronilla scorpioides, Dianthus carthusianorum, Dianthus giganteiformis, Dianthus giganteus, Dianthus gracillis, Dianthus gratianopolitanus, Dianthus spiculifolius, Edraianthus serbicus, Erysimum witmannii, Euphorbia cyparissias, Euphorbia myrsinites, Euphorbia seguieriana, Festuca dalmatica, Festuca pallens* s.l.*, Festuca pseudodalmatica, Festuca stricta, Fumana procumbens, Galium glaucum, Galium lucidum, Genista jaunensis, Globularia bisnagarica, Helianthemum canum, Helianthemum nummularium* agg*., Helictotrichon decorum, Hornungia petraea, Hyacinthella leucophaea, Hypericum olympicum, Hypericum rumeliacum, Hyssopus officinalis, Inula aschersoniana, Inula oculus-christii, Inula spiraeifolia, Iris pumila, Iris variegata, Jasione montana, Jovibarba heufelii, Jurinea glycacantha, Jurinea mollis, Koeleria macrantha, Koeleria splendens, Leontodon biscutellifolius, Leontodon crispus, Leontodon incanus, Linaria angustissima, Linum tenuifolium, Melica ciliata, Microthlaspi perfoliatum, Minuartia hirsuta, Minuartia verna, Orlaya grandiflora, Ornithogalum nanum, Paeonia tenuifolia,  Paronychia cephalotes, Paronychia kapela, Petrorhagia saxifraga, Peucedanum tauricum, Pilosella officinarum, Poa bulbosa, Poa pannonica, Potentilla argentea* agg., *Potentilla cinerea, Potentilla incana agg., Psilurus incurvus, Pulsatilla halleri* subsp*. slavica, Queria hispanica, Rumex acetosella* s.l.*, Sanguisorba minor, Satureja coerulea, Satureja montana, Satureja pilosa, Saxifraga paniculata, Scleranthus perennis, Scorzonera austriaca, Sedum hispanicum, Sedum sexangulare, Selinum silaifolium, Sempervivum marmoreum, Seseli gracile, Seseli leucospermum, Seseli osseum, Seseli pallasii, Seseli rigidum, Sesleria caerulea, Sesleria filiformis, Sesleria heuflerana, Sesleria latifolia, Sesleria rigida, Sesleria sadlerana, Silene armeria, Silene bupleuroides, Silene frivaldskyana, Silene nutans, Stachys recta, Stenbergia colchiciflora, Stipa eriocaulis, Stipa pulcherrima, Teucrium chamaedrys, Teucrium montanum, Teucrium polium, Thesium alpinum, Thymus comosus, Thymus praecox* agg., *Thymus striatus, Trifolium arvense, Trigonella gladiata, Trigonella monspeliaca, Trinia glauca, Velezia rigida, Veronica spicata, Viola jooi, Xeranthemum annuum, Xeranthemum cylindraceum.*  Bryophytes: *Ceratodon purpureus, Ditrichum flexicaule, Encalypta streptocarpa, Grimmia sp. pl*., *Polytrichum piliferum, Syntrichia ruralis* agg., *Tortella inclinata, Tortella tortuosa, Weissia longifolia.*  Lichens: *Cladonia convoluta*, *Cladonia magyarica, Cladonia pyxidata* agg.  *Fauna*  Birds: *Anthus campestris, Calandrella brachydactyla, Oenanthe hispanica.*  Reptiles: *Ablepharus kitaibelli, Elaphe sauromates, Eurotestudo hermannii, Testudo graeca.*  Insects: *Calliptamus italicus*, *Oedpioda caerulescens.* |
| E1.1h Heavy-metal dry grassland of the Balkans | Ultramafic rocks (e.g. serpentine, ophiolite) form dark-colored soils characterized by high content of heavy metals such as iron, nickel, cobalt and chromium, and a relatively low content of nutrients such as calcium, potassium and phosphorous, as well as by a low ratio of Ca/Mg. Ultramafic soils are also characterized by pronounced fluctuation of temperature, heat and drought because of their dark color, small water capacity and usually low organic matter content. The above-mentioned special properties of ultramafic soils are considered responsible for their low fertility and the specialized vegetation they host. Species growing on ultramafic soils possess a range of adaptations to these severe ecologic conditions, such as nanism, pelosity, shiny surfaces and the ability to hyperaccumulate heavy metals in their tissues. In these habitats grow many relict and endemic species. The largest ultramafic surfaces in Europe are found in the Balkan Peninsula: Bosnia, Serbia, Kosovo, FYR of Macedonia, Bulgaria and Greece.  Indicators of quality:  This habitat depends on ultramafic soil properties but also on the type of land use. Grazing of medium intensity helps the conservation of the floristic composition and the physiognomy of this habitat type. The following characteristics may be considered as indicators of good quality: natural species composition, absence of invasive species as well as of tall herb, shrub and tree species, regular grazing and presence of endemic or specialized species adapted to ultramafic soils.  Characteristic species:  Vascular plants:*Achillea pseudopectinata, Allyssum heldreichii, Allyssum montanum* subsp.*serbicum, Allysum* *markgrafii, Armeriacanescens, Asplenium adiantum-nigrum* subsp. *serpentini, Astargalus onobrychis* subsp. *chlorocarpus, Botriochloa ischaemum, Bromopsis pannonica, Bromopsis erercta, Centaurea grisebachii* subsp.*occidentalis, Centaurea kosanini, Centaurea stoebe* subsp.*australis, Convolvulus boissieri* subsp. *parnassicus, Dianthus giganteus* subsp. *croaticus, Drymocallis rupestris, Echium rubrum, Erysimum linariifolium, Euphorbia glabriflora, Euphorbia montenegrina, Fumana bonapartei, Gypsophila spergulifolia, Halacsya sendtneri, Haplophyllum boissieranum, Medicago prostrata, Minuartia verna subsp. collina, Noccaea kovatsii, Paragymnopteris marantae, Pistorinia hispanica, Plantago holosteum, Plantago subulata, Poa badensis, Polygonum albanicum, Potentilla astrachanica, Potentilla visianii, Rumex acetosella, Scabiosa leucophylla, Scleranthus perennis, Scrophularia canina subsp. tristis, Sedum hispanicum, Sedum ochroleucum, Sedum serpentini, Sesleria latifolia, Silene armeria, Silene bupleuroides* subsp.*staticifolia, Stachys recta* subsp*. baldacii, Stachys scardica, Thymus praecox* subsp. *jankae, Verbascum glabratum* subsp*. bosnense.* |
| E1.1i Perennial rocky calcareous grassland of subatlantic-submediterranean Europe | This habitat type occurs on shallow calcareous substrates with hardly any soil and humus, mostly on slopes. The underlying bedrock can be of different geological origin, including Carboniferous limestone and Cretaceous chalk. The open vegetation is characterized by perennials, among which a large percentage of chamaephytes. This is in contrast with habitat type 1.1d (Pioneer grassland on shallow soils on calcareous and ultramafic rocky outcrops), where annuals play a prominent role. Syntaxonomically, the vegetation type forms a separate order (*Artemisio albae-Brometalia erecti*) within the class *Festuco-Brometea*. The communities have a rather small distribution, ranging from the United Kingdom in the northwest and Italy (Liguria) in the southeast. In the National Vegetation Classification of the UK, it is represented by the sub-community with *Helianthemum canum* and *Asperula cynanchica* of the ‘Sesleria albicans-Galium sterneri grassland’ (CG9). The centre of the distribution is in France and Germany. In France, these grasslands are (for the greater part) described as ‘pelouses primaires’ in contrast to the other limestone grasslands of the *Festuco-Brometea* that are considered to be ‘pelouses secondaires’ or ‘semi-naturelles’. The habitat type, occurring from the lowlands to the submontane zone, is regarded as a western vicariant of E1.1g (Perennial grassland on rocky outcrops at low altitudes in Central and Southeastern Europe). The bedrock is often broken, resulting in a lot of loose material, resembling screes at higher altitudes in the mountains. The nutrient status (nitrogen, phosphorous) is extremely low, the pH high. Although the production of the vegetation is very low, grazing is important to guarantee that the sites are not grown over by shrubs and trees. As such, the habitat generally is part of a traditional management regime.  Indicators of quality:  ·      Open and low vegetation structure, with a high percentage of bare rock  ·      Absence of nutrient-demanding and ruderal species  ·      Chamaephytes account for a large proportion in the vegetation  ·      Exposed to sunshine to support light-demanding species  ·      Extensive grazing regime preventing the encroachment of shrubs and tree at the sites and the near vicinity  Characteristic species:  Flora: Vascular plants: *Allium sphaerocephalon, Anthyllis vulneraria, Asperula cynanchica, Aster linosyris, Bromus erectus, Carex halleriana, Carex humilis, Coronilla minima, Euphorbia cyparissias, Fumana procumbens, Galium sterneri, Globularia punctata, Helianthemum apenninum, Helianthemum canum, Helianthemum oelandicum, Hippocrepis comosa, Koeleria vallesiana, Linum tenuifolium, Melica ciliata, Ononis pusilla, Orobanche teucrii, Potentilla tabernaemontani, Ranunculus gramineus, Seseli montanum, Stachys recta, Teucrium botrys, Teucrium chamaedrys, Teucrium montanum, Thymus praecox, Trinia glauca.*  Mosses: *Abietinella abietina, Encalypta streptocarpa, Homalothecium lutescens, Rhytidium rugosum, Tortella tortuosa, Trichostomum brachydontium.* |
| E1.1j Dry steppic, submediterranean pasture of South-Eastern Europe | This habitat type is composed of dry steppic, submediterranean pastures, found along the eastern coast of the Adriatic Sea and the southeastern coastal districts of the Italian Peninsula. These semi-natural grasslands appear in the meso/supra-Mediterranean and Mediterranean-montane vegetation belts, where the zonal vegetation is represented by thermophilous deciduous forest, dominated by *Quercus pubescens s.l., Ostrya carpinifolia* and *Carpinus orientalis*, or locally (especially in Italy) by evergreen forests dominated by *Quercus ilex*. As the mountain chains extend parallel to the coastline, the climatic influence does not penetrate deeply into the inland regions of the Balkan Peninsula. The climate shows two peaks of precipitation during the year, with the main peak appearing in autumn (November) and a second peak in spring (May). The amount of precipitation can be very fluctuating and vary up to 3000 mm on mountain barriers. However, even when precipitation is relatively high, the water flows mainly underground due to the nature of the bedrock, which is mainly composed of carbonate. Due to the lack of precipitation and the high temperature reached during the summer, the vegetation suffers from drought during these months. Winters are mild, with temperatures that do not drop much below freezing.  Since the bedrock generally lies close to the surface, these habitats are characterized by many chamaephytes and can be used only as pastures. Sometimes the carbonate bedrock is substituted by “flysch” marls (terra rossa) and sandstones. The morphology of this habitat is characterized by valleys, dolinas and sink-holes with depositional soils and clay from decalcification at the bottom.  Two habitat subtypes may be distinguished based on their biogeographic distribution, which correspond to two alliances: *Chrysopogono*-*Saturejion subspicatae* for the Balkan Peninsula, and *Hippocrepido glaucae-Stipion austroitalicae*, which is endemic to southeastern Italy. The latter refers to steppe grasslands with the endemic species *Stipa austroitalica*.  This habitat type is the result of a long time of human influence. After the Second World War, abandonment of this habitat begun. Firstly, only the less productive pastures were abandoned, but later also other examples of this grasslands were not managed anymore. Nowadays, a mosaic with various stages of scrub encroachment is found. Succession towards forests begins with high stalk plants (e.g. *Umbelliferaea*) and scrub species (e.g. *Cotinus coggygria*). In order to maintain these habitats, traditional management (grazing, mowing) should be continued. In early successional stages, restoration is relatively easy by introduction of livestock. However, livestock intensification leads to the destruction of the habitat, so animal numbers should not be too high. In certain sites, this habitat is affected by urbanization.  Indicators of good quality:   * Species richness of the grasslands and presence of character species * Absence of invasive species * Absence of high tall herbs, shrubs and trees * Regular grazing/mowing * Absence of intensive grazing   Characteristic species:  Flora: Vascular plants: *Allium ochroleucon, Anthyllis montana* subsp. *jacquinii, Anthyllis vulneraria* subsp. *polyphylla, Asperula cynanchica, Aster linosyris, Betonica officinalis* subsp. *serotina, Botriochloa ischaemum, Bromus erectus, Carex humilis, Centaurea triumfetti* subsp. *adscendens, Chrysopogon gryllus, Cirsium pannonicum, Crepis chondrilloides, Danthonia alpina, Dianthus carthusinorum* subsp. *sanguineus, Dianthus garganicus*, *Eryngium amethystinum, Euphrasia illyrica, Festuca rupicola, Anacamptis pyramidalis, Fumana procumbens, Galium purpureum, Genista sericea, Gentiana tergestina, Globularia cordifolia, Helianthemum ovatum, Hippocrepis glauca*, *Inula ensifolia, Iris pseudopumila*, *Knautia illyrica, Koeleria splendens, Lathyrus latifolius, Lathyrus pannonicus, Leontodon crispus, Linum tenuifolium, Medicago falcata, Medicago prostrate, Narcisus radiiflorus, Onobrychis arenaria* subsp. *tomasinii, Plantago argentea* subsp. *liburnica, Plantago holosteum, Polygala nicaensis* subsp. *mediteranea, Potentilla australis, Ranunculus bulbosus, Rhinanthus freynii, Satureja montana, Satureja subspicata* subsp. *liburnica, Scabiosa gramuntia, Scorzonera villosa, Sesleria tenuifolia, Stipa austroitalica*, *Stipa eriocaulis* subsp. *austriaca, Teucrium montanum, Thapsia garganica*, *Thesium divaricatum, Thlaspi pracox, Thymus longicaulis, Thymus spinulosus*, *Tragopogon tomasinii, Trinia glauca.* |
| E1.2a Semi-dry perennial calcareous grassland | These grasslands generally dominated by broad-leaved graminoids (especially *Brachypodium pinnatum* agg. and *Bromus erectus*) are typical of traditionally-managed pastures and meadows developed on relatively deep, nutrient-poor, usually calcareous soils from sea-level to the montane belt throughout temperate Europe.  The swards are generally closed, with a plant cover of more than 80% and often are very rich in species, for which reason they are of high interest for nature conservation. Sites that harbour a conspicuous orchid flora – both in number of species and in number of individual plants – are given a priority status by Natura 2000. The centre of distribution is in suboceanic and submediterranean regions, and outside this range, the communities can be found only under specific conditions: towards northwestern Europe where they are more confined to relatively warm and dry, southern exposed calcareous slopes or, as in the Baltic islands of Öland and Gotland, on low altitude limestone pavement (alvar).  The species composition varies over the geographical range, reflected by different sets of companions: in southern Europe, there are many sub-mediterranean species, whereas in Eastern Europe continental species are of more importance.  Syntaxonomically, the semi-dry perennial calcareous grasslands form a separate order (*Brachypodietalia pinnati*) within the class *Festuco-Brometea*. Here we also include the remaining meso-xeric types that are currently still placed in other *Festuco-Brometea* orders, namely most of the East-European meso-xeric order *Galietalia veri* as well as the alliance *Brachypodion phoenicoidis* from North Iberia and South France (traditionally in the order *Brachypodietalia phoenicoidis*) and the Illyrian *Scorzonerion villosae* (traditionally placed in the order *Scorzonero villosae-Chrysopogenetalia grylli*).  The specific characteristics  of mostly closed swards, deep soils, semi-natural character and temperate climate help delineate this habitat type from similar vegetation types on rocky calcareous soils (E1.1g) or under drier conditions in Eastern Europe (E1.2b), both of which are generally dominated by narrow-leaved graminoids.  Being mostly semi-natural and needing management, i.e. grazing by sheep and/or cattle and hay-making, where these practices have ceased for economic reasons throughout Europe, abandonment is one of the main threats when tall grasses (e.g. B*rachypodium pinnatum* agg., *Calamagrostis epigejos*) and tall forbs will take over the vegetation within a couple of years, and eventual encroachment of woody species will transform the community first into scrub, then forest. Sometimes, the stands are burned in spring time to destroy standing dead material, which encourages the growth of grasses and so helps prevent any further development of shrubs and trees. Another serious risk is intensification, as deeper calcareous soils can be rather easily transformed into productive agricultural land when competitive grasses like *Lolium perenne*, *Dactylis glomerata* and *Poa trivialis* can outcompete the characteristic grasses and herbs. Nowadays, many sites are managed in the traditional way for the sake of nature conservation.  Indicators of good quality:   * High species richness * Absence of nutrient-demanding and ruderal species * Long-term habitat stability * Generally closed sward with low vegetation structure * Traditional grazing/mowing regime * Low cover of encroaching tall grasses, shrubs and trees.   Characteristic species:  Flora  Vascular plants: *Adonis vernalis, Anacamptis pyramidalis, Anthyllis vulneraria, Arabis hirsuta, Brachypodium pinnatum, Brachypodium phoenicoides, Brachypodium rupestre, Briza media, Bromus erectus, Campanula glomerata, Carex caryophyllea, Carex flacca, Carlina acaulis, Carlina vulgaris, Centaurea scabiosa, Chrysopogon gryllus, Danthonia alpina, Dianthus carthusianorum, Eryngium campestre, Euphorbia cyparissias, Festuca guestfalica, Festuca rupicola, Filipendula vulgaris, Fragaria viridis, Galium pumilum, Galium verum, Gentiana cruciata, Gentianella ciliata, Gentianella germanica, Gymnadenia conopsea, Helianthemum nummularium* subsp*. ovatum, Helictotrichon pratense, Hypochoeris maculata, Knautia illyrica, Koeleria pyramidata, Leontodon hispidus, Linum catharticum, Lotus corniculatus, Medicago sativa* subsp*. falcata, Neotinea ustulata, Onobrychis viciifolia, Ononis spinosa, Ophrys apifera, Ophrys insectifera, Orchis mascula, Orchis militaris, Orchis morio, Orchis purpurea, Orchis ustulata, Plantago media, Polygala comosa, Potentilla heptaphylla, Primula veris, Ranunculus bulbosus, Salvia pratensis, Sanguisorba minor, Scabiosa columbaria, Scorzonera villosa, Thesium linophyllum, Thymus pulegioides, Trifolium montanum, Veronica prostrata, Veronica teucrium.*  Bryophytes: *Ctenidium molluscum, Entodon concinnus, Homalothecium lutescens, Hypnum cupressiforme* var*. lacunosum, Thuidium philibertii.*  Fauna  Birds*: Lanius collurio.*  Reptiles*: Lacerta agilis.*  Insects*: Papilio machaon* |
| E1.2b Continental dry steppe | Open or closed arid, floristically rich or poor steppes or steppe-like grasslands of sub-continental and continental areas of Central, South-Eastern and Eastern Europe from sea level to maximum 1200-1300 m alt.They are widespread in the plains, lowlands, hills and foothills, mostly on slopes or plainly but elevated terrains. The localities have mostly southern exposure and different tilt, as a result of which the underground surface waters are absent and the humidity of the soil completely depends on the rainfall. The habitat comprises plant communities which have developed in different soil and climatic conditions. The bedrock is mostly calcareous (limestones, dolomites, marls) but it can also be silicate and even sandstones. The soils are very diverse: Phaeozems, Chernozems, Luvisols, Lithosols, Rankers and Rendzhinas, but generally dry, thick or shallow, eroded and stony. The plant species that participate in the composition of this herbaceous vegetation are adapted to long periods of drought. There are two rest periods, one of which is in summer. Their distribution in various climatic conditions reflects in their floristic composition and structure. Additional factors of the environment such as altitude, soil characteristics, including soil acidity and anthropogenic pressure also have an impact on these communities.  The plant communities are dominated by high, tuft-forming grasses and other perennial herbaceous species. Inn the west, such communities (*Stipo-Poion* *xerophilae*) extend to the lower arid slopes of valleys in Eastern and Central Alps. The typical steppes (*Festucion sulcatae*, *Stipion lessingianae*) are developed mostly on deep soils in Central and Eastern Europe. They are dominated from xerophytic grasses: *Stipa* spp., *Festuca* spp., *Chrysopogon gryllus*, *Dichanthium ischaemum*, *Bromus* spp. They may be of primary origin, especially in most continental regions on thick loess cover or on naturally eroded terrains with basic rocks outcrops. But in the sub-continental and foothill regions they can inhabit places of former destroyed woodland. In these parts, semi-shrubs and solitary trees have remained from the primary wood vegetation. In more humid regions, or on eastern and northern slope in primary steppes, the habitat is more like a meadow, with many tall herbs, among which *Salvia* spp., *Phlomis* spp. and *Filipendula vulgaris*. On eroded slopes there are various petrophytic steppes (*Satureion montanae*) on shallow, degraded humus-carbonate soils or sandy-clayey screes. These communities are dominated by perennial herbs and aromatic semi-shrubs like *Satureja* spp., *Thymus* spp., *Genista* spp., *Teucrium* spp., *Hyssopus officinalis*. In the southernmost parts of the habitat’s range and on the coastal areas of the Black Sea, besides perennial grasses and semi-shrubs, also many annuals with Mediterranean origin participate in the habitat. The species composition of steppes along the Northern Black Sea is a mixture between typical steppe grasses, semi-shrubs and southern annuals (endemic alliance *Pimpinello-Thymion zigoidi*). Very diverse are also steppe communities on slopes, ridges and tops of loess plateaus in the Danube plain. They range from typical primary grasslands on deep chernozems on the tops, to open and poor semi-ruderal communities (*Artemisio-Kochion*) on the steep loess outcrops. The last ones are relic communities from the Pleistocene and dominated by large tufts of *Artemisia campestris*, *Chamaecytisus supinus*, *Kochia prostrata*, *Agropyron cristatum* and *Krascheninnikovia ceratoides*. The richest steppes are found however outside th EU28+, in Ukraine, South Russia and Kazakhstan, regions of ecological and climatic optimum for steppes. Many different steppe syntaxa have described there, representing a large diversity of steppe vegetation.  Through the whole range, overgrazing of steppes has caused ruderalization and degradation of the habitat, which transforms into pastures dominated by low grasses like *Cynodon dactylon* and *Lolium perenne*, with many spiny, poisonous or non-patable species for cattle. The semi-ruderal grasslands dominated by *Dichanthium ischaemum* are also secondary, because due the overgrazing they may replace more natural communities dominated by *Chrysopogon gryllus*, *Stipa* spp., etc. Continental steppes are very important habitat for many plant and animal species including relics and endemics. They are also very valuable resource for cattle. The most fertile soils, Chernozems, are formed by the interaction of the steppe vegetation and loess. Because it, the most steppe areas are ploughed and replaced from agricultures.  Indicators of good quality:  In good conditions these grasslands have rich species composition and dominance of steppe grasses.Mainthreat is ploughing, urbanization, industrial, agricultural and communication infrastructure, overgrazing that leads to xerophytisation, ruderalization and changes in their structure and ecological characteristics. General aridisation of the climate, fertilization of the neighbouring agricultural land, stone pits, digging activities, deposition of industrial and household waste, invasion of alien species, developing of tree and shrub vegetation are also serious threats. Complete abandoning of the grazing in foothill areas led to shrub and tree invasion as a process of restoration of former woodland.A patchy pattern of grassland and shrubs on a landscape scale is, on the other hand, of importance for many typical insects, birdsand reptilians.In such cases, especially for secondary steppes in foothill and low mountain areas, more intensive management may be needed for maintenance. The following characteristics may be considered as indicators of good quality, but these indicators differ in different regions depending by origin, geographical position and level of human disturbance:   * High species richness * Presence of rare and/or threatened species mostly with relic steppe origin * Low cover and balance of encroaching shrubs and trees * Absence of invasive species * Sustainability of traditional human activities: mowing, grazing, gathering of medicinal plants, fungi, etc.   Characteristic species:  Flora  Vascular plants: *Achillea clypeolata, A.collina, A. millefolium, A. nobilis, A. pannonica, A. setacea, A. tormentosa, A. virescens, Adonis flammea, A. vernalis, A. volgensis, Aegilops cylindrica, A. geniculata, A. triuncialis, Agrimonia eupatoria, Agropyron pectinatum, Ajuga genevensis, A. laxmannii, Alyssum alyssoides, A. caliacrae, A. parviflorum, A. saxatile, Allium flavum, A. moschatum, A. paniculatum, A. sphaerocephalon, Althaea hirsuta, Anacamptis pyramidalis, Anthericum ramosum, Asperula cynanchica, Arabis recta, Artemisia alba, A. austriaca, A. campestris, A. lerchiana, A. pedemontana, A. pontica, A. scoparia, Asphodeline lutea, Aster oleifolius, Astragalus austriacus, A. corniculatus, A. dasyanthus, A. exscapus, A. haarbachii, A. glaucus, A. monspessulanus, A. onobrychis, A. ponticus, A. pubiflorus, A. spruneri, A. vesicarius, Bellevalia ciliata, Brachypodium pinnatum, Brassica elongata, Bromus erectus, B.inermis, B.japonicus, B. mollis, B. tectorum, Buglossoides incrassata, Bupleurum falcatum, Camelinamicrocarpa, Campanula macrostachya, C. sibirica, Carex humilis, C. montana, C. caryophyllea, C. stenophylla, C. supina, Centaureamicranthos, C. stereophylla, C. stoebe, C. triumfetti, Cephalaria transsilvanica, C. uralensis, Chamaecytisus austriacus, Ch. jankae, C. supinus, Chondrilla juncea, Chrysopogon gryllus, Cichorium intybus, Cleistogenes serotina Colchicum turcicum, Convolvulus cantabrica, Coronilla scorpioides, Crambe tataria, Crocus reticulatus, Crupina vulgaris, Cynodon dactylon, Danthonia alpina, Dianthus campestris subsp. roseoluteus, D. carthusianorum, D. glabriusculus, D. nardiformis, D. pallens, D. petraeus subsp. noaeanus, D. pontederae, D. pseudarmeria, Dichanthium ischaemum, Dorycnium herbaceum, Dracocephalum austriacum, Echinops ritro, Echium maculatum E. vulgare, Elymus elongatus, E. hispidus, Elytrigia intermedia subsp. intermedia, Ephedra distachya, E. helvetica, E. negrii, Eryngium campestre, Erysimum diffusum, Euphorbia cyparissias, E. myrsinites, E. nicaeensis, E. seguierana, Euphrasia tatarica, Helianthemum canum, Hedysarum tauricum, Helianthemum salicifolium, Helictotrichon compressum, Herminium monorchis, Hieracium bauhinii, H. hoppeanum, Himantoglossum caprinum, Hyacinthella leucophaea, Hypericumelegans, H. perforatum, Hypochoeris maculata, Falcaria vulgaris, Ferula sadlerana, Festuca dalmatica, F. valesiaca, F. rupicola, Filipendula vulgaris, Fragaria viridis, Fumana procumbens, Galium album, G. octonarium, G. purpureum, G. verum, Genista sessilifolia subsp. trifoliata, Goniolimon besseranum, G. collinum, G. tataricum, Gypsophila glomerata, Inula ensifolia, I. hirta, I. oculus-christi, Iris pumila, Jurinea mollis, J. stoechadifolia, Kochia prostrata, Koeleria brevis, K. cristata, K. gracilis, Leontodon crispus, Limonium latifolium, Linum austriacum, L. tauricum, Lolium perenne, Matthiola fruticulosa, M. odoratissima, Medicago disciformis, M. falcata, M. minima,M. orbicularis, M. rigidula, Melampyrum arvense, Melica ciliata, Minuartia setacea, Nepeta parviflora, Nonea pulla, Onobrychis arenaria, O. viciifolia, Ononis arvensis, O. cenisia, O. pusilla, Onosma helveticassp. tridentina, Onosma tornensis, O. visianii, Orchis militaris, O. ustulata, Origanum vulgare, Orlaya grandiflora, Ornithogalum refractum, Ophrys apifera, O. sphegodes, O. fuciflora, Oxytropis pilosa,Paeonia tenuifolia, Paliurus spina-christi, Parentucellia latifolia, Paronychia cephalotes, Petrorhagia prolifera, P. saxifraga, P. velutina, Peucedanum arenarium, P. cervaria, Pimpinella saxifraga, P. tragium, Phleum phleoides, Phlomis herba-venti subsp. pungens, P. tuberosa, Plantago lanceolata, P. media, Poa angustifolia, P. bulbosa, Polygala major, Potentilla astracanica, P. arenaria,P. bornmuelleri, P. emilii-popii, P. pilosa, P. pusilla, Pseudolysimachion spicatum, Pulsatilla montana, P. nigricans, P. zimmermannii, Ranunculus illyricus, R. polyanthemos, Rhamnus saxatilis, Rindera umbellata, Ruta graveolens, Salvia aethiopis, S. argentea, S. austriaca, S. nemorosa, S. nutans, S. scabiosifolia, S. pratensis, S. ringens, S. sclarea, Sanguisorba minor, Satureja coerulea, S, montana, Saxifraga tridactylites, Scabiosa micrantha, S. ochroleuca, Scandix australis, Scorzonera austriaca, Scutellaria orientalis subsp. pinnatifida, Sedum hispanicum, S. maximum, S. urvillei, Seseli annuum, Seseli tortuosum, S. osseum, S. varium, Sideritis montana, Silene longiflora, S. otites, Stachys arenariaeformis, S. officinalis, S. recta, Sternbergia colchiciflora, Stipa capillata, S. crassiculmis, S. dasyphylla, S. joannis, S. lessingiana, S. stenophylla, S.pulcherrima, S. ucrainica, Syringa vulgaris, Tanacetum millefolium, Taraxacum serotinum, Teucrium chamaedrys, T. montanum, T. polium, Thlaspi jankae, Thesium linophyllon, Thymus callieri subsp. urumovii, T. glabrescens, T. pannonicus T. zygioides, Trifolium alpestre, T. angustifolium, T. cherleri, T. hirtum, T. incarnatum, T. montanum, T. scabrum, T. subterraneum, Trigonella gladiata, T. monspeliaca, Valerianella pumila, Verbascum banaticum, V. phoeniceum, Veronica austriaca, V. prostrata, Vinca herbacea, Vincetoxicum hirundinaria, Viola ambigua, Xeranthemum annuum*.  Mosses: *Campylliadephus chrysophyllus, Ceratodon purpureus, Eurhynchiumhians, Homalothecium lutescens, Hypnum cupressiforme, Fissidens dubius, F. taxifolius, Grimmia pulvinata, Plagiomnium affine, Polytrichum piliferum, Rhytidium rugosum, Rhytidiadelphus triquetrus, Syntrichia ruralis, Thuidium abietinum*  Lichens: *Cladonia convoluta, C. foliacea, C. furcata, C. rangiformis, Fulgensia fulgens, Peltigera canina, P. rufescens*  Fauna  Mammals: *Cricetus cricetus, Mesocricetus newtoni, Mus spicilegus, Mustela eversmanni, Sicista subtilis, Spermophilus citellus, Vormela peregusna*  Birds: *Alauda arvensis, Anthus campestris, Anthopoide svirgo, Asio flammeus,Burhinus oedicnemus, Calandrella brachydactyla, Circus cyaneus, C. pygargus, Emberiza calandra, E. cia, E. citrinella, E. melanocephala, Lullua arborea, Lanius collurio, Melanocorypha calandra, Oenanthe pleshanka, Otis tarda, Perdi xperdix, Phoenicurus ochruros, Sturnus roseus, Tetrax tetrax*  Reptilia: *Ablepharus kitaibelii, Dolichophis caspius, Eurotestudo hermannii, Lacerta trilineata, Lacerta viridis, Pseudopus apodus, Testudo graeca,Vipera ammodytes* Insects: *Bradyporus dasypus, Iphiclides podalirius, Mantis religiosa, Oedipoda germanica, Papilio machaon, Tettigonia viridissima Indicatorsofquality* |
| E1.3a Mediterranean closely grazed dry grassland | These grasslands consist of heavily grazed pastures, mostly by sheep. They are usually found on fine clay/silt soils and on flat areas, often at low elevations, which are intensively grazed and trampled by livestock. Due to grazing, their soils are often eutrophic, although they contain low abundance of nitrophilous plant species, probably due to the xerothermic conditions of these areas and to the effect of soil compaction by trampling. These anthropogenic grasslands are dry in early summer, but with the first autumn rains sprout and grow rapidly, remaining green and fertile during the winter. The dominating species, usually hemicryptophytes and chamaephytes such as *Poa bulbosa* and clovers, are characterized by grazing-tolerant mechanisms (e.g. rosettes) and low height. Such grasslands are found mostly in the Mediterranean and sub-Mediterranean zone of the western and central Mediterranean basin, including N-W Africa; their eastern distribution limit lies within the Balkan Peninsula. Depending on the environmental conditions and the geographic location, these grasslands include:  (a) Communities on acidic soils that tend to create uniform turfs with grasses and legumes adapted to grazing (e.g. *Poa bulbosa, Aira caryophyllea, Trifolium subterraneum, Trifolium nigrescens*). In Portugal these grasslands, among others, serve as very important food resources for wild rabbit populations and consequently for the diet of several important birds of prey, such as *Aquila adalberti*.  (b) Communities on clay soils of the western Mediterranean dominated by low hemicryptophytes and therophytes adapted to very intensive grazing, such as species with rosettes. The most common species of these grasslands are *Plantago serraria* and *Trifolium subterraneum*, while some of the diagnostic species are *Paronychia echinulata, Erodium primulaceum* and *Biscutella baetica*.  (c) Mesophilous grasslands of southern Italy which are usually the result of forest degradation. The most common species of these grasslands are *Bellis perennis, Barbarea bracteosa, Trifolium repens, Poa bulbosa, Plantago cupanii* and several others, some of which are endemic to Sicily.  (d) Communities of the southern Balkan Peninsula on fine clay soils (sometimes also in humid salty soils) around intensively grazed areas. In these early spring communities typical species develop from February to the end of March gradually drying out until summer, and only some C4 (drought-resistant species) plants can be found afterwards (e.g. *Achnatherum bromoides*). The most common species of these grasslands are *Romulea* spp., *Hedypnois rhagadioloides, Hypochoeris cretensis*.  Indicators of good quality:  ·       Presence of traditional grazing regime without signs of abandonment  ·       Absence of indication of significant, crevice-like, erosion  ·       Absence (or very low cover) of nitrophilous species  ·       No signs of secondary succession (e.g. encroachment of chamaephytes or shrub species)  Characteristic species:  Flora: Vascular plants: *Achillea coarctata, Acinos alpinus, Aira caryophyllea, Allium guttatum, Alyssum desertorum, Anthemis arvensis* subsp. *spacelata, Astragalus cymbaecarpos, Astragalus echinatus, Astragalus incanus, Astragalus macrorhizus, Astragalus pelecinus, Astragalus scorpioides, Astragalus sesameus, Astragalus stella, Barbarea bracteosa, Bellis annua, Bellis perennis, Biscutella baetica, Carex caryophyllea, Convolvulus lineatus, Crepis zacintha, Erodium botrys, Erodium cavanillesii, Erodium primulaceum, Festuca trichophylla* subsp. *trichophylla, Galium murale, Gynandriris sisyrinchium, Hedypnois rhagadioloides, Herniaria glabra* var. *glaberrima, Herniaria glabra* var. *glabra, Hordeum murinum* subsp. *leporinum, Hypochoeris cretensis, Hypochoeris radicata* subsp. *platylepis, Lagurus ovatus, Linaria simplex, Lolium perenne, Lotus angustissimus, Lotus corniculatus, Lupinus micranthus, Medicago intertexta, Merendera filifolia, Moenchia erecta, Myosotis ramosissima, Onobrychis humilis, Ophrys incubacea, Ornithogalum collinum, Parentucellia latifolia, Paronychia argentea, Plantago albicans, Plantago coronopus, Plantago cupanii, Plantago lagopus, Plantago lanceolata, Plantago loeflingii, Plantago serraria, Poa bulbosa, Poa trivialis, Potentilla calabra, Ranunculus bullatus, Ranunculus paludosus, Ranunculus pseudomillefoliatus, Romulea bulbocodium, Romulea linaresii* subsp. *graeca, Romulea ramiflora, Scorpiurus vermiculatus, Scorzonera villosiformis, Taraxacum obovatum, Teucrium capitatum, Thymus spinulosus, Trifolium bocconei, Trifolium bivonnae, Trifolium cherleri, Trifolium gemellum, Trifolium glomeratum, Trifolium micranthum, Trifolium nigrescens, Trifolium pallidum, Trifolium pratense* subsp. *semipurpureum, Trifolium repens, Trifolium scabrum, Trifolium subterraneum, Trifolium suffocatum, Trifolium tomentosum, Trigonella gladiata, Urospermum picroides, Vulpia sicula.* |
| E1.3b Mediterranean tall perennial dry grassland | The habitat type includes mainly basophilous, xerophytic, tall, tufted, dense or short open grasslands (pseudosteppes) with a wide Mediterranean distribution. They are dominated by plant species which are adapted to the xerothermic climatic conditions, the poor soil conditions and human-made disturbances such as grazing, trampling etc. This habitat type includes several plant communities of dry grasslands, differentiated mostly by the geographical region (western, central or eastern Mediterranean area) and the geological substrate (calcareous, magnesite, dolomite) or the soil types (deep or shallow, sandy, clay or ultramafic soils). Physiognomically, they usually look like steppes even if no *Stipa* species occur (pseudosteppes). Their floristic composition can be fairly differentiated depending on specific communities, but generally they are dominated by grasses such as *Lygeum spartum, Brachypodium retusum, Hyparrhenia hirta, Stipa* spp. etc. Alien species, adapted to xerothermic conditions, are often found with high abundance, like *Opuntia* spp. Grazing or other disturbances, such as wildfires, maintain these grasslands, which are – in several cases – the result of the degradation of forests or evergreen shrublands. Invasion by alien species, transformation to agricultural land and urbanization are the major threats for this habitat type.  Indicators of quality:  This habitat type is characterized by steppe-like grasslands. Subsequently, the most important quality indicators are: (a) dominance of grass species, (b) absence or very low cover of nitrophilous or alien species, (c) no signs of primary succession (e.g. encroachment of chamaephytes or shrub species), (d) presence of properly adjusted, extensive grazing, (e) absence of indications of significant, crevice-like, erosion.  Characteristic species:  Dominant species:*Andropogon distachyos, Brachypodium boissieri, B. retusum, Cachrys pungens, Dactylis glomerata*subsp. *hispanica, Festuca capillifolia, F. scariosa, Helictochloa bromoides, Helictotrichon filifolium s.l., Heteropogon contortus, Hyparrhenia hirta, H. sinaica, Lygeum spartum, Macrochloa tenacissima, Magydaris pastinaca, Stipa barbata, S. cazorlensis, S. iberica, S. juncea, S. lagascae, S. offneri, S. parviflora, S. pauneroana, Trisetum velutinum.*  Diagnostic species: *Allium pallens, A. sphaerocephalon, Aristida adscensionis* subsp.*caerulescens,â€‹ Arrhenatherum album, Carlina corymbosa, C. graeca, Cenchrus ciliaris, Convolvulus althaeoides,â€‹ Dichanthium annulatum, Echinophora tenuifolia, Eryngium dichotomum, E. triquetrum, Euphorbia terracina, Ferula communis, Festuca humifusa, Ferulago nodosa, Helictochloa gervaisii, Lapiedra martinezii, Moricandia arvensis, Phagnalon rupestre* subsp. *graecum, P. saxatile, Rhaponticum coniferum, Sanguisorba verrucosa, Scorzonera cretica, Stipa bufensis, S. capillata, S. gussonei, Thapsia pelagica, Tricholaena teneriffae.*  Invasive: *Pennisetum setaceum.* |
| E1.3c Mediterranean annual-rich dry grassland | These grasslands are composed mainly by short annual plants with a short winter-spring vegetative cycle. There is a large inter-annual variation in the development of plant communities that is attributed to climatic fluctuations and especially to the amount of precipitation during spring; usually in summer they become dry. They grow mainly in the Mediterranean macrobioclimate, extending into the Temperate one, but mostly within its Submediterranean variant. These nano-therophytic, often ephemeral, communities exhibit extremely rich plant diversity that is mainly composed by species of the families *Leguminosae*, *Rubiaceae*, *Compositae*, *Umbelliferae* and *Gramineae*. Consequently, the high plant species diversity results in a high communities' diversity. Floristic composition and plant diversity of these communities depends on geographical location, substrate, climatic factors and human activities. Most of them are pioneer, xerophytic, basophilous communities that develop on various substrata (limestone, clay, gypsum, dolomite, serpentines, mafic) with lithosols or slightly euptrophic soils. Occasionally, they occupy areas close to the sea, regardless of the substrate. The grasslands of this habitat type are found mainly in South Mediterranean countries and are considered as an ultimate stage in the degradative succession of xeric Mediterranean forests and shrub communities. Traditional practices such as logging, fires and grazing led to the degradation of forests and evergreen scrublands of the Mediterranean area, which gradually turned to grasslands. Abandonment of the traditional practices, mainly of grazing, facilitates the encroachment of woody species, a fact that may alter the character of this grassland habitat type.  Indicators of good quality:   * extensive grazing, without signs of abandonment, * absence of crevice-like erosion, * absence (or low cover) of nitrophilous species, * absence of signs of secondary succession (e.g. encroachment of chamaephytes or shrub species)   Characteristic species:  Vascular plants: *Clinopodium* *acinos (= Acinos alpinus), Aegilops geniculata, Aizoon hispanicum, Ajuga iva, Allium pentadactyli, Alyssum alyssoides, Alyssum* *simplex (= A. minus), Ammoides pusilla, Androsace elongata* subsp*. breistrofferi, Arenaria capillipes, Arenaria pomelii, Arenaria modesta* subsp*. modesta, Arenaria retusa* subsp*. arundana, Arenaria retusa* subsp*. retusa, Arenaria serpyllifolia, Atractylis cancellata, Avena barbata, Trachynia* *distachya (=Brachypodium distachyon), Anisantha* *fasciculata (=Bromus fasciculatus), Buglossoides* *incrassata* subsp. *incrassata (=B. arvensis* subsp*. gasparrinii), Bupleurum baldense, Bupleurum gerardi, Bupleurum gracile, Bupleurum semicompositum, Callipeltis cucullaria, Campanula dichotoma* (incl. subsp*. afra) Campanula dichotoma* subsp*. semisecta, Campanula erinus, Catapodium rigidum, Cerastium* *brachypetalum* subsp. *tenoreanum (=C. tenoreanum), Chaenorhinum macropodum, Chaenorhinum grandiflorum* subsp*. carthaginense, Microrrhinum* *minus (=Chaenorhinum minus), Chaenorhinum rubrifolium* subsp*. raveyi, Chaenorhinum rubrifolium* subsp*. rubrifolium, Clypeola* *jonthlaspi (=C. microcarpa), Coronilla scorpioides, Crepis neglecta, Crucianella angustifolia, Daucus durieua, Echinaria capitata, Erodium recoderi, Eryngium grossii, Erysimum incanum* subsp*. matritense, Euphorbia exigua, Euphorbia falcata, Euphorbia sulcata, Filago eriocephala, Filago pyramidata, Gastridium ventricosum, Geranium molle, Geranium columbinum, Moraea* *sisyrinchium (=Gynandriris sisyrinchium), Hedysarum spinosissimum* subsp. *capitatum (=H. glomeratum), Helianthemum angustatum, Helianthemum salicifolium, Hippocrepis biflora, Hippocrepis ciliata, Hornungia petraea, Hypericum perforatum* subsp*. veronense, Hypochoeris achyrophorus, Iberis fontqueri, Jasione montana* subsp*. blepharodon (=J.  blepharodon), Jasione penicillata, Lactuca viminea, Lathyrus sphaericus, Limonium echioides, Linaria huteri, Linaria micrantha, Linaria oblongifolia, Linaria platycalyx, Linaria salzmannii* var*. flava, Linaria saturejoides* var*. angustealata, Linaria saturejoides* var*. saturejoides, Linaria simplex, Linum strictum, Lotus ornithopodioides, Medicago littoralis, Medicago minima, Melilotus neapolitana, Minuartia hamata, Minuartia hybrida, Minuartia mediterranea, Minuartia montana, Medicago rigidula, Micropus supinus, Neatostemma apulum, Nepeta ucranica* subsp*. braun-blanquetii, Nepeta ucranica* subsp*. hispanica, Odontites kaliformis, Odontites longiflorus* subsp*. lateritia, Odontites viscosus subsp. oscensis, Omphalodes commutata, Omphalodes linifolia, Onobrychis caput-galli, Ononis pubescens, Ononis ornithopodioides, Ononis pendula* subsp*. boissieri, Ononis reclinata, Ononis viscosa subsp. breviflora, Anacamptis* *coriophora* subsp. *fragrans (=Orchis fragrans), Orlaya grandiflora, Parapholis incurva, Petrorhagia saxifraga, Pistorinia breviflora, Plantago albicans, Plantago amplexicaulis, Plantago bellardi* subsp*. bellardi, Plantago bellardi* subsp*. deflexa, Platycapnos tenuilobus* subsp*. paralelus, Polygala monspeliensis, Ptilostemon stellatus, Romulea columnae, Scabiosa stellata* subsp*. simplex, Scandix stellata* subsp*. velutina, Silene almolae, Silene germana, Silene inaperta* subsp*. serpentinicola, Silene psammitis* subsp*. lasiostyla, Thymelaea passerina, Trachynia distachya, Trifolium campestre, Trifolium cherleri, Trifolium scabrum, Trifolium stellatum, Trisetaria* *loeflingiana (=Trisetum loeflingianum), Trisetaria scabriuscula (=Trisetum scabriusculum), Sedum sexangulare, Sideritis romana, Silene conica, Stipa capensis, Valerianella eriocarpa, Valerianella multidentata, Valerianella rimosa, Velezia rigida, Vulpia ciliata, Vulpia hispanica subsp. montana, Wangenheimia lima.* |
| E1.5a Iberian oromediterranean siliceous dry grassland | Dwarf grasslands growing in alpine (crioro) and upper subalpine (oro) environment at elevations above 1900 m in siliceous mountains in Mediterranean Iberian Peninsula, from the Cantabrian range in the NW to Sierra Nevada in the SE. Conditions are extreme in such altitudes, and include low temperatures, a short growing season in which solar irradiation is very high and rainfall can be low, combined with a high wind exposure. Strong wind sweeps the snow preventing from being accumulated. The removal of the protective snow layer in winter exacerbates drought by enhancing evaporation and also entails an important abrasion and mechanical pressure. Due to the extreme cold and dryness, those grasslands have been qualified as psychro-xerophilous. They occupy crests and slopes in which snow cover is shallow, avoiding depressions where it accumulates. Phenomena of cryoturbation and solifluxion are common in the soils, which are leptosols, lithosols or distric cambisols without histic, gleic and hydromorphic properties. The plants are dwarf or prostrated, with hard tissues to endure wind abrasion and drought. The grasses, particularly the *Festuca* species, have hard leaves with sclerenchyma bundles that give way to a low palatable or even indigestive pasture (revientabarrigas). Cover can be complete (ca 100%) to intermediate (40-50%) or low depending on extreme conditions, slope and solifluxion incidence. Succession towards tall vegetation types is prevented by extreme environmental conditions in the higher altitudes, where those grasslands are the Potential Natural Vegetation. Grazing, usually by sheep, is restricted to a short growing season and its impact used to be low.  The majority of the species are Iberian endemics, often restricted to one of the mountain groups and particularly abundant in Sierra Nevada.  Indicators of good quality:   * The grassland should be dominated by grasses (*Festuca* sp. pl.), grass-like species (*Luzula* sp. pl.) and other herbaceous plants, having few ligneous plants. * A medium to high vegetation cover * Absence of nitrophilic species linked to human activities * No visible anthropic disturbances due to building activities, skying or intensive trampling   Characteristic species:  Vascular plants: *Agrostis tileni, Androsace rioxana, Arenaria imbricata, Armeria bigerrensis, Armeria duriaei, Armeria losae, Armeria micriocephala, Armeria caespitosa, Artemisia granatensis, Dianthus langeanus, Erigeron frigidus, Eryngium glaciale, Festuca aragonensis, Festuca clementei, Festuca curvifolia, Festuca pseudeskia, Herniaria boissieri, Hieracium myriadenum, Hieracium vahlii, Jasione amethystina,  Jasione brevisepala, Jasione centralis, Koeleria caudata* subsp. *crassipes, Leontodon cantabricus, Leucanthemopsis flaveola, Leucanthemopsis cuneata, Leucanthemopsis pectinata, Luzula caespitosa, Luzula caespitosa* subsp*. iberica, Luzula hispanica, Minuartia bigerrensis, Minuartia juresii, Nevadensia purpurea, Potentilla nevadensis, Senecio boissieri, Sideritis glacialis, Silene elegans, Trisetum antoni-josephii, Trisetum glaciale, Silene elegans, Teesdaliopsis conferta, Veronica cantabrica.* |
| E1.5b Iberian oromediterranean basiphilous dry grassland | Dwarf vegetation composed of hard leaved grasses (*Festuca, Koeleria*) and other ligneous plants which form a grassy scrub on calcareous thin rocky soils. Depending on the association involved, the grassland-scrub can be dominated by grasses (*Festuca* sp. pl.), or by other ligneous plants. The vegetation completely covers the soil surface or leaves up to 40 % of bare soil, depending on the rocky character of the soil, but also on the freezing-thawing cycle (geliturbation, gelifluction) which takes place in this habitat.  The habitat type is found in Mediterranean mountains, at upper supra-oro-cryoro levels, of the Iberian Peninsula, Pyrenees, French Massif Central and Alps Maritimes - Ligurian Alps, between 1300 to 2500 m. Here the grasslands are found under submediterranean high mountain climatic conditions, with a short summer drought, and severe low winter temperatures, as they are poorly protected by snow (they are covered by a thin layer of snow or even remain snow-free in winter).  The habitat is very rich in endemic species, probably due to its calcareous soils and its extreme environmental conditions. Succession towards taller vegetation types is prevented by extreme environmental conditions in the higher altitudes, where those grasslands are often climax communities. At lower altitudes (supra levels) encroachment by shrubs is easier, due to the more mesic conditions and this vegetation may be replaced by succession. The habitat can endure a light grazing pressure (usually sheep) without altering its structure and composition and it used to be grazed in summer during the short growing season.  Indicators of good quality:  The following characteristics may be considered as indicators of good quality:  ·      High species richness  ·      Presence of endemic species  ·      A medium to high vegetation cover  ·      Absence of nitrophilic species, linked to human activities  ·      No visible anthropic disturbances due to building activities, skiing or intensive trampling  Characteristic species:  Flora  Dominants:  *Anthyllis montana, Arenaria aggregata*, *Artemisia pedemontana* subsp*. assoana*, *Astragalus incanus* subsp*. nummularioides, Astragalus sempervirens* s.l., *Carex humilis, Festuca altopyrenaica*, *Festuca burnatii*, *Festuca dimorpha,* *Festuca gautieri* subsp*. scoparia, Festuca hystrix, Festuca nevadensis, Festuca reverchonii, Genista lobelii, Globularia cordifolia, Helictotrichon sedenense, Helictotrichon sempervirens, Ononis cristata, Ononis striata*, *Sesleria caerulea* subsp*. elegantissima*, *Stipa eriocaulis*, *Teucrium polium* subsp. *aureum, Thymelaea nivalis.*  Diagnostic: *Androsace vitaliana* s.l.*, Anthyllis vulneraria* subsp*. argyrophylla, Arenaria erinacea* s.l., *Arenaria murcica, Armeria bigerrensis* subsp*. legionensis*, *Artemisia chamaemifolia* subsp*. cantabrica*, *Asperula pyrenaica*, *Astragalus cavanillesii, Astragalus tremolsianus, Brimeura amethystina* s.l., *Centaurea podospermifolia, Centaurea jaennensis, Centaurea janerii* subsp*. babiana*, *Crepis albida* s.l.*, Cyanus triumfettii,* *Cytisus ardoinii,* *Dianthus brachyanthus s.l., Dianthus subacaulis,* *Draba cantabriae* s.l., *Draba lebrunii*, *Dyanthus brachyanthus* s.l., *Erodium cazorlanum, Erodium daucoides, Erodium foetidum* s.l., *Erysimum humile* subsp*. pyrenaicum*, *Erysimum seipkae*, *Euphorbia duvalii*, *Genista delphinensis, Genista villarsii, Gentiana clusii* subsp*. corbariensis, Globularia punctata, , Helictotrichon sedenense* subsp*. gervaisii*, *Iberis saxatilis, Laserpitium lainzii, Leucanthemum burnatii, Leucanthemum graminifolium*, *Linaria aeruginea* subsp*. cardonica*, *Narcissus assoanus, Onobrychis pirenaica, Onosma bubani*, *Onosma fastigiata*, *Onosma tricerosperma* subsp*. alpicola*, *Oreochloa confusa*, *Oxytropis javalambrensis, Paronychia kapela* subsp. *serpyllifolia, Plantago argentea*, *Saponaria caespitosa, Saxifraga conifera*, *Sempervivum calcareum, Senecio doronicum* s.l., *Senecio provincialis* var*. corbariensis, Seseli granatensis, Sideritis glacialis* subsp*. fontqueriana, Sideritis hyssopifolia* s.l., *Sideritis subspinosa*, *Teucrium luteum, Thesium catalaunicum*, *Thymus godayanus, Thymus vulgaris* subsp*. palearensis, Thymus willkommii.* |
| E1.5c Cyrno-Sardean oromediterranean siliceous dry grassland | High-mountain siliceous grasslands of the oromediterranean belt of Corsica, occurring mainly at altitudes of 1,800-2,100 m, especially in the massifs of Monte Cinto, Monte Rotondo, Monte Renoso and Monte Incudine. These grasslands are dominated by herbs and graminoids, of which *Bellardiochloa variegata, Ligusticum corsicum, Plantago sarda, Sagina pilifera* and *Luzula spicata* subsp. *italica* are most frequent. Species endemic to Corsica are also common, including *Armeria multiceps*, *Paronychia polygonifolia* and *Trisetum conradiae*. In places dwarf shrubs may occur, especially *Genista lobelii*, and patches of creeping juniper *Juniperus communis* subsp. *alpina.* At altitudes between 2,100 and 2,200 m, these grasslands become more open.  This habitat type might be present also in Sardinia, represented by fragments localized on Mt. Gennargentu. The altitude of this mountain (1,834 m a.s.l.) reaches the oromediterranean climatic belt, and its top is characterized by strong winds that, in areas of ridges, exert a strict selection of the plant species in favor of crawling hemicryptophytes and cushion-like chamephytes, pushing the hemicryptophytic vegetation to find protection in between the dwarf shrubs. The most representative species are *Festuca morisiana, Armeria sardoa* subsp. *genargentea, Hieracium soleirolianum* and other endemics.  This vegetation occurs on different types of siliceous rocks, which give rise to soils of pH between 5 and 6. These soils are influenced by cryoturbation and gelifluction.  Indicators of good quality:  ·       Occurrence of rare species, especially Corsican endemics  ·       Absence of nutrient-demanding, tall-growing competitive species  ·       No indication of the spread of (dwarf) shrubs  ·       Absence of overgrazing  Characteristic species:  Vascular plants: *Armeria multiceps, Bellardiochloa variegata* (=*Poa violacea*), *Cerastium soleirolii, Genista lobelii, Hieracium auricula* subsp. *micranthum, Juniperus communis* subsp*. alpina, Luzula spicata* subsp. *italica, Minuartia verna* s.l., *Nardus stricta, Paronychia polygonifolia, Plantago sarda, Poa balbisii* var. *prorepens, Reseda phyteuma* (=*Sesamoides pygmaea*)*, Robertia taraxacoides, Sagina pilifera, Scleranthus burnatii, Sempervivum arachnoideum, Trisetum conradiae* |
| E1.5d Greek and Anatolian oromediterranean siliceous dry grassland | This habitat is formed by dense, closed, usually unsculptured, oromediterranean chionophilous grasslands of acid and often deep soils over siliceous or calcareous substrates, as well as the closed, dry or mesophilous perennial *Nardus* spp. grasslands (mat-grass swards) occupying siliceous soils in the mountains of central and southern Greece, and north-western Anatolia (transitional region between the Mediterranean and the Euro-Siberian floristic region). The various vegetation communities of this unit occur on the high mountains of the southern Balkan peninsula under Mediterranean climate influence, including southern Albania, the Former Yuguslav Republic of Macedonia (FYROM), northwestern Turkey, the southern Pelagonides (Vermion), the Pindus mountain range (Tymfi, Peristeri, Karava, Smolikas), the high Thessalian mountains (Olimbos, Ossa), the Sterea Ellas (Giona, Iti) and the Peloponnesus mountains (Chelmos, Killini, Erimanthos, Taygetos); they develop on decalcified colluviums, on damp soils of seeps or poorly drained areas, and in depressions and other sites where snow lingers. These grassland communities or grassy meadows ("pelouses rases") above the treeline are mainly found at altitudes from 1,800 to 2,400 m Asl, and are mainly associated with late snow cover (>150 days) and irrigation from melt water in shallow depressions or in more or less flat ground with accumulated fine-grained soil.  Indicators of quality:   * Vegetation cover > 80% * Species rich communities * High grass species presence * Absence of strong erosion indication * Soil without significant disturbances * Absence or very low cover of weed species * Absence of indications of secondary succession (e.g. invasion by tall herbs and the establishment of trees and shrubs on grassland areas) * Controlled grazing regime   Characteristic species:  Flora: Vascular plants: *Alopecurus gerardii*, *Poa pumila*, *Anthoxanthum alpinum*, *Phleum alpinum*, *Nardus stricta*, *Bellardiochloa violacea* (*Poa violacea*), *Trisetum flavescens*, *Trifolium pallescens*, *Trifolium parnassi*, *Trifolium* *heldreichianum*, *Trifolium alpestre*, *Trifolium ottonis*, *Omalotheca supina*, *Omalotheca hoppeana*, *Herniaria parnassica*, *Ranunculus sartorianus*, *Lotus corniculatus*, *Thesium parnassi*, *Plantago lanceolata*, *Plantago atrata*, *Plantago holosteum*, *Scleranthus perennis*, *Rorippa thracica*, *Erigeron epiroticus*, *Acinos alpinus*, *Luzula pindica*, *Crocus veluchensis*, *Scilla nivalis*, *Corydalis densiflora*, *Corydalis parnassica*, *Beta nana*, *Trinia guicciardii*, *Botrychium lunaria.* |
| E1.5e Madeiran oromediterranean siliceous dry grassland | This habitat consists of perennial cespitose grasslands of oromediterranean, humid to ultrahyperhumid bioclimates, in the summit of mountains of Madeira Island, to which this vegetation is strictly endemic. Such communities occur at altitudes over 1,500 m Asl, either in earthy rock crevices (chasmophytic) or over horizontal platforms along hillsides with shallow andosols, on silicate volcanic substrata (either hardrock or pyroclast). The physiognomy of these communities varies from dense mat-like, more or less continuous in platforms, to discontinuous on rock outcrops following crevices; it´s height is normally between 0.2 and 0.4 m. Dominant species are mostly madeiran endemic grasses: *Parafestuca albida* (= *Koeleria albida*), *Deschampsia maderensis*, *Festuca jubata*, *Anthoxanthum maderense*, *Agrostis obtusissima* and *Holcus pintodasilvae*; notheworthy madeiran endemics having their optima in this habitat are: *Armeria maderensis*, *Anthyllis lemmaniana*, *Crepis andryaloides*, *Orchis scopulorum*, *Micromeria varia* subsp. *thymoides* var. *cacuminicolae*, *Rumex bucephalophorus* subsp. *fruticescens*.  This vegetation occupies azonal permanent habitats in a mosaic with tree-heath forests of Madeira (*Polysticho falcinelli-Ericion canariensis*- G2.7 =*Polysticho-Ericion arboreae*) and mat-forming mountain low heath communities of *Erica maderensis* (*Argyranthemo montani-Ericetum maderensis*, *Bystropogono punctati-Telinion maderensis* –G2.7). Side contacts with succulent semi-deciduous rosette *Crassulaceae* comophyte (*i.e.* on the surface of rock) communities (*Sinapidendro angustifolii-Aeonion glandulosi* – F8.2) enrich the madeiran grasslands with many other endemics (see F8.2- Madeiran xerophytic scrub). Other common contacts are with *Thymus micans* communities (E1.Ad).  As the summit of Madeira´s mountains was, until recently, grazed mostly by domestic goats, the coenotic extreme of the community in platforms is thought to be quite rare, being the rocky coenotical extreme the dominant case. Platforms if permanently grazed normally had nitrogen-prone grasslands dominated by *Agrostis castellana* / *Holcus* sp. pl. With withdrawal of goat grazing the platforms with shallow andosols were gradually colonized, in recent years, by this habitat's community where the habitat optimum seems to be. Thus, due to grazing withdrawal the actual area of the community is bigger than it was ten years ago. Although in shallower platforms and rock outcrops the community seems to be of a permanent type (a *permasigmetum* in the sense of S. Rivas-Martínez) and kept by regular gravitational disturbance, in deeper more stable soils ecological succession may lead to substitution of grasslands by woody types.  Indicators of quality:  The habitat contains a set of endemics with high constancy and fidelity that are observed in most well-preserved situations. Nevertheless, poorer basal communities dominated by few of the grasses can be found. These have lower floristical quality, but, in turn can develop into fully coenotically saturated versions. In general, the greater the diversity of the above cited flora is found and less of generalist Mediterranean and Madeiran-Canarian grasses or semi-nitrogen-prone grasses (e.g. *Bromus* sp. pl.) are found, the better the habitat quality is (e.g. *Dactylis smithii* subsp. *hylodes*, *Agrostis castellana*).  Characteristic species:  Flora, Vascular plants:  Endemics trictly characteristic of habitat: *Parafestuca albida* (dom.)\*, *Deschampsia maderensis* (dom.), *Festuca jubata*, (dom.) *Anthoxanthum maderense*, *Agrostis obtusissima, Holcus pintodasilvae, Armeria maderensis*, *Anthyllis lemmaniana*, *Crepis andryaloides*, *Orchis scopulorum*, *Micromeria varia* subsp. *thymoides* var. *cacuminicolae*, *Rumex bucephalophorus* subsp. *fruticescens.* (Taxonomical remarks: *Parafestuca* is a monotypic genus endemic of Madeira according to the criteria of E.B. Alexeev (1985). Recent revision places it in Koeleria. We follow the former criteria; *Festuca jubata* was formerly thought to be shared with Azores, but is now taken to be a strict madeiran endemic; in Azores *F. jubata* auct. is *F. francoi*)  Common transgressive endemics from other habitats: *Odontites holliana, Andryala grandulosa* subsp. *varia*, *Saxifraga maderensis* var. *pickeringii*, *Argyranthemum pinnatifidum* subsp. *montanum*, *Teucrium francoi, Plantago arborescens* subsp. *maderensis*, *Viola paradoxa*, *Vicia capreolata*, *Sinapidendron frutescens*.  Fauna  Birds: *Pterodroma madeira*(Zino’s Petrel, is one of the most threatened bird species in the world (ca. 30 couples) and nests on this habitat alone). |
| E1.7 Lowland to submontane, dry to mesic Nardus grassland | The grasslands characterized by *Nardus stricta* from the lowland areas up to the submontane belt of the mountains are separated from the *Nardus* communities in higher mountains (E4.3b), although Natura 2000 classifies them together in one type (H6230). This in spite of the naming of the habitat type in the EU Interpretation Manual: ‘Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)’. The habitat includes low-growing grasslands on nutrient-poor, acidic and moist to moderately dry soils. In most cases, the vegetation is grazed by sheep and/or cattle; occasionally, burning takes place. The species composition of the vegetation is closely related to the intensity and type of grazing.  Generally, *Nardus stricta* is the dominant species, providing the vegetation with a densely tufted structure. Even from a distance, the pale wiry foliage of the species helps marking out the stands; later in the season the leaves turn to a bleached straw colour. Occasionally, other oligotrophic grasses (such as *Festuca filiformis*, *Agrostis capillaris* and *Deschampsia flexuosa*) may dominate, as well as – less frequent – rushes like *Juncus squarrosus*, the latter on relatively wet soils and in regions with a high precipitation. The habitat is widespread in the temperate zone of Europe, from Western to Central Europe. In Northern Europe, it reaches to Southern Norway, Southern Sweden and Latvia, in Southern Europe to Spain and Italy. The *Nardus* swards prefer a rainy and cool climate; in Great Britain, for instance, the habitat is rather rare in the warmer and drier lowlands, but very common and widespread in the cool and wet mountains in the north.  In the widespread ‘sand landscape’ of the lowland regions in North-western Europe (Belgium, Netherlands, Northern Germany and Southern Denmark), the Nardus grasslands are part of the traditional heathland systems, nowadays limited to nature reserves. Here, the communities are often restricted to small localities and highly endangered. Where the Nardus grasslands in Europe occupy larger areas, they tend to disappear due to abandoning at the one hand or nutrient enrichment on the other hand. In both cases, the sites are taken over by more competitive species.  Consequently to the abandonment of the traditional grazing activities, these grasslands are invaded by shrubs, such as *Calluna vulgaris*, *Vaccinium* sp. pl., *Juniperus communis*, or trees, e.g. *Betula pendula*, *Pinus sylvestris*, as well as *Picea* and *Larix* and, sometimes, *Pinus cembra* or *Populus tremula*.  Indicators of good quality:  ·     Low and rather dense vegetation structure;  ·     Absence of shrubs and trees.  Characteristic species:  Vascular plants: *Agrostis capillaris, Ajuga tenorei, Antennaria dioica, Arnica montana, Bellardiochloa variegata, Brachypodium genuense, Campanula barbata, Carex ericetorum, Crepis conyzifolia, Crocus neapolitanus, Deschampsia flexuosa, Dianthus deltoides, Festuca circumediterranea, Festuca filiformis, Festuca ovina (agg.), Festuca nigrescens, Festuca paniculata, Galium saxatile, Gentiana pneumonanthe, Gentiana kochiana, Geum montanum, Gnaphalium sylvaticum, Homogyne alpina, Hypericum maculatum, Juncus squarrosus, Lathyrus linifolius* (= *L. montanus*)*, Leontodon helveticus, Meum athamanticum, Nardus stricta, Nigritella rhellicani, Orchis spitzelii, Pedicularis sylvatica, Pilosella aurantiaca, Pilosella lactucella, Platanthera bifolia, Polygala serpyllifolia, Polygala vulgaris, Potentilla aurea, Potentilla erecta, Potentilla rigoana, Ranunculus pollinensis, Senecio scopolii, Tulipa sylvestris* subsp. *australis, Veronica officinalis, Viola calcarata* subsp. *cavillieri , Viola canina*. |
| E1.8 Open Iberian supramediterranean dry acid and neutral grassland | Perennial grasslands formed by hard grasses (*Festuca*) and small hemicryptophytes and chamaephytes covering shallow soils on siliceous substrata in western Iberian Peninsula, at medium to high elevations (supra-oro levels). The vegetation is closed, covering between 60 to 90 % of the surface, and the dominant species are of low height, with a dense layer of 5 to 10 cm height in which some plants loom above until 20 to 30 cm. Most of the plants present the typical set of morpho-ecological traits of the Mediterranean grasslands, with adaptations to the summer drought, which in this case combine with the nutrient poverty stress. Substrata are varied, from mafic and ultramafic in NE Portugal (Tras os Montes), where the endemic alliance *Armerion eriophyllae* occurs, to schist in south Spain (Sierra Nevada and Filabres), where the endemic alliance *Thymion serpylloidis* is found. The main alliance, *Hieracio castellani-Plantaginion radicatae* is widespread in western Iberia and develops on sandy soils derived from granite, gneiss and sandstone. Soils are dry, lacking any hydromorphic properties, and have a limited development of the edaphic layers. As they cover rocky outcrops or eroded substrata, soils can be qualified as rocky lithosols, having primary stations in outcrops and secondary ones in eroded places. Usually this habitat type is distributed forming a mosaic pattern with others, such as *Nardus* grasslands (E1.7a) or vallicares (E2.4), forming part of the seral communities complex replacing pine or oak forests. These grasslands have been traditionally grazed, mostly by sheep, in a system of a comprehensive utilization of the available resources valid in the traditional husbandry system existed so far. A large number of Iberian endemic species constitute the core of this type, with a high representation of *Plumbaginaceae (Armeria), Caryophyllaceae* and *Festuca sp. pl*.  Indicators of good quality:  These grasslands are in a good condition if they show a low height and a high cover, not necessarily of 100%, without woody plants of the more developed stages in succession such as shrubs or trees. Signals of moderate grazing are also acceptable. Artificial conifer plantations should be absent.  Characteristic species:  *Vascular plants*  Dominants: *Agrostis truncatula, Arenaria* *frigida*, *Armeria eriophylla*, *Armeria* *langei s.l.*, *Armeria odorata*, *Festuca gredensis*, *Festuca* *rivas-martinezii*, *Festuca* *summilusitana*, *Hieracium* *castellanum*, *Leucanthemopsis* *pallida*, *Leucanthemopsis* *pulverulenta*, *Plantago radicata.*  Diagnostic species: *Arenaria* *armerina*, *Arenaria querioides* s.l.*, Armeria* *caballeroi*, *Armeria* *ciliata*, *Armeria* *humilis* s.l., *Armeria merinoi, Armeria* *salmantica*, *Armeria* *trachyphylla*, *Armeria* *transmontana*, *Armeria vestita*, *Astragalus devesae*, *Avenula* *romero-zarcoi*, *Bufonia* *macropetala*, *Centaurea* *alba*, *Centaurea borjae, Centaurea* *toletana*, *Dianthus* *laricifolius* s.l*.*, *Dianthus* *merinoi*, *Erodium* *cheilanthifolium*, *Erysimum* *nevadense, Festuca brigantina*, *Festuca* *longiauriculata*, *Helianthemum* *masguindalii*, *Herniaria* *scabrida*, *Hippocrepis* *carpetana*, *Jasione* *sessiliflora* s.l., *Koeleria nevadensis, Linaria* *atrofusca*, *Ornithogalum* *concinnum*, *Ortegia* *hispanica*, *Plantago* *acanthophylla, Reseda* *virgata*, *Sagina merinoi, Sesamoides* *purpurascens, Silene* *legionensis*, *Thymus* *borgiae*, *Thymus* *izcoi*, *Thymus* *serpylloides.* |
| E1.9a Oceanic to subcontinental inland sand grassland on dry acid and neutral soils | This habitat comprises semi-natural, moderately open to closed, relatively low-grown meso-xeric grasslands on nutrient-poor, acid to neutral, sometimes slightly calcareous sands in the lowlands and middle high mountains throughout temperate Europe. These grasslands are mostly dominated by tussock-forming, narrow-leaved graminoids (hemicryptophytes) of the *Festuca ovina* aggregate (namely *F. brevipila*, *F. filiformis*, *F. guestfalica*, *F. heteropachys*, *F. lemanii, F. ovina*), often accompanied by *Agrostis capillaris*, *Poa angustifolia* or *Carex praecox*. In good conditions they are relatively rich in herbs, forming an important nectar source for insects.  Characteristic herbs of the habitat are *Armeria maritima* subsp*. elongata*, *Artemisia campestris*, *Dianthus deltoides*, *Campanula rotundifolia*, *Galium verum*, *Sedum acre*, *Silene otites*, *Potentilla argentea* agg., *Thymus serpyllum*, *Trifolium arvense*, *Veronica prostrata* and *Herniaria glabra*. Present in most sites of this habitat are *Achillea millefolium*, *Plantago lanceolata*, *Hieracium pilosella*, *Rumex acetosella*, *Hypochaeris radicata* and *Jasione montana*. More open examples of this habitat contain a high cover of mosses and/or lichens and are rich in annual vascular plants (therophytes). Several ‘steppe elements’ have a western or northern outpost in this habitat, thanks to the extreme micro-climate, with high temperatures during the day, dropping down quickly at night. Examples of such species (most of them characteristic of the class *Festuco-Brometea*) are *Euphorbia cyparissias*, *Helichrysum arenarium*, *Phleum phleoides* and *Veronica spicata*. On the Balkans the vicariant alliance *Armerio-Potentillion* is described, with *Armeria rumelica*, *Agrostis castellana*, *Jasione heldreichii*, *Plantago subulata* and *Potentilla inclinata*.  Especially, the more calcareous examples of the habitat contain several characteristic species of type E1.1g. On relative acid soils the habitat shows transitions towards grasslands of habitat ‘Lowland to submontane Nardus grassland’ (E1.7a, mainly alliance *Violion caninae*). More natural, pioneer stages of these grasslands, develop under relatively dynamic conditions along rivers, with active sand sedimentation. On inland sandy dunes the habitat forms a succession stage after the initial *Corynephorus*-grasslands (type E1.9b), as a result of humus accumulation. Some of the grasslands of this type are rather similar to Atlantic and Baltic coastal dune grasslands (type B1.4a), and such inland and coastal grasslands are united in the same alliances.  This habitat is found on high, rarely flooded levees in river valleys, on dry, sandy parts of plains and siliceous mountains, as well as on coastal sandy cliffs in the Baltics. Its main range covers France, the UK, the Netherlands, Northern Germany, South Scandinavia, Poland and the Baltic countries. It is less frequent in the southern half of Central Europe (in siliceous mountain ranges and on dune systems along the big rivers), becomes rarer to the South (Northern Iberia, Central France) and East (e.g. restricted to the valleys of the big rivers in Ukraine). Based on available data on vegetation and soils, there seems to be a second centre of distribution in the central parts of the Balkan Peninsula (Republic of Macedonia, Serbia, Bulgaria).  The habitat type corresponds to the phytosociological orders *Trifolio arvensis-Fetucetalia ovinae* and *Thero-Airetalia* (class *Koelerio-Corynephoretea*), excluding their occurrences on coastal grey dunes.It occurs from the submediterranean to the southern boreal zones of Europe, where ever there are dry, moderately developed sandy soils, be it from dunes or as weathering product of siliceous bedrock. The range of E1.9a extends to Northern Iberia, France and the British Isles in the West, while in Eastern Central and Eastern Europe it co-occurs with the habitat type ‘Pannonian and Pontic sandy steppe’ (E1.1a, grasslands of the order *Festuco-Sedetalia acris*). There, type E1.9a is found on better developed soils, where it may be found side by side to habitat E1.1a on more xeric, poorly developed soils.  The habitat type mainly consists of five, largely vicariant alliances of meso-xeric perennial grasslands, differentiated by the matrix-forming graminoids: In the Atlantic region (mainly in the lowlands) the *Sedo-Cerastion arvensis* with *Festuca filiformis* occurs, in the subcontinental lowlands (mainly the areas covered by the Nordic Ice shield during the glaciations) the *Armerion elongatae* with *Festuca brevipila* and *Armeria maritima* subsp. *elongata* is widespread, the *Hyperico perforati-Scleranthion perennis* with *Festuca ovina* and *F. guestfalica* is mainly distributed in siliceous low mountain ranges and in Scandinavia, the *Agrostion vinealis* with *Poa angustifolia* and *Agrostis vinealis* is typical for the big river valleys of East Europe (but probably not within EU28+) and the *Armerio rumelicae-Potentillion* with various *Agrostis* species*, Festuca valesiaca* and *Armeria rumelica* occurs on the Central and Northern Balkan Peninsula. There are two more alliances of perennial tussock grasslands that potentially or partly belong here. The *Koelerio-Phleion phleioidis*, described from the lower siliceous mountain ranges in the southern half of Central Europe is a transition between the *Hyperico perforati-Scleranthion perennis* and the *Armerion elongatae* on the one side and the *Festucion valesiacae* (belonging to the habitat type E1.2b) on the other side, and not accepted in the EuroVegChecklist. The *Armerion junceae* from Southern France has been preliminarily placed in the *Trifolio arvensis-Festucetalia ovinae* by the EuroVegChecklist, but this position is questionable. Lastly, there are the grasslands rich in winter-annuals (*Filago arvensis*, *F. minima*, *Vulpia* spp., *Aira* spp., *Trifolium* spp.) of the order *Thero-Airetalia* with the single alliance *Thero-Airion*, which occurs under similar site conditions in the Submediterranean-Atlantic parts of temperate Europe (Northern Iberia, France, British Isles), but can be found in small patches at disturbed sited within *Trifolio arvensis-Festucetalia ovinae* stands also further to the east.  Indicators of good quality:  Continuation of management is important, but under very dry conditions the structure and species composition may remain unchanged for rather long periods without management. Inadequate management (burning, no management) may cause dominance of a single graminoid species, and finally succession towards scrub and woodland.  Indicators of good quality include:  ·      Long continuation of management (grazing, hay making or a combination of both)  ·      Occurrence of regional rare species (steppic elements) having an outpost in their European distribution range  ·      High richness in herb species, no development of dense, species-poor grassland with thick litter accumulation  ·      No encroachment of mosses (*Rhytidiadelphus squarrosus*), grasses (*Calamagrostis epigejos, Arrhenatherum elatius*), shrubs (*Rubus caesius*) or trees  Characteristic species:  Flora  Vascular plants: *Achillea millefolium* agg., *Agrostis capillaris*, *Agrostis castellana*, *Agrostis vinealis*, *Aira caryophyllea*, *Aira elegantissima*, *Aira praecox*, *Allium schoenoprasum*, *Allium vineale*, *Anthoxanthum odoratum*, *Arenaria serpyllifolia*, *Armeria maritima* subsp*. elongata*, *Armeria rumelica*, *Artemisia campestris* subsp. *campestris, Bromus hordeaceus, Campanula rotundifolia*, *Carex arenaria, Carex ligerica*, *Carex pairae*, *Carex praecox, Cerastium arvense* subsp*. arvense, Cerastium glutinosum, Cerastium semidecandrum, Dianthus armeria, Dianthus deltoides*, *Dianthus carthusianorum*, *Erodium cicutarium*, *Erysimum diffusum*, *Euphorbia cyparissias*, *Festuca brevipila*, *Festuca filiformis*, *Festuca guestfalica*, *Festuca heteropachys*, *Festuca lemanii, Festuca ovina, Filago arvensis, Galium verum*, *Helichrysum arenarium*, *Herniaria glabra*, *Hieracium hoppeanum, Hieracium pilosella, Hypochoeris radicata, Jasione heldreichii, Jasione montana, Koeleria macrantha, Luzula campestris, Myosotis ramosissima, Myosotis stricta, Ononis reprens, Ornithopus perpusillus, Orobanche arenaria, Orobanche purpurea, Phleum phleoides, Pimpinella saxifraga* agg.*, Plantago lanceolata, Plantago subulata*, *Poa angustifolia,* *Potentilla argentea* agg., *Potentilla inclinata*, *Potentilla tabernaemontani*, *Rumex thyrsiflorus, Saxifraga granulata, Scleranthus perennis, Scleranthus polycarpos, Sedum acre*, *Sedum reflexum*, *Sedum sexangulare*, *Silene nutans*, *Silene otites*, *Taraxacum* sect. *Erythrosperma*, *Thymus pulegioides*, *Thymus serpyllum*, *Trifolium arvense*, *Trifolium campestre*, *Trifolium striatum*, *Veronica arvensis*, *Veronica prostrata, Veronica spicata, Vicia angustifolia, Vicia lathyroides, Viola tricolor, Vulpia bromoides, Vulpia myuros.*  Bryophytes: *Brachythecium albicans*, *Ceratodon purpureus, Dicranum scoparium, Hypnum cupressiforme* var*. lacunosum, Polytrichum juniperinum, Racomitrium canescens* agg.*, Syntrichia ruralis* agg.  Lichens: *Cladonia fimbriata*, *Cladonia furcata, Cladonia pyxidata, Cladonia scabriuscula, Peltigera canina, Peltigera didactyla, Peltigera rufescens.*  Fauna  Reptiles: *Lacerta agilis*  Insects: *Decticus verrucivorus* |
| E1.9b Inland sanddrift and dune with siliceous grassland | These are open grasslands on inland sand-drift areas, dunes and other sites with poorly developed sandy, acidic and nutrient-poor soils, characterized by a pattern of small tussocks of the grass *Corynephorus canescens* and/or patches of the stoloniferous graminoids *Agrostis vinealis* and *Carex arenaria* in a matrix of lichens, mosses and open sand. The habitat has its main distribution in the North Central European lowland of the Netherlands, Germany and Poland, and in this region the large open landscapes formed by the habitat are known as ‘Atlantic deserts’. The habitat is considered to be the result of overexploitation of woodlands and heathlands since the Middle Ages, and these sand drifts had their largest distribution in the middle of the 19th century.  The open sand is an extreme habitat, with high temperatures and extreme drought during summer, where only a few plants and animals can live. Some of the characteristic fauna here have their main distribution in the Southeast European steppes, for example the grasshopper *Oedipoda caerulescens* and the butterfly *Hipparchia semele* *semele*.  Soil development occurs very slowly, due to wind erosion and nutrient poverty. In the Netherlands and Germany the following succession stages have been distinguished: open sand, pioneer communities with *Polytrichum piliferum*, lichen-rich open grassland with *Corynephorus canescens*, lichen-rich open grassland with *Agrostis vinealis* and *Festuca* spp., and more closed grasslands with *Carex areanaria* and *Deschampsia flexuosa* with few lichens. Further development leads to heathland with *Calluna vulgaris*. This succession is exaggerated by nutrient input, for example from nitrogen deposition, which also favours the dominance of the non-native moss *Campylopus introflexus*. Characteristic lichens of the younger succession stages are *Stereocaulon condensatum* and small-cup lichens, like *Cladonia pulivinata*, *Cladonia cervicornis*, *Cladonia glauca*, *Cladonia strepsilis* and *Cladonia borealis*. The *Agrostis vinealis* stage is also indicated by *Cladonia portentosa*, *Cladonia zopfii* and *Cladonia uncialis*. Where wind erosion of sand occurs up to a deeper soil layer, moist depressions develop, in which typically *Juncus sqarrosus* is found.  The habitat occurs in mosaics with heathland, scrub and forest, and such mosaics are an especially suitable habitat for birds like *Lullula arborea* and *Anthus campestris*. Small patches of open *Corynephorus* vegetation occur as open spots in heathlands, but in such cases these patches should be considered as part of dry heathlands, providing some differentiation in structure and some additional species diversity and therefore adding to the quality of the heathland habitat.  Outside the North Central European plains, the habitat is found in lowlands of southern Central Europe, the Baltic states, Southern Sweden and Denmark, Western Ukraine and the region Aquitaine of Southwest France. It occurs rarely in the UK, Italy and the Iberian Peninsula.  Habitat type E1.9b represents the part of the phytosociological order *Corynephoretalia canescentis* with its only alliance *Corynephorion canescentis* that occurs on sites not located close to the sea coast. On coastal dunes, there are floristically and ecologically very similar to indistinguishable stands, which in the current typology are considered as part of the habitat type *B1.4a − Atlantic and Baltic coastal stable dune grasslands (grey dunes)*.  With decreasing sand mobility, the natural succession of the habitat type typically leads to meso-xeric sandy grasslands with closed swards (order *Trifolio arvensis-Festucetalia ovinae*; habitat type *E1.9a − Oceanic to sub-continental inland sand grassland on dry acid and neutral soils*). Under subcontinental to continental climates on base-rich soils, often sandy grasslands of the order *Sedo acris-Festucetalia* (habitat type E1.1a Pannonian and Pontic sandy steppe) are inserted in this sequence, while under the most oceanic climates and most acidic soils, *Deschampsia flexuosa* grasslands or *Calluna vulgaris* heaths of the class *Calluno-Ulicetea* might follow more or less immediately.  Indicators of good quality   * Maintenance of open sand, and open grassland in different stages of succession * Active processes of sand transport by wind * High diversity in lichens * Presence and maintenance of populations of characteristic fauna (birds, insects) * Part of a landscape mosaic with forest and heathland * No dominance of non-native species, such as *Campylopus introflexus* * Little or no regeneration of trees * Absence of high levels of nitrogen deposition   Characteristic species  Flora:  Vascular plants: *Agrostis capillaris, Agrostis vinealis, Carex arenaria, Corynephorus canescens, Filago minima, Hieracium pilosella, Hypochaeris radicata, Jasione montana, Ornithopus perpusillus, Rumex acetosella, Scleranthus perennis, Scleranthus polycarpos, Spergula morisonii, Teesdalia nudicaulis, Thymus serpyllum.*  Bryophytes: *Campylopus introflexus*, *Cephaloziella divaricata*, *Ceratodon purpureus*, *Pohlia nutans*, *Polytrichum piliferum*, *Racomitrium canescens* agg.  Lichens: *Cetraria aculeata*, *Cetraria islandica*, *Cetraria muricata*, *Cladonia portentosa*, *Cladonia borealis*, *Cladonia cervicornis*, *Cladonia cornuta*, *Cladonia crispata, Cladonia deformis, Cladonia floerkeana, Cladonia foliacea*, *Cladonia furcata*, *Cladonia glauca*, *Cladonia gracilis*, *Cladonia grayi*, *Cladonia macilenta*, *Cladonia mitis*, *Cladonia monomorpha, Cladonia phyllophora, Cladonia pleurota, Cladonia portentosa, Cladonia pulvinata, Cladonia strepsilis, Cladonia subulata, Cladonia uncialis*, *Cladonia verticillata*, *Cladonia zopfii*, *Placynthiella icmalea*, *Placynthiella oligotropha*, *Placynthiella uliginosa*, *Stereocaulon condensatum, Trapeliopsis granulosa.*  Fungi: *Tulostoma brumale*.  Fauna  Birds: *Anthus campestris*, *Lullula arborea*, *Caprimulgus europaeus*, *Oenanthe oenanthe*  Butterflies: *Hipparchia semele* s*emele, Hipparchia statilinus*  Grasshoppers: *Oedipoda caerulescens* |
| E1.A Mediterranean to Atlantic open, dry, acid and neutral grassland | Siliceous low sized grasslands of low density and biomass, formed by small ephemeral annuals presenting the typical eco-morphological traits syndrome of the pioneer initial stages of succession. Vascular plant species have a short life cycle of less than one year, usually starting in autumn/winter with the germination and seedlings establishment, followed by a fast growth in early spring and a flowering and a rapid seed production in late spring to early summer. After seed dispersal, the plants immediately die (*agostamiento* in Spanish) leaving their offspring in form of dormant seeds lying in the soil seed bank until autumn rainfalls trigger germination and the outbreak of a new generation. The biomass of the vegetative phases of this cycle strongly depends on the rainfall amount during early spring, reaching to have high biomass if abundant precipitations are received in the wet season and remaining practically invisible when drought becomes dominant in spring. In such cases seeds remain dormant in the seed bank until the next germinating period.  Soils are dry, with no gravitational surplus of water and no hydromorphy in their profile. Texture varies from coarse sandy to lime rich and inorganic nutrient content is generally low, with low values of pH. The disturbance regime endured by these grasslands does not include strong nitrification due to artificial fertilization nor soil tilling, keeping soils structured and with low content in nitrogen and phosphate compounds. This habitat almost always occupies small surfaces in mosaic with others, usually shrubby or herbaceous, vegetation types, in the clearings and open spaces between shrubs or other taller perennial herbs or grasses. In the Mediterranean region as well as in other Atlantic areas, the scrub or heathland landscape, resulted from human disturbance, entails such inextricable mosaic between patches of these annual grasslands and the scrub itself that it becomes extremely difficult to disentangle one from the other in the medium to large scale, making it difficult performing separate cartographies. These annual grasslands are considered being the initial stage of succession replacing mature vegetation of mainly *Quercus* forests in disturbed areas submitted to grazing and fire.  This habitat type is the silicicolous replicate of E1.3c being more widely represented in Temperate and Atlantic Europe as in these areas base poor substrata are more frequent due to the leaching effect on the soils favored by the more abundant summer rainfalls. In spite of its low biomass, this habitat type can reach a high species richness, particularly in Mediterranean countries. The total number of taxa bounded to this habitat type is more than one hundred, most of them with a Mediterranean optimal distribution, with few endemics of restricted area. This habitat, together with the homologous E1.3c of base-rich soils, incorporate the majority of the European annual vascular flora not bound to nitrophilic environments.  These grasslands can represent an appreciable resource for grazing flocks in spring period, when they are exploiting the scrub and heathland areas. They are not a highly valuable pasture in absolute terms, but they increase substantially the values of these scrub areas in spring, when sheep are breeding their lambs; for that reason, these grasslands contribute strategically to satisfy a temporary additional energetic and protein demand of the flocks and are much appreciated by the shepherds.  This habitat type occurs in most of the Temperate and Mediterranean countries of Europe but the highest frequency, quantity and diversity is found in the western Mediterranean area, particularly in the Iberian countries, where there are large areas with siliceous substrata with abundant scrub (matorral, garrigue or phrygana). It is also common in the siliceous territories of North Africa and Middle East.  Indicators of good quality:  ·       medium disturbance regime  ·       extensive grazing  ·       absence of nitrophilous species  ·       absence of signs of secondary succession (e.g. encroachment of chamaephytes or shrub species)  Characteristic species:  Vascular plants: *Aira caryophyllea* subsp. *caryophyllea, Aira caryophyllea* subsp. *multiculmis*, *Aira cupaniana, Aira elegantissima*, *Aira praecox, Aira tenorii*, *Airopsis tenella, Andryala integrifolia* var. *corymbosa, Anthoxanthum aristatum, Anthyllis lotoides, Apera interrupta, Aphanes cornucopioides*, *Aphanes microcarpa*, *Arabis nova* subsp. *iberica*, *Asterolinum linum-stellatum, Astragalus pelecinus, Briza maxima*, *Briza minor, Campanula lusitanica,* *Cerastium diffusum*, *Cerastium ramosissimum, Cerastium semidecandrum, Chamaemelum fuscatum, Coronilla dura, Corynephorus divaricatus*, *Crassula tillaea, Crucianella angustifolia, Ctenopsis delicatula*, *Erophila praecox, Eryngium tenue*, *Evax carpetana, Evax lasiocarpa*, *Evax pygmaea, Filago lutescens*, *Galium divaricatum, Gaudinia coarctata, Gnaphalium teydeum, Helianthemum aegyptiacum*, *Helianthemum sanguineum*, *Hispidella hispanica*, *Holcus annuus* subsp. *duriensis*, *Holcus gayanus*, *Hymenocarpos cornicina*, *Hymenocarpos lotoides*, *Hypochoeris glabra, Jasione echinata, Jasione montana* subsp. *gracilis*, *Jasione montana* subsp. *montana, Lathyrus angulatus*, *Lathyrus inconspicuus, Lathyrus sphaericus, Leontodon longirostris, Linaria elegans*, *Linaria intricata*, *Linaria pelisseriana, Linaria saxatilis* subsp. *saxatilis, Linaria saxatilis* var. *minor*, *Linaria spartea*, *Linum trigynum*, *Logfia gallica, Logfia minima, Lolium aristatum, Lotus conimbricensis*, *Micropyrum patens*, *Micropyrum tenellum, Moenchia erecta, Molineriella laevis, Molineriella minuta* subsp. *australis*, *Molineriella minuta* subsp. *minuta, Myosotis incrassata, Myosotis stricta*, *Onobrychis caput-galli*, *Ononis cintrana*, *Ononis varelae*, *Ornithopus compressus, Ornithopus perpusillus, Ornithopus pinnatus, Paronychia cymosa*, *Paronychia echinulata*, *Periballia involucrata*, *Plantago bellardii*, *Psilurus incurvus, Pterocephalus diandrus*, *Rostraria azorica, Rumex bucephalophorus* subsp. *bucephalophorus*, *Rumex bucephalophorus* subsp. *canariensis, Rumex bucephalophorus* subsp. *gallicus*, *Scleranthus delortii*, *Sedum andegavense, Sedum arenarium, Sedum caespitosum, Sedum pedicellatum, Sedum willkommianum, Senecio minutus*, *Silene mariana*, *Silene portensis*, *Silene psammitis, Silene scabriflora* subsp. *megacalycina, Silene scabriflora* subsp. *scabriflora*, *Spergula morisonii*, *Spergula pentandra, Teesdalia coronopifolia, Teesdalia nudicaulis*, *Tolpis barbata*, *Tolpis umbellata, Trifolium arvense, Trifolium bocconei, Trifolium campestre, Trifolium cherleri, Trifolium phleoides* subsp. *willkommii*, *Trifolium stellatum, Trifolium striatum, Trifolium strictum,* *Trifolium sylvaticum*, *Trisetum ovatum, Tuberaria guttata, Veronica dillenii*, *Viola parvula, Vulpia bromoides, Vulpia ciliata, Vulpia muralis*, *Vulpia myuros, Vulpia unilateralis.* |
| E1.B Heavy-metal grassland in Western and Central Europe | This habitat comprises dry, short grasslands on soils with a high natural or anthropogenic content of heavy metals such as zinc, lead, copper, nickel, cobalt, cadmium or chromium, occurring in western and central Europe. The characteristic plant taxa (mostly subspecies or ecotypes) are metallophytes, species that developed various mechanisms for tolerating these heavy metals in the soil. The vegetation often has an open cover of vascular plants and is rich in lichens and mosses. The typical grasslands of the order *Violetalia calaminaria* are dominated by metallophytes, but on non-optimal sites also grasslands of other types (belonging to the classes *Koelerio-Corynephoretea*, *Festuco-Brometea*, *Molinio-Arrhenatheretea*) may contain lower numbers of metallophytes, and these also are regarded as belonging to this Red List type.  Heavy metal grasslands of this habitat are found in Ireland, England and Scotland, Northeast-Belgium and adjacent Netherlands, Northern France, Germany, Poland, Austria and Slovenia. They occur on natural sites where bedrocks with zinc or lead lie close to or at the surface. Secondary habitats have been created by mining the metal ores, which has resulted in contaminated soils in the vicinity of mines, along transporting routes and in storage areas. Tertiary locations occur where heavy metals have contaminated the soil by air or water transport from other sources. In many places, grazing by wild herbivores such as rabbits helps maintain an open sward and prevents the disappearance of cryptogam-rich early stages in the development of the vegetation and the greater dominance of grasses and dicotyledons.  Exploitation of the heavy metals ores is recorded from Roman times, but has probably occurred since the Bronze Age. Exploitation increased strongly from the Middle Ages, with an optimum industrial exploitation in the 19th century. In that period, the Belgian area of La Calamine (Kelmis) and Plombières (Bleiberg) was the world centre of zinc mining. Ores were transported to this area from mines in the surrounding to be washed and processed and because of this industry large amounts of zinc have been loaded into the environment, especially into the river Geul (Geulle), resulting in tertiary sites of metallophytes in its floodplain grasslands. The maximum distribution of the habitat type probably occurred in the first half of the 20th century.  In habitat type E1.B only those heavy metal grasslands are included that have traditionally been placed in the order *Violetalia calaminariae*.  In several countries, inside and outside the range of this order, other habitats occur on metal-rich soils, like grasslands and scree vegetation on ultramafic soils (serpentine soils and other copper-rich soils). These habitats are not included here, but are considered under other grassland or scree types. According to this definition, the resulting Red List type E1.B is equivalent to the Annex 1 habitat type 6130.  Indicators of good quality:  In good conditions these grasslands are rich in and dominated by metallophytes. In heavily contaminated spots even 100 years after mining no plants may grow at all. In soils with low concentration of heavy metals and where grazing declines, succession slowly leads to overgrowing with taller grasses (for instance *Holcus lanatus*) or shrubs and trees. In such cases, sites may be managed by mowing, removing trees and shrubs or sod cutting. Eutrophication, manuring and addition of chalk reduces the availability of zinc to the plants, causing a decrease in metallophytes.  The following characteristics are indicators of good quality:  ·      High cover of metallophytes  ·      Areas with open soil and characteristic lichens  ·      Low vegetation structure  ·      Low cover of encroaching tall grasses, tall herbs and shrubs  Characteristic species:  Flora  Vascular plants: *Agrostis capillaris*, *Armeria maritima* subsp. *halleri* (including subsp. *bottendorfensis* and subsp. *hornburgensis*), *Cardaminopsis halleri*, *Cochlearia pyrenaica*, *Festuca ovina* subsp. *ophioliticola*, *Festuca rubra*, *Galium verum*, *Holcus mollis*, *Minuartia verna* var. *hercynica*, *Pimpinella saxifraga*, *Potentilla tabernaemontani*, *Rumex acetosella*, *Silene otites*, *Silene vulgaris* subsp. *humilis*, *Spergularia rubra*, *Thlaspi caerulescens* subsp. *calaminaria*, *Viola calaminaria, Viola guestphalica.*  Bryophytes: *Polytrichum piliferum, Riccia bischoffii.*  Lichens: *Cladonia pocillum, Diploschistes scruposus.*  Fauna  The heavy metal vegetation typically contains fauna species of dry, steppic grasslands, which are also (and in higher numbers) found in other dry grasslands and heathlands. |
| E1.F Azorean open dry, acid to neutral grassland | Non-grazed perennial grasslands of rocky outcrops and slopes dominated by strictly Azorean endemic grasses, hemicryptophytes and dwarf chamaephytic forbs. The majority of the non-woody vascular Azorean endemics are found in this habitat. The habitat can be divided in subtypes that are different in substrate, geomorphology and bioclimate, and thus in species composition, vegetation structure and dominance. It spans from the thermomediterranean (Santa Maria and SW of São Miguel Islands only) and thermotemperate to the supratemperate belts of the Azorean biogeographical Province. Two main subtypes can be distinguished:  Subtype #1. Open grasslands with scattered megaphorbs dominated or co-dominated by combinations of *Deschampsia foliosa, Festuca francoi* (=*F. jubata*)*, Holcus rigidus, Agrostis azorica, Leontodon rigens* and *Leontodon filii*. They grow in meso-supratemperate climate (i.e. in altitudes above 300 m.), in nutrient-poor, acid soils, either in steep earthy or rocky slopes subject to gravitational disturbance, slope deposits with peat formation or under the permanent influence of gusting winds. Pioneer versions can be found colonizing former biotopes, like blanket bogs that were removed by catastrophic mass movements. The subtype contacts with vegetation of Azorean *Juniperus* woodland (G3.9c) and Azorean heath (F4.3).  Subtype #2. Low-altitude (thermomediterranean and thermotemperate) open grasslands of cliffs and landslide scarps, either in rock outcrops or earthy platforms between rocks, dominated by combinations of *Agrostis congestiflora* subsp*. congestiflora, Festuca petraea, Holcus rigidus* and *Brachypodium gaditanum*. The main contacts are woody vegetation of *Picconia azorica* and/or *Pittosporum undulatum* (alliance *Myrico fayae-Pittosporion*, habitat G2.3) and Azorean heath (F4.3).  The enormous extent of zooanthropic swards of introduced grasses in the Azores, used for dairy production, is a severe threat to the endemic grasslands. Soil tilling followed by cattle grazing causes immediate destruction of the endemic habitat type and its permanent substitution by alien-dominated swards. Also, even if endemic grasslands are preserved well in sites far from artificial swards, alien flora tends to invade them by seed dispersal, leading to invasion of endemic grassland by alien grasses with similar ecological requirements and genetic contamination of Azorean endemics by taxonomically close relatives (i.e. aliens of the same genus). The main alien grasses of artificial swards are *Anthoxantum odoratum*, *Holcus lanatus*, *Dactylis glomerata* and *Agrostis castellana*. Some other frequent aliens are *Lotus pedunculatus, Rumex conglomeratuss, Crepis lampsanoides* and *Hypochaeris glabra*. Ecological integrity of Azorean endemic grasslands is beste maintained by exclusion of man-induced disturbances and keeping distance to zooanthropogenic swards.  Indicators of good quality:   * absence of alien plant species * no human disturbances   Characteristic species:  Flora, Vascular plants:  Common to both subtypes:  *Agrostis azorica* (dom.)*, Brachypodium gaditanum* (dom.)*, Carex guthnickiana, Carex vulcani, Centaurium scilloides, Holcus rigidus* (dom.), *Luzula purpureo-splendens, Lysimachia azorica, Scabiosa nitens and Tolpis azorica*.  Characteristic of subtype #1: *Deschampsia foliosa* (dom.), *Festuca francoi* (=*F. jubata* sensu auct. az. non Lowe) (dom.), *Leontodon rigens*, *Holcus rigidus* (dom.), *Leontodon filii*, *Agrostis botelhoi*, *Agrostis congestiflora* subsp. *oreophylla*, *Carex punctata*, *Euphrasia azorica*, *Euphrasia grandiflora*, *Myosotis azorica* and *Veronica dabneyi*.  Characteristic of subtype #2: *Agrostis congestiflora* subsp. *congestiflora* (dom.), *Agrostis gracililaxa*, *Carex hochstetterana*, *Daucus carota* subsp. *azoricus*, *Euphorbia azorica*, *Festuca petraea* (dom.) and *Tolpis succulenta*. |
| E2.1a Mesic permanent pasture of lowlands and mountains | These are mesotrophic pastures on deep, well-drained, mesic soils occurring very commonly throughout temperate Europe, though more restricted in mountains to warmer and more Continental regions. Such pastures are the basis of stock-rearing across much of Europe but the grazing regime varies greatly, from rather intensive to light, year-round or only in summer and may involve cattle, horses, sheep, goats or various combinations of these. Semi-wild herds of horses or cattle may also be used in extensively grazed areas and wild herbivores such as deer, rabbits and hares may be locally important.  Transitions to E2.2 Low and medium altitude hay-meadows can occur, especially where these have been subject to increased grazing in spring and late summer but, in contrast to mown grasslands on similar soils, these pastures contain numerous leaf rosette plants and a smaller contingent of slender, taller grasses and herbs. Flowering is less concentrated in late spring than for meadows, but spread through the growing season. In well-managed grasslands of this type, much of the herbage is palatable and nutritious.  These grasslands are typically characterized by the combination of *Cynosurus cristatus*, *Bellis perennis*, *Trifolium repens* and *Lolium perenne* in lowlands and montane areas, and *Poa alpina* and *Leontodon hispidus* in upper-montane to alpine areas with some associated vicariant species pairs in these respective ranges, like *Phleum pratense* vs. *Phleum rhaeticum*, *Trifolium repens* vs. *Trifolium thalii* and *Poa pratensis* vs. *Poa alpina*. Other regional sub-types are found in southern Europe where, because of the favourable climate, the grasslands can be both grazed and mown, with *Agrostis castellana*, *Carum verticillatum, Linum bienne, Orchis coriophora* and *Gaudinia fragilis* in the south-west and *Hordeum bulbosum, Trifolium incarnatum* ssp. *molinerii* and *Vulpia ligustica* in the central and southern Apennines.  There are also variations related to soil differences. On calcareous soils *Plantago media*, *Briza media, Sanguisorba minor* and *Galium verum* indicate transitions towards calcareous grasslands (Habitat E1.2a Semi-dry perennial calcareous grassland), while in acidic, nutrient poor conditions transitions towards species-poor calcifuge grasslands (Habitat E1.7a Lowland to submontane *Nardus* grassland) indicated by *Nardus stricta, Potentilla erecta*, *Danthonia decumbens* and *Hieracium pilosella*. In boreal regions *Galium boreale* is an additional species, in alpine areas *Gentiana bavarica*, *Gentiana nivalis*, *Nigritella nigra* and *Crocus* species are found in this habitat and on moist, severely trampled situations in high mountains, *Poa supina* may dominate.  Indicators of good quality   * Continuation of traditional grazing management * Diversity of species-rich examples in different regions * Presence of distinctive rare species * Presence of fungi indicative for “old grassland” * No increase of nutrients by fertilization addition or atmospheric nitrogen deposition * No overgrazing with spread of unpalatable weeds, like *Rumex* spp., *Cirsium* spp. *Senecio* spp. * No under-grazing with spread of palatable coarse grasses such as *Arrheneatherum elatius*   Characteristic species:  Vascular plants : *Achillea millefolium*, *Agrostis capillaris*, *Agrostis castellana*, *Alchemilla vulgaris, Alchemilla xanthochlora, Anthoxanthum odoratum, Bellis perennis, Carum verticillatum, Cerastium fontanum, Chamaemelum nobile, Crepis aurea, Crepis capillaris, Cynosurus cristatus, Deschampsia caespitosa, Elymus repens, Euphrasia rostkoviana, Festuca pratensis, Festuca rubra, Gaudinia fragilis, Holcus lanatus, Hordeum bulbosum, Hordeum secalinum, Lathyrus pratensis, Leucanthemum vulgare, Leontodon autumnalis, Leontodon hispidus, Leontodon saxatilis, Linum bienne, Lolium perenne, Lotus corniculatus, Nardus stricta, Orchis coriophora,* *Phleum alpinum, Phleum pratense*, *Phleum rhaeticum*, *Plantago alpina, Plantago lanceolata, Plantago major, Poa alpina, Poa pratensis, Poa trivialis, Prunella vulgaris, Ranunculus bulbosus, Ranunculus repens, Rhinanthus minor, Taraxacum* sect. *officinale, Trifolium badium, Trifolium campestre, Trifolium dubium, Trifolium incarnatum ssp. molinierii, Trifolium micranthum, Trifolium pratense, Trifolium repens, Trifolium striatum, Trifolium thalii, Veronica serpyllifolia, Vulpia ligustica.*  Fungi: Especially in situations where grassland management has been long uninterrupted (so-called ‘old grasslands’), many rare waxcap and other basidiomycete fungi can be found. |
| E2.2 Low and medium altitude hay meadow | This habitat includes grasslands mown for hay occurring on deep, well-drained, mesic soils throughout much of Europe, especially in the nemoral and boreo-nemoral zones where they are found from low to medium altitudes. In southern Europe they are confined to precipitation-rich areas at higher altitudes, occurring in the mountains of the northern half of the Iberian Peninsula, the Apennines and the supra-Mediterranean zone of the Balkan Peninsula. These meadows are typically fertilized by dung, only lightly by chemical fertilisers, and mown once or twice a year for hay, rather than silage, with light spring and/or aftermath grazing in some places.  They are dominated by productive grasses such as *Arrhenatherum elatius, Briza media, Dactylis glomerata, Festuca pratensis, F. rubra, Poa pratensis* and *Trisetum flavescens,* dicotyledonous herbs, particular rosette plants with taller flowering stems, including *Crepis biennis, Heracleum sphondylium, Knautia arvensis* agg.*, Leucanthemum vulgare* agg., *Pimpinella major, Plantago lanceolata* and *Rumex acetosa,* and clonal geophytes such as *Geranium pratense* and *Sanguisorba officinalis*. Species-richness can be high, especially in types where low-input management has been consistent over long periods of time. Such grasslands also better reflect regional differences in climate and local variations in soil, whether to more base-rich or acidic substrates, or to moister or drought-prone situations.   Transitions to E2.1a Mesic permanent pastures are widespread in the lowlands, especially where there is a shift from mowing to more consistent grazing which favours a lower structure, the elimination of more palatable grasses and the prevention of flowering among taller rosette hemicryptophytes.  Although the meadows of this type are still widespread through the nemoral and boreo-nemoral zones, they have been declining for many decades either because of such conversion to intensively grazed pastures or through heavy fertilizing and reseeding for crops of silage which can be cut three or more times a year.  In landscapes dominated by intensive agriculture, this habitat often survives best on road verges that are cut annually for amenity reasons but, where coarse perennials or weeds invade such situations, the vegetation does not belong to this habitat. Abandonment and subsequent encroachment of shrubs and trees is also widespread.  Indicators of good quality:   * Continuation of traditional management with one or two hay cuts per year * Light or no spring and/or aftermath grazing * High species richness * Absence of patches dominated by nutrient-demanding, tall-growing competitive dicotyldeonous herbs * Absence of alien plant species * No encroachment of trees and shrubs * Absence of heavy grazing * No increase of fertility with addition of chemical fertilisers   Characteristic species:  Flora: Vascular plants : *Achillea millefolium* agg., *Agrostis capillaris, Anthoxanthum odoratum, Arrhenatherum elatius, Avenula pubescens, Briza media, Campanula patula, Centaurea jacea, C. nigra, Cerastium holosteoides, Crepis biennis, Cynosurus cristatus, Dactylis glomerata, Daucus carota, Festuca pratensis, F. rubra, Galium album, Geranium pratense, Holcus lanatus, Knautia arvensis* agg., *Lathyrus pratensis, Leontodon autumnalia. L. hispidus, Leucanthemum vulgare* agg., *Lolium perenne*, *Lotus corniculatus, Luzula campestris* agg., *Pimpinella major, Plantago lanceolata, Poa pratensis, P. trivialis, Prunella vulgaris, Ranunculus acris, R. bulbosus, Rumex acetosa, Salvia pratensis, Trifolium dubium, T. pratense, T. repens, Taraxacum* sect. *Taraxacum, Trisetum flavescens, Veronica chamaedrys, Vicia cracca.*  Mosses: *Brachythecium rutabulum, Plagiomnium affine* agg., *Rhytidiadelphus squarrosus* |
| E2.3 Mountain hay meadow | This habitat is characteristic of deep, well-drained, mesic soils through the sub-montane and montane zones of northern and central Europe, being favoured by an oceanic rather than continental climate and, at southern latitudes, more limited to high mountains.  It is especially well developed in the Alps and Carpathians but extends also into Scandinavia and the United Kingdom and the Pyrenees and Balkan Peninsula.  A shorter and/or cooler growing season at higher altitudes results in less productive growth than in lowland meadows on similar soils and often only one hay crop a year.  Spring and aftermath grazing occurs in some regions.  These meadows have traditionally been fertilized by dung and so tend to be more frequent near settlements, farms and mountain huts  where grazing stock were available and carting easier. Typically, chemical fertilisers are not used.  These meadows share many species of medium-tall grasses and herbs with mown grasslands of lower altitudes but the distinctive character is provided by such plants as *Trisetum flavescens, Polygonum bistorta, Geranium sylvaticum, Cirsium helenioides, Trollius europaeus,*  *Alchemilla vulgaris* agg.  Some of these plants occur both in these meadows and in the more open woodlands of the montane belt from which they were probably originally derived.  Distinctive sub-types of mountain hay meadows reflect regional contrasts in climate from the more oceanic north and west of Europe (with *Lathyrus linifolius, Poa chaixii, Anemone nemorosa, Crepis mollis*), the sub-Continental central European mountains (*Meum athamanticum, Galium hercynicum, Arnica montana*), the Jura and Alps (*Rumex alpestris, Pleum alpinum, Poa alpina, Campanula scheuchzeri, Myosotis alpestris, Rhinanthus alectorolophus*)and the Tatra and west Carpathians (*Alchemilla walasii, A. crinita, Cardaminopsis halleri*).  Indicators of good quality:   * High species-richness * Occurrence of regionally distinctive rare plants * Continuation of traditional management with one or two hay cuts per year, optionally with light aftermath grazing * Absence of heavy grazing * No encroachment of trees and shrubs * Absence of patches dominated by nutrient-demanding, tall-growing competitive herbs and grasses * Absence of alien plant species   Characteristic species:  Vascular plants:  *Agrostis capillaris, Alchemilla vulgaris* agg., *Anthoxanthum odoratum, Astrantia major, Bistorta major, Briza media, Campanula patula, Cardaminopsis halleri, Centaurea phrygia agg., Cirsium helenioides, Crepis mollis, Dactylis glomerata, Festuca rubra agg., Geranium sylvaticum, Hypericum maculatum, Lathyrus pratensis, Meum athamanticum, Narcissus poeticus, Phleum rhaeticum, Phyteuma spicatum, Pimpinella major, Poa chaixii, Polygonum bistorta, Primula elatior, Rumex acetosa, Trifolium pratense, Trisetum flavescens, Trollius europaeus, Phleum rhaeticum.*  *Mosses: Plagiomnium affine* agg., *Rhytidiadelphus squarrosus* |
| E2.4 Iberian summer pasture (vallicar) | This habitat comprises dense medium to tall grasslands growing in the lowlands and at moderate elevations up to 1500m on siliceous rocks with sandy to clayey oligotrophic soils in the Mediterranean and sub-mediterranean western Iberian Peninsula. The drainage conditions are good to poor and there can be temporary flooding with rapid desiccation afterwards. This is largely a semi-natural habitat type, linked to traditional cattle husbandry management.  The grasslands are dense and dominated by tall perennial grasses (*vallicos*) and annual species such as clovers, which have been traditionally grazed and sometimes mown. Waterlogging in the soil causes dominance of *Agrostis pourretii* and *Agrostis castellana* (alliance *Agrostion castellanae*), while free drainage favours dominance of *Festuca elegans* subsp*. elegans, Festuca elegans* subsp*. merinoi* (alliance *Festucion merinoi*) or *Stipa gigantea* (alliance *Agrostio-Stipion giganteae*),depending on the region and environmental conditions.  Indicators of quality:   * Dominance of grasses in a dense, carpet-like sward * High plant species diversity * Few or no open spots due to overgrazing or the use of machinery * Absence of shrubs, particularly brooms, indicating initial stages of succession towards shrubland * Absence of nitrophilous plants indicating overgrazing and over-fertilizing   Characteristic species:  Vascular plants: *Agrostis castellana, Agrostis pourretii (Agrostis salmantica), Anthoxanthum aristatum, Anthoxanthum ovatum, Carex chaetophylla, Dactylis hispanica* subsp*. lusitanica, Gaudinia fragilis, Festuca ampla, Festuca elegans* subsp*. elegans, Festuca elegans* subsp*. merinoi, Festuca summilusitana* subsp*. graniticola, Holcus setiglumis, Malva tournefortiana, Molineriella minuta, Periballia involucrata, Phalacrocarpon oppositifolium, Phalacrocarpon hoffmanssegii, Rumex angiocarpus, Sedum forsterianum, Stipa gigantea, Vulpia ciliata, Vulpia myuros, Vulpia bromoides,* and often with *Juncus capitatus* andclovers such as *Trifolium campestre, Trifolium cernuum, Trifolium retusum* |
| E3.1a Mediterranean tall humid inland grassland | Mediterranean humid herb communities dominated by rushes (*Scirpus holoschoenus*) and tall grasses, common in depressions with wet soils, on both siliceous and calcareous terrain. The water table remains permanently near to the surface but is subject to strong seasonal fluctuations, experiencing a lower level during summer and a higher in the rainy season, although the habitat is never or very rarely flooded. It is more frequent in areas under a predominantly stock-rearing system, being thus more abundant in siliceous regions. It is widespread in the entire Mediterranean basin, extending as far as the coasts of the Black Sea and the Balkans, north to Romania. This habitat has been traditionally grazed in the areas where summer pastures dry out and cattle and sheep have to graze humid pastures in the dry season. However, it is not dependent on grazing and its sustainability can be assured without this intervention.  Indicators of good quality:   * Domination by a complete and dense cover of reeds (*Scirpus holoschoenus*) and grasses * High plant species diversity * Absence of shrubs, particularly willows, ashes or poplars, indicating initial stages of succession towards forest * No signs of heavy grazing.   Characteristic species:  Vascular plants: *Agrostis stolonifera, Agrostis reuteri, Alopecurus arundinaceus* subsp*. castellanus, Blackstonia perfoliata, Carex mairii, Centaurea jacea* subsp*. vinyalsii, Cirsium monspessulanum, Cirsium pyreanicum* subsp*. micranthum, Cirsium pyrenaicum* subsp*. pyrenaicum, Cochlearia glastifolia, Cochlearia megalosperma, Cyperus eragrostis, Dorycnium rectum, Erica erigena, Euphorbia hirsuta, Festuca arundinacea* subsp*. mediterranea, Festuca fenas, Galium debile, Genista tinctoria, Hypericum caprifolium, Hypericum hircinum* subsp*. cambessedesii, Hypericum pubescens, Hypericum tetrapterum, Hypericum tomentosum, Juncus striatus, Linum tenue, Lysimachia ephemerum, Melilotus indicus, Molinia caerulea* subsp*. arundinacea, Oenanthe lachenalii, Oenanthe pimpinelloides, Peucedanum hispanicum, Phalaris aquatica, Prunella vulgaris, Pulicaria dysenterica* var*. ramossisima, Ranunculus bulbosus* subsp*. aleae, Ranunculus granatensis, Ranunculus macrophyllus, Senecio doria, Sonchus aquatilis, Schoenus nigricans, Scirpus holoschoenus (Holoschoenus vulgaris),Scrophularia balbisii* subsp*. valentina, Serapias vomeracea, Sonchus maritimus* subsp*. aquatilis, Succisella andreae-molinae, Tetragonolobus maritimus* var*. hirsutus, Thalictrum flavum, Thalictrum minus* subsp*. matritense, Thalictrum speciosissimum.* |
| E3.2a Mediterranean short moist grassland of lowlands | These humid meadows occur in the Mediterranean region on clayey soils, often vertisols which experience a strong oscillatory regime in the water table level, with sharp seasonal dry-wet cycles. Winter flood is followed by summer drought and the swelling clay expands and contracts until it splits apart in narrow cracks, the typical appearance in summer. Historically, they have been intensively grazed.  The habitat can be considered a western vicariant of habitat E3.3 Submediterranean moist grassland.  Indicators of good quality:   * A medium to short grassy sward with associated herbs irregularly scattered, sometimes forming an open cover over the cracked soil surface * High species richness with even distribution and abundance * Absence of species related to intense grazing * No visible anthropogenic disturbances due to intensive trampling   Characteristic species:  Vascular plants: *Achillea ageratum, Agrostis stolonifera var. gaditana, Festuca asperifolia, Centaurea jacea subsp. approximata, Cirsium rosulatum, Deschampsia cespitosa subsp. subtriflora, Deschampsia media, Festuca arundinacea subsp. atlantigena, Gaudiniafragilios var. verticicola, Gentianella hispanica, Hordeum bulbosum , Jasonia tuberosa, Leucanthemum aligulatum, Phalaris coerulescens, Plantago serpentina, Prunella hyssopifolia, Sanguisorba lateriflora, Senecio carpetanus, Seseli elatum, Trifolium lappaceum* |
| E3.2b Mediterranean short moist grassland of mountains | High mountain evergreen pastures of the western Mediterranean dominated by tussocky grasses such as *Nardus stricta* and *Festuca microphylla* (= *Festuca nigrescens* subsp. *microphylla*), located in moist places such as depressions experiencing long-lasting snow cover and even a certain water stagnation. The vegetation cover is near to closed with the grasses forming a continuous sward.  As they remain green and productive during summer, those meadows constitute an important resource for the transhumant flocks of sheep and cows which spend the summer at high altitudes.  In the Sierra Nevada these grasslands are called *borreguiles*, derived from *borrego*, sheep, while in the rest of the areas receive the name of *cervunales*. This name is derived from the *pasto cervuno* or *cebruno*, the Spanish name of *Nardus stricta*, as it was the main grass which was the pasture of an extint Iberian endemic equidae, called Zebro (*Equus hydruntinus*).  The grasslands occur in the central and southern Iberian siliceous mountains of the Cordillera Central, Sierra Nevada and northern Iberian System, extending to the neighboring North African mountains of the Rif and Atlas.  They also occur in the high mountains of Corsica on slightly drier sites than the D2.2b Relict mires of Medi-terranean mountains dominated by *Carex intricata*.  Indicators of good quality:   * Closed carpet-like sward without open soil patches due to intensive grazing or trampling * Dominance of grasses, such as *Nardus* or *Festuca*, combined with an even representation of the other herbaceous species * Absence of nitrophilous species indicative of very heavy grazing pressure   Characteristic species:  Vascular plants in the Iberian Peninsula:  *Nardus stricta*, *Agrostis nevadensis*, *Allium schoenoprasum* subsp*. gredense*, *Allium schoenoprasum* subsp*. latiorifolium*, *Armeria splendens*, *Campanula herminii*, *Carex furva*, *Cirsium gregarium*, *Dactylis juncinella, Deschampsia refracta* subsp*. gredensis*, *Dianthus langeanus* subsp*. gredensis*, *Dianthus lusitanus* subsp*. legionensis*, *Erodium carvifolium*, *Festuca henriquesii*, *Festuca iberica*, *Festuca microphylla*, *Festuca rothmaleri*, *Galium saxatile,* *Gentiana boryi*, *Gentiana pneumonanthe* subsp*. depressa*, *Gentiana verna* subsp*. sierrae*, *Hieracium pilosela* subsp*. tricholepium*, *Jasione laevis* subsp*. carpetana*, *Jasione laevis* subsp*. gredensis*, *Juncus squarrosus,* *Leontodon carpetanus* subsp*. carpetanus*, *Leontodon carpetanus* subsp*. nevadensis*, *Lotus glacialis*, *Lotus glareosus, Luzula campestris* subsp*. carpetana*, *Luzula hispanica* subsp. *nevadensis*, *Meum athamanticum* subsp*. nevadense*, *Narcissus bulbocodium* subsp*. graellsii*, *Narcissus bulbocodium* subsp*. nivalis*, *Phleum abbreviatum*, *Plantago alpina* subsp*. penyalarensis*, *Plantago nivalis*, *Plantago radicata* subsp*. granatensis*, *Poa alpina* subsp*. legionensis*, *Potentilla erecta, Potentilla nevadensis* subsp*. condensata*, *Potentilla recta* subsp. *asturica*, *Potentilla reuteri, Ranunculus abnormis*, *Ranunculus acetosellifolius*, *Ranunculus bulbosus* subsp*. castellanus, Ranunculus cacuminalis*, *Ranunculus demissus* var*. hispanicus, Sagina nevadensis*, *Sedum melanantherum*, *Trifolium nevadense.*  Vascular plants in Corsica:  *Anthoxanthum odoratum*, *Bellium bellidioides*, *Botrychium matricariifolium*, *Botrychium simplex*, *Carex caryophyllea, Carex flava* subsp*. nevadensis*, *Carex nigra ssp. intricata*, *Carex ovalis*, *Carex pallescens*, *Colchicum alpinum* subsp. *parvulum*, *Cynosurus cristatus*, *Danthonia decumbens*, *Luzula spicata* subsp. *italica*, *Potentilla anglica* subsp. *nesogenes*, *Ophioglossum azoricum*, *Ophioglossum vulgatum*, *Plantago subulata* var. *insularis* (=*Plantago sarda* var. *alpinoides*), *Polygala serpyllifolia*, *Sagina pilifera*, *Potentilla* *anglica* subsp. *nesogenes*, *Potentilla erecta*, *Poa supina*, *Veronica serpyllifolia* subsp. *repens* |
| E3.3 Submediterranean moist meadow | This habitat type comprises hay meadows that cover riverside terraces and gentle slopes. It represents typical lowland communities, that sometimes appear at higher altitude, up to 1 000 m. The ground is generally flat, only rarely the inclination is more pronounced. The site conditions are humid to rather wet, due to relatively high amounts of rainfall and the fact that groundwater level is close to the surface. Often the sites are inundated during winter and spring. In July and August, the ground conditions may become rather dry. These wet meadows have a pronounced phenology. In early spring, yellow flowering *Ranunculus* species may prevail, while later on various *Trifolium* species as well as *Alopecurus rendlei* (*Alopecurus utriculatus*) appear. Hay making takes place mainly in May and June. Sometimes, grazing is practiced, that may change the species composition.  The climate is submediterranean and the habitat type can be found in the coastal region of the Adriatic Sea, in the central part of the Italian Peninsula, the southern edge of the Pannonian Basin and in the southern part of the Balkan Peninsula. The climax vegetation of the areas where the habitat occurs belongs to the class *Quercetea pubescentis*. The soil mainly consists of – rather sandy – clay, locally mixed with river deposits. Quite often the sites are moderately salted, which also effects the species composition. Nevertheless, the alliances that can be assigned to this habitat type do not vary that much that a division in subtypes is needed. The *Trifolion resupinati*, for instance, has its main occurence in the central Balkans with its centre of distribution in Macedonia, whereas the *Trifolion pallidi* is found on floodplains that are less dry in summer, having its center of distribution in eastern Croatia and western Serbia. The  *Molinio-Hordeion secalini*, of which the distribution stretches from Slovenia through Croatia to Bosnia and Herzegovina,  is also rather humid. The *Trifolio-Ranunculion pedati* is sub-halophytic and restricted to the Pannonion plain; the *Ranunculion velutini* is bound to central Italy.  These grasslands are in good condition, when they appear on primary sites and are maintained through traditional management. In case the meadows are drained or watered artificially, the species composition would change dramatically. Since these sites are fertile, the surfaces can be ploughed out and converted to fields. On the other hand their surfaces will overgrow with shrubs and tall grasses in case of abandonment of traditional management. Regular mowing prevents the beginning of secondary succession towards forests. One of the threats is also use of fertilizers and sawing of seeds. One additional threat is the use of fertilizers and the sawing of seeds. Another  treat is intensive grazing, that also changes species composition.  Indicators of good quality are:   * Species richness of the herb layer * Absence of invasive, tall herb and shrub species * Regular mowing * Absence of intensive grazing   Characteristic species:  Vascular plants: *Achillea millefolium, Agrostis stolonifera, Alopecurus pratensis, Alopecurus rendlei, Anthoxanthum odoratum, Bromus racemosus, Carex distans, Carex hirta, Carex otrubae, Carex tomentosa, Carex vulpina, Centaurea jacea, Centaurea pannonica, Cichorium intybus, Cirsium canum, Clematis integrifolia, Convolvulus arvensis, Crepis setosa, Cynosurus cristatus, Daucus carota, Deschampsia cespitosa, Deschampsia media, Edraianthus dalmaticus, Elymus repens, Festuca pratensis, Galium debile, Galium verum, Gaudinia fragilis, Gratiola officinalis, Holcus lanatus, Hordeum murinum, Hordeum secalinum, Lathyrus nissolia, Lathyrus pannonicus, Lathyrus pratensis, Leucanthemum vulgare, Leucojum aestivum, Lolium perenne, Lotus corniculatus, Lychnis flos-cuculi, Lysimachia nummularia, Lythrum salicaria, Medicago arabica, Medicago hispida, Moenchia mantica, Molinia caerulea, Narcissus poeticus, Oenanthe silaifolia, Oenanthe stenoloba, Ophioglossum vulgatum, Orchis laxiflora, Peucedanum coriaceum, Plantago lanceolata, Poa pratensis, Poa trivialis, Poa trivialis ssp.sylvicola, Podospermum canum, Potentilla reptans, Prunella vulgaris, Ranunculus acris, Ranunculus marginatus Ranunculus polyanthemos, Ranunculus repens, Ranunculus sardous, Ranunculus stevenii (acris), Ranunculus velutinus, Rhinanthus minor, Rorippa sylvestris, Rumex acetosa, Rumex crispus, Scilla litardierei, Scutellaria hastifolia, Serratula tinctoria, Symphytum officinale, Taraxacum officinale agg., Moenchia mantica Tragopogon orientalis, Tragopogon pratensis, Trifolium balansae, Trifolium cinctum, Trifolium dubium, Trifolium fragiferum, Trifolium patens, Trifolium pallidum, Trifolium pratense, Trifolium repens, Trifolium resupinatum.* |
| E3.4a Moist or wet mesotrophic to eutrophic hay meadow | The habitat comprises various wet to moist grasslands that are influenced by a high water table level and in some cases can be temporarily flooded. This group contains nutrient rich hay meadows, which sometimes are (moderately) grazed at the end of the summer period or in autumn after hay making. When the human impact is reduced or stopped, the habitat will be invaded by tall forb species (*Filipendulion, Galio-Urticetea*) and consequently by shrub and tree species *(Salicion cinereae, Alno-Fraxinetalia*). On the other hand, an intensive grazing regime will convert these meadows into pastures (*Cynosurion cristati, Potentillo-Poygonetalia*). Time and duration of flooding and/or the impact of groundwater are important factors in determining the floristic composition, as they influence the physiological (e.g. roots become in anaerobic condition) and ecological conditions (e.g. availability of nutrients). The main soil types are palanosol and gleysol (also amphigley). These mesotrophic  to eutrophic hay meadows can be found widespread over Europe. In temperate zones, they may occur in fresh and relatively nutrient-rich flooded plains along rivers and on wet mesotrophic mineral to peaty soils in brook valleys and comparable landscapes. In other parts of Europe (subcontinental, submediterranean), such wet meadows are found on alluvial plains that are relatively dry during parts of the year.  These habitats should be mown regularly to prevent afforestation process. This process can be started with various high forb communities (mainly from the alliance *Filipendulion*). The other threat for these grasslands is increased drainage of the habitat that causes turnover of species and formation of low and medium altitude hay meadows. In case of increased humidity, there appear sedges and reed (*Phragmiti-Magnocaricetea*). Communities from the alliance *Oenanthion fistulosae* indicate the transition between those two classes: *Molinio-Arrhenatheretea* and *Phragmiti-Magnocaricetea*. A further threats is (over)grazing that could convert those meadows into pastures.  The following characteristics can be considered as Indicators of good quality:   * High richness in herb species; * Occurrence of regionally distinct species; * Long-term habitat stability; * Extensive management regime aimed at long-term continuation of yearly mowing; * No encroachment of trees en shrubs.   Characteristic species:  Vascular plants: *Alchemilla* subsp., *Alisma plantago-aquatica, Allium angulosum, Alopecurus bulbosus, Alopecurus pratensis, Bromus racemosus, Caltha palustris, Carex divisa, Centaurea carniolica, Cirsium helenioides, Cirsium oleraceum, Cirsium rivulare, Clematis integrifolia, Crepis paludosa, Dactylorhiza majalis, Eleocharis palustris, Equisetum palustre, Filipendula ulmaria, Fritillaria meleagris. Galium debile, Galium palustre, Geum coccineum, Geum rivale, Gratiola officinalis, Hypericum tetrapterum, Leucojum aestivum, Lotus uliginosus, Lychnis flos-cuculi, Lysimachia vulgaris, Myosotis nemorosa, Myosotis scorpioides, Oenanthe fistulosa* subsp. *fistulosa, Oenanthe silaifolia, Plantago altissima, Polygonum bistorta, Pseudolysimachion longifolium, Ranunculus ophioglossifolius, Ranunculus sardous, Rhinanthus angustifolius, Sanguisorba officinalis, Scirpus sylvaticus, Senecio aquaticus, Silaum silaus, Stachys palustris, Thalictrum flavum, Trifolium michelianum, Trollius europaeus, Valeriana officinalis, Viola elatior*. |
| E3.4b Moist or wet mesotrophic to eutrophic pasture | Pastures or trampled grasslands on mesotrophic to eutrophic, wet to moist sites in the temperate regions of Europe. Naturally such grasslands occur in floodplains and on shores of lowland lakes, in poorly drained places that are grazed by wild animals or cattle. More anthropogenic they are found along banks of ditches, and in wet grasslands in sites where cattle gathers or that are inundated a long time of the year. The soil may vary from clayey, sandy to peaty and sometimes is brackish. The sites are inundated during winter and spring, but fall dry in summer. The habitat is most common in riverine areas, and may occupy large areas under natural flooding regimes. Embanking of floodplains and regulating of water courses may result in a loss of area of the habitat. On the other hand, intensive grazing of grasslands may result in the species composition of this habitat on the lower and most trampled sites. The species combination consists of plants that endure long periods of inundation (and trampling) very well, like *Potentilla anserina*, *Trifolium fragiferum*, *Trifolium repens*, *Plantago major*, *Agrostis stolonifera*, *Mentha pulegioides*. They develop and flower in the dry periods. Some of them are able to quickly occupy empty sites by stolones or rhizomes. Other plants in the communities are especially resistant to grazing by being unpalatable, like *Juncus inflexus* and *Rumex crispus*. Most species of the habitat are common and widespread, but a few rare and more restricted species are characteristic, amongst which *Apium repens*, *Blysmus compressus*, *Alopecurus bulbosus*, *Carex vulpina* and *Teucrium scordium*. The habitat has some species in common with pioneer communities of river shores (type C3.5a), with which type transitions and mosaics occur, but in general type E3.4b is a more closed community, really a grassland type. On the higher site it may form mosaics with Cynosurion-pastures (habitat E2.1a) or moist or wet hay meadows (habitat E3.4a). Some other species are in common with tall-herb communities on moist sites, like *Mentha longifolia*. The habitat occurs widespread throughout the temperate European lowlands. In most of the Mediterranean region it is replaced by communities of habitat E3.2a Mediterranean short moist grassland of lowlands. In the continental parts of Europe the habitat is rare, and restricted to sites with long-term high water levels. Similar communities occur on the brackish, higher parts of Atlantic and Baltic saltmarshes, but in that case they are included under habitat A2.5b or A2.5c. Also inland salt pan communities of the Lolio-Potentillion are excluded, as they are considered under type E6.2 or E6.3.  Indicators of good quality:  • Natural flooding regime  • Long term inundation during winter and spring  • Maintenance of grazing pressure  • Absence of non-native plant species  Characteristic species:  Flora: Vascular plants: *Agrostis stolonifera*, *Alopecurus bulbosus*, *Alopecurus geniculatus*, *Blysmus compressus*, *Cardamine parviflora*, *Carex otrubae* (= *C*. *cuprina*), *Carex vulpina*, *Carex hirta*, *Eleocharis uniglumis*, *Festuca arundinacea*, *Gratiola officinalis*, *Glyceria fluitans*, *Inula brittanica*, *Juncus articulatus*, *Juncus compressus*, *Juncus effusus*, *Juncus inflexus*, *Lolium perenne*, *Mentha longifolia*, *Mentha pulegium*, *Mentha suaveolens*, *Oenanthe fistulosa*, *Plantago major* ssp. *intermedia*, *Poa trivialis*, *Potentilla anserina*, *Potentilla reptans*, *Pulicaria dysenterica*, *Pulicaria vulgaris*, *Ranunculus repens*, *Ranunculus sardous*, *Rorippa* (*Nasturtium*) *microphylla*, *Rorippa sylvestris*, *Rumex conglomeratus*, *Rumex crispus*, *Teucrium scordium*, *Trifolium fragiferum*, *Trifolium repens*, *Triglochin palustris*. |
| E3.5 Temperate and boreal moist or wet oligotrophic grassland | This habitat comprises meadows on nutrient-poor soils (both in nitrogen and phosphorus) that are wet during a large part of the year, but superficially may dry out in summer. This especially refers to the more continental regions of its distribution range. In spring, the sites are not flooded, which distinguishes these meadows from floodplain meadows belonging to habitat E3.4 (Moist or wet mesotrophic to eutrophic hay meadows). Due to their relatively low productivity, these grasslands are mown only ones a year, usually late in the season (July, August). The grasses *Molinia caerulea* and *Molinia arundinacea* quite often dominate these rather species-rich communities. Both *Molinia* species may form tussocks, up to 50 cm tall, but – especially in the more Atlantic regions – *Molinia* (*caerulea*) is sometimes less conspicuous and integrates more with other plant species in the stands. Companions are low-productive species of intermittently wet soils that generally also can be found in open forests. Some of the rather striking tall herbs may provide the vegetation a splendid sight in mid-summer. In the western part of its distribution range, the more peaty appearance of the communities goes along with the frequent occurence of sedges (like *Carex nigra* and *Carex panicea*) and rushes (like *Juncus acutiflorus* and J*uncus conglomeratus*); here the communities are sometimes grazed. In syntaxonomic literature, these grasslands are often described as distinct alliances (*Junco-Molinion* and/or *Juncion acutiflorae*). The habitat may occur from the lowlands up to the (sub)montane areas. The pH varies from more or less acidic to calcareous, with calcium carbonate as an important chemical compound. In fen-meadows, the peaty soils may temper the effect of the fluctuating water tables. When the water fluctuations become too intense, other species may take over, like *Juncus effusus*.  The following characteristics can be considered as indicators of good quality:   * High richness in herb species; * Long-term habitat stability; * Extensive management regime aimed at long-term continuation of yearly mowing, prohibiting a succesion towards woodland; * Complex landscape setting, with fens or other kinds of mire vegetation on the one hand and drier grasslands on the other.   Characteristic species:  Vascular plants: *Betonica officinalis, Carex pallescens, Cirsium dissectum, Cirsium tuberosum, Crepis paludosa, Dianthus superbus, Galium boreale subsp. boreale, Gladiolus imbricatus, Iris sibirica, Molinia caerulea, Molina arundinacea, Sanguisorba officinalis, Scorzonera humilis, Selinum carvifolia, Serratula tinctoria, Silaum silaus, Stachys officinalis, Succisa pratensis, Tetragonolobus maritimus, Viola persiciflora.*  Mosses: *Calliergonella cuspidata, Climacium dendroides* |
| E4.1 Vegetated snow patch | The habitat is represented by chionophile vegetation on places that retains late-lying snow (snowfield, snowbed and snow-patch), often on the drift from the melting snow-patches. They are well developed in boreal and arctic mountains and in sub-arctic lowlands. Dominants may be mosses, liverworts, lichens, short graminoids, ferns and small herbs. The species composition depends on the geographical range, the altitude, bedrock (calcareous or siliceous soils) and length of vegetation seasons. On the tops of high mountains in South-Europe snow patches are characterised by the presence of endemic taxa and syntaxa. Often the plant communities are disposed in the depressions of slopes and ridges amongst the dominant acidophilous or caciphilous alpine and sub-alpine grasslands. Soils are poorly developed: Lithosols (1–4 cm), strongly skeletal, often with small stones on the surface. Some of them are rich in fine, organic substances.  The most widespread in mountains throughout the Europe are acidophilous mixed herbaceous-dwarf shrub communities ofthe class *Salicetea herbaceae*. The dominant species are *Salix herbacea*, *Ligusticum mutelina, Luzula alpinopilosa* many mossesas *Polytrichum sexangulare*, *P. juniperinum*, *Pohlia commutata*, ect. Dwarf willow shrubs belong to shrub not to the snow-patch grasslands, but are included under habitat F2.1. The most widespread acidophilous snow-patch communities in the mountains are dominated from *Omalotheca supina*, *Alopecurus gerardii*, *Carex* spp., *Alchemilla* spp., etc. But the snow-patch vegetation of Iberian Peninsula is rich in endemics and belongs to the endemic alliance *Sedion candollei.* The endemic alliance *Ranunculion crenatii* represents the uncommon, isolated herbaceous snow-patch swards of the southern Dinarides and the Pelagonides. Another endemic alliance *Hyalopoion ponticae* represent the snow-bed vegetation on acidic soils in the Caucasus Mts.  In Northern Europe (Fennoscandia, the Scottish Highlands, Iceland, Greenland and arctic islands) snow-patch communities are dominated by mosses (*Distichium capillaceum*, *Pohlia* spp.), lichens or coarse tussock forming grasses, like *Deschampsia cespitosa*. On Svalbard some snow-beds over siliceous bedrock are dominated by *Dicranoweissia crispula*, with *Andreaea blyttii*, *A. obovata* and *A. rupestris* as characteristic species. The northern alliance *Cassiopo--Salicion herbaceae* is very similar to the alpine *Salicion herbaceae*, but diagnostic are typical arctic species like *Carex bigelowii* and *Harrimanella hypnoides*. Specific are some snowbed communities of Fennoscandian Mountains, Iceland and Scottish Highlands, which are dominated by ferns as *Cryptogramma crispa*, *Athyrium distentifolium* (*Athyrium alpestre*), *Athyrium filix-femina*, *Dryopteris expansa* (*Dryopteris assimilis*) or *Dryopteris filix-mas.*  Calciphilous boreo-alpine snow patch grasslands (*Arabidetalia caeruleae*) are rich in small herbs, grasses and mosses. Among the characteristic speciesare *Arabis caerulea*, *Carex atrata*, *Saxifraga androsacea* and *Ranunculus alpestris*. Open, herbaceous communities on wet (from melting snow), calcareous stones in Scandinavian mountains belong to the alliance *Saxifrago oppositifoliae-Oxyrion digynae* (=*Ranunculo-Oxyrion digynae*)*.* Typical species here are *Oxyria digyna*, *Cerastium cerastoides*, *Cetraria delisei* and *Saxifraga oppositifolia*.  The vegetation communities mostly cover small areas above the forest belt (alpine and sub-alpine parts) in the high mountains of Central and Eastern Europe: Alps, Pyrenees, Carpathians and Caucasus, and in the Scottish Highlands and Sudeten. In South-European Mountains, they are spread very locally in the Paeonian Mountains, Sierra Nevada, Cordillera Central, Monti Sibillini, Abruzzi, Balkan Mountains as Pirin and Rila Mts. and some of the Dinarides.  In a good condition the habitat is represented by communities in patches with different sizes, within a matrix of the dominant alpine, subalpine and tundra grasslands. The development of these communities depends on the duration of snow cover, amount of snowfall in winter and water supply from melting snow-patches. Moss and lichen communities are very sensitive to any disturbance. Alpine and subalpine communities are threatened by overgrazing and development for tourism (ski tracks, trampling on tourist routes, etc). Global warming is another serious threat, because it reduces the snow-patch size, decreases the duration of snow cover and increases the duration of the vegetation growing season.  Indicators of good quality:   * High amount of snowfall and long-term snow cover * High species richness * Presence of rare and/or threatened species (on high mountains also endemic species) * High cover of lichens and mosses (in some varieties   Characteristic species:  Vascular plants:*Achillea clusiana*, *A*. *lingulata*, *Alchemilla pentaphyllea*, *A. fissa, A. pentaphyllea, A. subsericea, Alopecurus gerardii, A*. *riloensis*, *Androsace carnea* ssp. *laggeri, Arabis alpina*, *A. caerulea*, *Athyrium filix-femina*, *A. distentifolium,* *Bartsia alpina, Calamagrostis purpurea*, *Carex atrata*, *C. bigelowii, C. foetida*, *C. kitaibeliana, C. lachenalii*, *C. norvegica*, *C. ornithopodioides, C. parviflora, C. pyrenaica, Cardamine alpina*, *C. pratensis* subsp. *dentata*, *Cerastium alpinum, C. arcticum*, *C. cerastoides*, *Crocus veluchensis*, *Cryptogramma crispa*, *Deschampsia alpina*, *Dianthus microlepis, Draba crassifolia, Dryopteris expansa*, *D. filix-mas*, *Festuca picturata, F. supina, Galium saxatile*, *Gentiana alpina, Gentiana verna*, *Geum montanum, Homogyne alpina, Hutchinsia alpina, Juncus biglumis*, *Lepidium stylatum*, *Ligusticum mutellina*, *Luzula alpinopilosa, L. arctica, L. confusa, L. desvauxii, L. spadicea*, *Minuartia biflora*, *Nardus stricta*, *Omalotheca hoppeana, O. supina, Oxyria digyna*, *Phippsia algida*, *Plantago alpina*, *P. atrata*, *Poa alpina, P. arctica, P. granitica*, *Poa pirinica*, *P. supina, Polygonum viviparum,* *Potentilla brauniana,* *P. crantzii*, *P. hyparctica*, *P. ternata, Primula integrifolia, P. stricta, Ranunculus alpestris*, *R. crenatus, R. glacialis, R. montanus*, *R. nivalis*, *R. pseudomontanus*, *R. pygmaeus, R. sulphureus*, *Salix herbacea*, *S. polaris*, *Sagina saginoides, Saussurea alpina*, *Selaginella selaginoides, Sibbaldia procumbens, Soldanella alpina, S. carpatica, Saxifraga androsacea, S. cernua*, *S. nivalis, S, oppositifolia, S. rivularis*, *S. stellaris*, *S. tenuis*, *S. wahlenbergii*, *Sedum alpestre, S. candollei*, *Sesleria coerulans*, *S. tatrae, Silene acaulis, Soldanella minima, Taraxacum apenninum*, *T*. *bithynicum* *Taraxacum croceum*, *Thalictrum alpinum*, *Trifolium thalii*, *Trisetum spicatum Veronica alpina, V. aphylla, Viola biflora*  Mosses: *Barbilophozia floerkii*, *Bryum elegans, Dicranum falcatum*, *Distichium capillaceum*, *Gymnomitrion concinnatum*, *Harrimanella hypnoides*, *Hylocomium splendens*, *Jungermania atrovirens, Kiaeria falcata, K. starkei*, *Lophozia wenzelii*, *Oligotrichum hercynicum, Pleurocladula albescens*, *Pohlia albicans*, *P. drummondii*, *Polytrichum alpinum,* *P. juniperinum*, *P. gracile*, *P. norvegicum, P. pyliferum, P. sexangulare*, *Racomitrium sudeticum, Tayloria froelichiana, Timmia austriaca, T. norvegica, Tortella tortuosa*  Lichens:*Anthelia juratzkana, Cladonia exmocyna, Cetraria delisei, Cetraria islandica,* *Pogonatum alpinum,* *Solorina crocea* |
| E4.3a Boreal and arctic acidophilous alpine grassland | Boreal and arctic acidophilous alpine grasslands represent grass-, sedge-, rush- or herb-dominated vegetation types in boreal and arcto-alpine mountains of Fennoscandia, Iceland and Scotland. The habitat includes a quite wide range of different vegetation communities from low-graminoid mountain heaths to mountain meadows. Common to these varieties is a low field layer, usually < 30 cm. These grasslands occur predominantly on siliceous bedrock and they are in most sites characterized by thick and late-lying snow cover.  There is no single characteristic species describing all of these grassland habitats, and the species composition varies according to the vegetation community. In high mountains grasses (*Nardus stricta, Festuca ovina*), sedges *(Carex bigelowii*) and/or rushes (*Juncus trifidus*) dominate the so-calledgraminoidmountain heaths (order *Juncetalia trifidi*). Other species present are a mixture of typical species for mountain heaths, snowbeds and mountain meadows. Mountain meadows (secondary grasslands) belonging to this habitat type are low-herb communities consisting mainly of *Bistorta vivipara, Cerastium alpinum, Thalictrum alpinum, Saussurea alpina, Ranunculus acris, Silene acaulis, Astragalus alpinus, A. frigidus, Ericeron uniflorus* and *Potentilla crantzii* (*alliance Potentillo-Polygonion vivipari*), forming a boreal equivalent to E2.3 Mountain hay meadows*.* The distinction between this habitat type and E4.4a Calcareous arctic-alpine grasslands does not relate only to the chemistry of bedrock, but is also reflected in the average height of vegetation, which in this habitat is usually relatively low.  Climate change can increase the growth of bushes and shrubs, which may reduce the area of grasslands.  Indicators of good quality:  The following characteristics are indicators of good quality:  ·      Openness (no trees or shrubs)  ·      Dominance of  low sedges, rushes, grasses or hebs  ·       Thick snow cover  Characteristic species:  Species marked with (\*) are calciphilic in Fennoscandia, but in the arctic are indifferent fro soil type.  Vascular plants: *Astragalus alpinus\*, Astragalus frigidus\*, Bistorta vivipara, Carex bigelowii, Cassiope tetragona, Cerastium alpinum\*,Deschampsia flexuosa, Ericeron uniflorus\*, Festuca ovina, Hieracium alpinum, Juncus trifidus, Luzula multiflora* ssp. *frigida, Nardus stricta, Poa alpina\*, Potentilla crantzii\*, Ranunculus acris ssp. pumila,  Salix polaris\*, Saussurea alpina\*, Silene acaulis\*, Soligado virgaurea, Thalictrum alpinum\*, Trisetum spicatum, Veronica alpina\*,  Viola biflora*  Mosses and liverworts: *Polytrichastrum alpinum, Polyrichum juniperinum*  Lichens: *Cetraria spp., Flavocetraria spp.* |
| E4.3b Temperate acidophilous alpine grassland | These grasslands and dwarf chamaephyte communities comprise the climax vegetation on predominantly siliceous bedrocks in the alpine belt throughout the temperate mountains of Europe.  Typical of the highest summits and ridges, often very exposed to strong winds and largely blown clear of snow in the winter, they are characteristic of skeletal rankers and mostly shallow free-draining cambisols that can sometimes also be found on de-calcified soils over basic bedrocks.  *Nardus stricta-*dominated grasslands included here may be influenced by grazing and where stock or wild herbivores reduce the cover of scrub or heath at lower altitudes, the habitat may extend down into the sub-alpine belt.  The vegetation is mostly species-poor, reflecting the harsh environmental conditions, and comprises xero- to mesophilous, heliophilous and calcifuge grasses, sedges and rushes with a significant contingent of foliose and fruticose lichens. However, very commonly the vegetation is found as part of large-scale mosaics with heaths, snow-bed communities and tall herb vegetation, with which there can be some overlap in species composition (for which reason the vegetation has traditionally been grouped in a broadly defined phytosociological class Juncetea trifidi, = Caricetea curvulae).  Regional subtypes sometime show species vicariance such as *Festuca eskia* being confined to the Pyrenean Peninsula, *Festuca varia* and *Carex curvula* missing from the Western Carpathians, *Sesleria comosa* typical for Balkan mountains.  Indicators of good quality:  ·       Presence of lichens such as *Alectoria ochroleuca*, *Cetraria islandica*, *Cladonia* spp. div.  ·       Stability of populations of rare species  ·       No signs of erosion due to grazing, indicated by open soil or patches of unpalatable herbs  ·       No visible disturbance by trampling, skiing, or burning  ·       Absence of nutrient-demanding weeds  ·       Continuance of grazing for *Nardus stricta-*dominated grasslands.  Characteristic species*:*  Vascular plants: *Agrostis nevadensis, Agrostis rupestris, Anthoxanthum odoratum s. alpinum, Anthyllis vulneraria s. pulchella, Avenula versicolor, Bellardiochloa violacea, Campanula alpina, Campanula herminii, Campanula scheuchzeri, Carex bigelowii, Carex curvula, Carex sempervirens, Cruciata glabra, Cynosurus cristatus, Danthonia decumbens, Deschampsia flexuosa, Euphrasia minima, Festuca airoides, Festuca eskia, Festuca iberica, Gentiana alpina, Gentiana alpina, Geum montanum, Globularia meridionalis, Helianthemum oelandicum s. incanum, Hieracium alpinum, Hieracium lactucella, Holcus lanatus, Homogyne alpina, Iris latifolia, Juncus squarrosus, Juncus trifidus, Koeleria lobata, Leontodon microcephalus, Leontodon pyrenaicus, Leucanthemopsis alpina, Ligusticum corsicum, Ligusticum mutellina, Lotus corniculatus s. carpetanus, Luzula nutans, Luzula spicata, Minuartia recurva, Minuartia verna s. collina, Nardus stricta, Oreochloa disticha, Phyteuma hemisphaericum, Plantago holosteum, Potentilla aurea, Potentilla erecta, Primula minima, Pulsatilla alba/alpina/scherfelii, Ranunculus pyrenaeus, Sagina pilifera, Senecio abrotanifolius, S. incanus, Thymus nervosus, Trifolium alpinum, Trifolium repens, Trinia glauca s. carniolica.*  Lichens and bryophytes: *Alectoria ochroleuca, Cetraria islandica, Cetraria cucullata, C. nivalis, Cladonia uncialis, Cladonia arbuscula, C. pyxidata, C. rangiferina, Thamnolia vermicularis, Racomitrium lanuginosum, Polytrichum alpinum, P. strictum.* |
| E4.4a Arctic-alpine calcareous grassland | This type of grasslands occurs in the alpine or subalpine belts of the high mountains of the nemoral zone, being best developed in the Alps but occurring also in boreal Scotland and Scandinavia, in the Carpathians and Pyrenees, and with small fragmentary stands also in the Sudetes. The cover of these grasslands varies considerably between 20 and 100%, depending mainly on soil depth (deeper soils usually support denser vegetation). The dominant species are graminoids such as *Sesleria caerulea*, *S*. *bielzii,* *S*. *tatrae*, *Carex austroalpina*, *C. ferruginea*, *C. firma*, *C. sempervirens*, *Festuca versicolor* or *Kobresia myosuroides*. In the matrix of graminoids numerous non-graminoid herbs occur. On south-facing slopes in the subalpine belt, mountain calcicolous species can be mixed with some species of lowland dry grasslands such as *Carex humilis*. In general, these grasslands are rich in species and colorful at the peak of the growing season. They occur on limestone or dolomite slopes and ridges, most typically on shallow soils of the Rendzic Leptosol type. On steeper slopes these soils are affected by solifluction. Tussocks of the dominating graminoids can act as small dams that prevent downslope movement of fine soil particles, which results in a stairway-like appearance of these grasslands with fine-scale mosaic of patches with soil erosion and accumulation. Calcareous grasslands above the timberline are natural vegetation, occasionally used as summer pastures. Below the timberline, these grasslands occur either as natural vegetation on steep slopes and rock outcrops, or as secondary vegetation of mountain pastures at the sites of potential spruce, larch or beech forests.  Indicators of good quality:  Calcareous grasslands above the timberline are natural vegetation which is generally rather stable. In some places it is disturbed by tourism, e.g. trampling, skiing or building touristic infrastructure, but these negative effects tend to be rather localized. More endangered are the calcareous grasslands below the timberline, which were traditionally grazed by cattle but are currently being abandoned and overgrow by shrubs and trees.  The following characteristics can be considered as indicators of good quality:  ·        High species richness.  ·        No encroachment of trees and shrubs.  ·        No spread of tall-growing herb species after abandonment of grazing.  ·        In the subalpine belt, continuation of traditional management by grazing.  ·        Absence of overgrazing that would strongly reduce grassland cover or disturb the soil.  ·        No signs of disturbance by trampling, skiing or construction works.  Characteristic species*:*  Vascular plants: *Achillea clavenae, Acinos alpinus, Alchemilla hoppeana, Androsace chamaejasme, A. villosa, Anthyllis vulneraria, Aster alpinus, A. bellidiastrum, Astragalus alpinus, A. frigidus, A. penduliflorus, Bartsia alpina, Betonica alopecuros, Biscutella laevigata, Calamagrostis varia, Callianthemum kernerianum, Campanula scheuchzeri, C. thyrsoides, Carex austroalpina, C. baldensis, C. ferruginea, C. firma, C. mucronata, C. ornithopoda, C. sempervirens, Coeloglossum viride, Draba aizoides, Dryas octopetala, Festuca versicolor, Galium anisophyllon, Gentiana clusii, G. verna, Globularia cordifolia, G. nudicaulis, Helianthemum nummularium* subsp. *grandiflorum, Helianthemum oelandicum* subsp. *alpestre, Hieracium villosum, Homogyne discolor, Juncus monanthos, Kobresia myosuroides, Leontopodium alpinum, Minuartia langii, Nigritella nigra, N. rubra, Onobrychis montana, Oxytropis campestris, O. carpatica, O. halleri, Pedicularis foliosa, P. rostratocapitata, P. rostratospicata, Phyteuma orbiculare, P. sieberii, Primula clusiana, P. wulfeniana, Pulsatilla alpina* subsp. *alpina, Ranunculus hybridus, R. thora, Rhinanthus glacialis, Saussurea alpina, S. pygmaea, Saxifraga caesia, paniculata, Scabiosa columbaria, Scorzonera rosea, Selaginella selaginoides, Senecio abrotanifolius, Senecio doronicum, Sesleria bielzii, S. caerulea, S. tatrae, Thesium alpinun, Veronica aphylla, V. fruticans, Viola jooi.*  Bryophytes: *Plagiochila porelloides, Polytrichum alpinum, Rhytidium rugosum, Tortella tortuosa*  Lichens: *Cetraria islandica* |
| E4.4b Alpine and subalpine calcareous grassland of the Balkan and Apennines | These habitats built by many alpine plant species have been a source for fodder during summer period. Grasslands can be divided into two main groups: grasslands over calcareous and acid bedrock. They are further divided into two groups according to altitude: one is of primary origin that appears above the timberline, where site conditions are too severe for woody species to grow. The other is secondary and developed in the subalpine vegetation belt, where the forest surfaces were deforested and transformed into pastures and the timberline was lowered for somewhere 300-500 meters. But it is very difficult to draw the line between the primary and secondary grasslands and they often overlap. The subalpine grasslands extend at altitude between 1650 and 2250 m and the alpine ones are above them. Geographically subalpine and alpine grasslands are divided into two orders, *Seslerietalia tenuifoliae*, comprising alpine and subalpine grasslands of the northern Balkan and Apennines, and *Onobrychido-Seslerietalia*,comprising those of central and southern Balkans. In the alpine vegetation belt we can find the vegetation alliances *Seslerio juncifoliae-Caricion firmae* on the northern Dinarides, *Seslerion apeninae* on the Apennines, *Oxytropion dinaricae* on southern Dinarides and *Anthyllido-Seslerion klastersky* in the central part of the Balkans. In the subalpine belt we can find *Seslerion apeninne* in the Apennines, *Seslerion juncifoliae* on wind exposed slopes and *Festucion pungentis* in sheltered sites in Dinarides and *Festuco-Knaution longifoliae* in Serbia, *Festucion xanthinae* in the southern Dinarides, *Campanulion albanicae* in Montenegro and Kosovo and *Seslerion nitidae* in the central part of the Balkans. But the division between alpine and subalpine is not fixed as alpine communities can appear in the subalpine and even in montane vegetation belt in exposed sites and vice versa in sheltered sites. At the same time, the subalpine communities are well differentiated by the presence of species from dry grasslands that appear in those communities.  Indicators of good quality:  Grasslands in the alpine zone are of primary origin and do not undergo the natural process of afforestation. The only threat is the abandonment of grazing that may change the species composition. It is also expected that global warming will raise the timberline and, therefore, the vegetation zones will shift upwards, however mountains are generally not high enough to allow such an altitudinal shift on the long term.  In the subalpine zone, the situation is much more complicated. With the abandonment of grazing the afforestation process begins. This process is due to severe site condition slower than in lowland, but we can expect that we will lose a great part of subalpine grasslands in the near future.  The following characteristics may be considered as indicators of good quality:  -                  species richness of the grasslands and presence of diagnostic species,  -                  presence of regular grazing (overgrazing can appear near to the stable),  -                  absence of afforestation, absence of high tall herb, shrub and tree species.  Characteristic species*:*  Vascular plants: *Achillea holosericea, Acinos alpinus, Aethionema saxatile, Anthylis aurea* subsp*. multifoliata, Asperula aristata, Asplenium fissum, Aster alpinus, Astragallus mayeri, Asyneuma limonifolia, Biscutella laevigata, Carex laevis, Centaurea triumfetti, Dianthus integer, Dianthus sylvestris* subsp. *longicaulis, Draba aizoides, Draba lasiocarpa, Edrianthus horvatii, Fritillaria tenella, Galium oreophyllum, Geranium subcaulescens* var*. rupestris, Helianthemum canum, Helianthemum nummularium* subsp. *grandiflorum, Hieracium pannosum, Iberis sempervirens, Juniperus nana, Leontodon crispus, Linum alpinum, Linum capitatum, Minuartia collina /verna, Oxytropis campestris* (=*O. dinarica*)*, Oxytropis neglecta, Oxytropis purpurea, Pedicularis comosa, Pedicularis verticillata, Peucedanum schottii, Phyteuma orbicularae, Plantago argentea, Polygala alpestris, Polygala comosa, Potentilla crantzii, Pulsatilla alpina, Ranunculus breyninus, Satureja pysidica, Senecio procera, Sesleria juncifolia, Sesleria nitida, Sideritis roeseri, Teucrium montanum, Thalictrum minus, Thymus ciliatipubescens, Thymus praecox* subsp. *polytrichus, Trinia dalechampii.* |
| E5.2a Thermophilous woodland fringe of base-rich soils | In the transitional zone between the open landscape and forests, habitats can be found that are characterized by a distinct species composition. Generally, two formations can be distinguished: one determined by shrubs, called mantle, and one – closer to the open landscape – built up by (tall) herbs and grasses, called fringe. Thus, fringe communities appear as a narrow belt along forests, but they also occur along scrublands and other formations. Even in the open landscape, e.g. along cliffs. In comparison with the generally rather species poor mantle communities, fringe communities are often harboring a large set of – colorful – flowers. This especially applies to the baserich soils, to which the heliophilous and thermophilous communities of Habitat type E5.2a are confined. Another prerequisite is a limited amount of nutrients; otherwise, the vegetation transforms into nitrophilous tall forb communities. The diagnostic species are adapted to the half-shadow conditions under the branches of trees and scrubs, but the small contact zone between the forest and the open landscape gives also room to the occurrence of species of these neighbouring formations. And this partly explains the species richness of the habitat.  In the subatlantic parts of Europe, fringes generally border mesophilous forests of the class *Carpino-Fagetea sylvaticae*. In the zone of thermophilous deciduous forest (*Quercetea pubescentis*), with relatively open canopy, most of the fringe species can also be found inside the forest communities. Fringe communities have developed through millennia of human activities. From a landscape ecological point of view, they may protect forests against unwanted effects from the open landscape, like the input of nutrients from agricultural land. Fringes provide important habitats for various animal groups, including birds and insects. Thermophile woodland fringes of baserich soils can be found in large parts of Europe. In Southern and Southeastern Europe, they also can be found in mountainous areas, but in the Northwestern parts of Europe, they are restricted to lowlands. Transitional zones are generally in need of well-balanced human activities, as changes in the neighboring formations (forest on the one side, open landscape on the other side) directly affects the quality of the fringe communities.  Indicators of good quality:   * Species richness * Periodical cutting or grazing, protecting encroachment of the habitat by shrubs and trees * Absence of woody species * Absence of invasive species * Low input of nutrients   Characteristic species:  Flora: Vascular plants: *Achillea millefolium*, *Anemone sylvestris*, *Anthericum ramosum*, *Betonica officinalis*, *Brachypodium pinnatum* agg., *Bupthalmum salicifolium*, *Bupleurum falcatum*, *Campanula bononiensis*, *Campanula persicifolia*, *Campanula trachelium*, *Centaurea jacea*, *Chamaecytisus hirsutus*, *Chamaecytisus supinus*, *Clematis recta*, *Clinopodium vulgare*, *Coronilla coronata*, *Cruciata glabra*, *Cytisus nigricans*, *Dactylis glomerata*, *Dictamnus albus*, *Ferulago galbanifera*, *Festuca rubra*, *Fragaria vesca*, *Fragaria viridis*, *Galium album*, *Galium lucidum*, *Galium verum*, *Geranium sanguineum*, *Hieracium racemosum*, *Hieracium umbellatum*, *Hypericum perforatum*, *Inula hirta*, *Inula salicina*, *Knautia drymeia*, *Knautia illyrica*, *Laserpitium latifolium*, *Lathyrus pannonicus*, *Libanotis sibirica*, *Medicago falcata*, *Medicago* *falcata*, *Melampyrum cristatum*, *Melampyrum nemorosum*, *Origanum vulgare*, *Peucedanum cervaria*, *Peucedanum oreoselinum*, *Pimpinella saxifraga*, *Poa angustifolia*, *Polygonatum odoratum*, *Primula veris*, *Rosa pimpinellifolia*, *Serratula tinctoria*, *Silene italica*, *Silene nutans*, *Solidago virgaurea*, *Tanacetum corymbosum*, *Teucrium* *chamaedrys*, *Thalictrum minus*, *Trifolium alpestre*, *Trifolium rubens*, *Verbascum austriacum*, *Veronica chamaedrys*, *Veronica spicatum*, *Veronica teucrium*, *Vincetoxicum* *hirundinaria*, *Viola hirta*.  Bryophytes: *Campthotecium lutescens, Hylocomium splendens, Rhytidium rugosum*. |
| E5.2b Thermophilous woodland fringe of acidic soils | These woodland fringes are especially characteristic of semi-shaded habitats along forest margins, overhung road verges and similar places with acidic and nutrient-poor soils. Dominated by bulky grasses and tall herbs, they are not so diverse as the more thermophilous E5.2a woodland fringe occurring on base-rich soils. They reach their optimum development in the cooler Atlantic and Subatlantic parts of Europe and, further east, their species richness gradually diminishes. The typical associated trees in the woodlands are deciduous *Quercus spp.*, *Betula* spp. and *Fagus sylvatica*.  Fringe communities are semi-natural habitats, strongly influenced by human activities and where newly established, for example in forest clearings, around plantations and along hedgebanks, some years are needed to develop their characteristic features, above all depending on neighbouring habitats. This kind of fringe can be found in association with mat-grass swards on nutrient-poor soils and heathlands on acidic and humus-rich soils. Towards the Mediterranean region, fringes on acidic and neutral and bedrock can be similar to fringes on basic soils (e.g. in the *Lathyro laxiflori-Trifolion velenovskyi*).  To prevent colonisation by shrubs and trees, the vegetation needs to be occasionally mown (for example, every second year) or extensively grazed.  The following characteristics may be considered as indicators of good quality:   * Absence of complete shade of shrubs and trees * Relative richness in apomictic species of *Hieracium* * Irregularly grazed and/or mown * Absence of invasive species * Low input of nutrients   Characteristic species:  Vascular plants: *Agrostis capillaris, Avenella flexuosa, Betonica officinalis, Campanula rapunculus, Centaurea nigra, Clinopodium vulgare, Conopodium majus, Digitalis purpurea, Hieracium lachenalii, Hieracium murorum, Hieracium sabaudum, Hieracium umbellatum, Holcus mollis, Hypericum perforatum, Hypericum pulchrum, Jasione montana, Lathyrus linifolius, Linaria repens, Lonicera periclimenum, Melampyrum pratense, Origanum virescens, Poa nemoralis, Potetilla erecta, Potentilla sterilis, Pulmonaria longifolia, Rumex acetosella, Serratula tinctoria, Solidago virgaurea, Stellaria holostea, Teucrium scorodonia, Veronica chamaedrys, Veronica officinalis, Viola riviniana.* |
| E5.2c Macaronesian thermophilous woodland fringe | Perennial herbaceous communities, humus-prone although not nitrophile, of thermophile half-shade, mesophytic natural hedges and clearings of macaronesian laurel-forests [G2.3]. This habitat type is found on forest micro-sites receiving a greater amount of radiation, compared to those typical of forest conditions, but still being dependent on forest litterfall defining somewhat mesotrophic conditions. The communities often have a heterogeneous physiognomy dominated by large-flowered herbs or forbs unlike deep-shade forest understory strata. The absence of grazing pressure and nitrogen inputs from large herbivores is also mandatory for its persistence.  Although it shares some floristic elements with continental Europe forest-fringe communities (E5.2a & b): *e.g.* *Agrimonia eupatoria, Brachypodium sylvaticum, Origanum virens, Carex divulsa, Lathyrus sylvestris, Clinopodium vulgare, Carex muricata* subsp. *lamprocarpa,* etc., this type exhibits a great wealth of macaronesian neoendemics. According to each archipelago’s endemicity character, three variants can be respectively set for Madeira, the Azores and Canary Islands. That of the Azores (*Pericallion malvifoliae*) is the most floristically deviant from that shared by Madeira and the Canaries (*Ranunculo cortusifolii-Geranion canariensis*). Azorean variant is enriched from catenal contact with Azorean endemic grasslands [E1.F: *Topido azoricae-Holcetea rigidi* vegetation class]. Apart from being typical of laurel forest fringes, Canarian versions of the habitat may be also found in lower altitude subhumid canarian pinewoods [G3.8] and Madeiran versions may be found in altitude tree-heath forests [G2.7]. Catenal contacts are those with forest understory, shady fern-moss communities [*Polypodion serrati, Polypodietea*] and macaronesian heath woody fringes [*Andryalo-Ericetalia arboreae* or *Frangulo-Lauretalia azoricae*].  Indicators of good quality:  Maximal coenotic saturation of communities in relation to local endemic taxa would be a criterion of habitat quality. Thus, versions of habitat having higher syntaxa elements alone [at order and class levels] are considered basal (pioneer) or disturbed versions with less conservation value. Also, as disturbance is set, invasion of the biotope by shrubs, tree-saplings or shady nitrogen-prone vegetation [*Geranio purpureae-Cardaminetalia hirsutae, Chenopodietea*] lessens the value of the habitat. The habitat type is a fragile one and depends on the critical maintenance of integrity of forest conditions for protection and organic matter, including clearing persistence.  Characteristic species:  Vascular plants:  Madeira: *Dactylorhiza foliosa, Geranium palmatum, Pericallis aurita, Ranunculus cortusifolius* subsp. *major, Rumex maderensis, Teucrium francoi, Viola paradoxa.*  Azores: *Ammi seubertianum, Ammi trifoliatum, Angelica lignescens, Chaerophyllum azoricum, Lactuca watsoniana, Pericallis malvifolia, Ranunculus cortusifolius* subsp. *cortusifolius.*  Canary Islands: *Geranium canariense, Myosotis latifolia, Pericallis appendiculata, Pericallis cruenta, Pericallis echinata, Pericallis tussilaginis, Pimpinella dendrotragium,  Ranunculus cortusifolius, Scrophularia smithii.* |
| E5.3 Pteridium aquilinum stand | In the humid regions of Europe bracken (*Pteridium aquilinum*) may form species-poor 1 to 2 meter high stands on deeper, acidic to neutral, well drained, well aerated and poor to relatively fertile soils. The associated species assemblage may vary depending on the context in which the bracken stands develop, particularly with the acidity and fertility of the soil and the density of the cover of fronds. On less acid soils, the herbaceous associates may be those of mesotrophic grasslands and it may be mixed with bramble species (*Rubus*), scattered scrubs (*Crataegus, Prunus*) or trees (*Fraxinus*, *Quercus*) , forming transitions towards Red List scrubs F3.1b and F3.1e. In other cases it may contain components of heath or acidic grassland, for example *Vaccinium myrtillus*, *Galium saxatile*, *Potentilla erecta* or *Anthoxanthum odoratum*.  Bracken is probably naturally a forest fern held in check by the shade of a canopy of trees and shrubs but it is found as this habitat in forest gaps and clearings, along forest margins, in heathlands, in drained bog areas, on burnt sites, being a component of agricultural or heathland areas and rarely occurring also in coastal dunes. Bracken can colonise open ground in such habitats by spore dispersal, but this is a relatively rare phenomenon. More usually the species expands from existing populations by vegetative rhizome spread, slowly forming larger clonal stands. Once established the species creates a hostile environment for other plants, by producing dense summer shade and large amounts of slowly-rotting litter. The result is a relatively species-poor habitat, not considered of high value from a nature conservation point-of-view. In many cases it is rather considered as a threat to other habitats, like grasslands and heathlands, developing as a result of abandonment of traditional management in which it was often cut and used as bedding for farm animals and also held in check by trampling of cattle.  The main distribution covers the Atlantic and Subatlantic lowlands and mountains of Europe, being most widespread in Ireland, the British Isles and Brittany (France). Further eastwards *Pteridium aquilinum* is mainly restricted to the humid microclimate of forests. More species-rich tall herb stands dominated by this species are widespread but not very common, and mostly confined to temperate mountains. In boreal and warm Mediterranean regions the conditions are less optimal for the habitat to develop.  Indicators of good quality:   * Being part of a landscape mosaic with heathlands, forests and grasslands * No co-dominance of trees and shrubs   Characteristic species:  Flora: Vascular plants: *Agrostis capillaris, Anthoxanthum odoratum, Dactyis glomerata, Festuca ovina agg., Galium saxatile, Holcus lanatus, Holcus mollis, Potentilla erecta, Pteridium aquilinum, Rosa spp., Rubus idaeus, Rubus ulmifolius, Rubus sect. Rubus, Sarothamnus scoparius, Teucrium scorodium, Ulex europaeus, Vaccinium myrtillus.* |
| E5.4 Lowland moist or wet tall-herb and fern fringe | Tall-herb and fern communities of this habitat type are widespread in the nemoral, boreal and submediterranean parts of Europe. These include stands of tall herbs and ferns in the lowlands, hills and low mountain ranges up to the subalpine zone. In general, this refers to areas below 1,000 meters of  altitude. Such tall herb communities are mostly found along watercourses, in wet meadows and in the shade at the edge of woodlands. The rather species-rich vegetation is dominated by 1 to 1.5 m (sometimes even more than 2 m), tall forbs and grasses, sometimes mixed with lianes such as *Calystegia sepium* and *Cuscuta europaea*. Usually the stands cover narrow strips (up to 2–3 m, often narrower). The communities are generally rich in flowers, attracting lots of insects, especially butterflies. The side conditions are moist to wet and generally nitrogen-rich; the substrates are often seasonally or even permanently submerged. As a result, many of the prevailing species may grow both in the water (shallow water 0.10–0.20 m deep) and on over-wet soils. The species composition is diverse, depending on the altitude and location in the landscape, reflecting the composition of the surrounding communities. In floodplains and along running water streams in more hilly regions, mostly on clay and gravel grounds, the communities are characterized by species like *Althaea officinalis*, *Epilobium hirsutum*, *Eupatorium cannabinum*, *Symphytum officinale* and various species of the genus *Angelica*, representing alliances of the order *Convolvuletalia sepium*. As such communities are found widespread over Europe, floristic differences may be observed in line with the geographic distribution (atlantic, subatlantic, boreal, submediterranean and central European). In abandoned meadows and places of secondary origin, e.g. along canals and ponds, ruderal species and neophytes (such as *Impatiens glandulifera* and *Solidago gigantea*) are frequent companions. The vegetation here is often assigned to the order *Molinietalia*. In the shade of the edge of woodlands, in forest clearings on wet soils, and in humid ravines, tall forb communities may develop that show quite some similarity with fringe communities of habitat type E5.2a. Such communities are assigned to the order *Circaeo lutetianae-Stachyetalia sylvaticae* and may include species like *Aegopodium podagraria*, *Brachypodium sylvaticum*, *Circaea lutetiana*, and *Stachys sylvatica*. In spite of all this variation, it is not easy and therefore not recommended to define subtypes.  Indicators of good quality:   * Lack of invasive species * Dominance of tall-herbs and lianes * Absence of shrubs and trees * No dominance of nitrophilous species like *Urtica dioica* and *Galium aparine* * High species richness   Characteristic species:  Flora, Vascular plants: A*chillea ptarmica, Aegopodium podagraria, Agrostis* *stolonifera, Alliaria petiolata, Althaea officinalis, Angelica archangelica, Angelica heterocarpa, Angelica sylvestris, Anthriscus* *sylvestris, Aristolochia* *clematitis, Artemisia* *vulgaris, Aruncus vulgaris, Atriplex* *sagittata, Ballota* *nigra, Brachypodium sylvaticum, Calystegia sepium, Calystegia* *sylvatica, Carduus crispus, Carex pendula, Chenopodium* *ambrosioides, Chaerophyllum* *aromaticum, Chaerophyllum hirsutum, Circaea lutetiana, Conyza* *primulifolia, Crepis paludosa, Cucubalus* *baccifer, Cuscuta* *europaea, Cynanchum* *acutum, Dipsacus fullonum, Dipsacus laciniatus, Dorycnium* *rectum, Dryopteris filix-mas, Echinochloa crus-galli, Echinocystis* *lobata, Epilobium hirsutum, Eupatorium* *cannabinum, Euphorbia lucida, Equisetum ramosissimum, Equisetum telmateia, Fallopia* *dumetorum, Festuca gigantea, Filipendula ulmaria, Fragaria vesca, Galeopsis speciosa, Galium* *aparine, Geranium* *palustre, Geranium phaeum, Geranium robertianum, Geum* *rivale, Geum urbanum, Glechoma* *hederacea, Glycyrrhiza echinata, Heracleum sibiricum, Humulus* *lupulus, Impatiens balfourii, Impatiens glandulifera, Impatiens noli-tangere, Inula* *helenium, Inula viscosa, Ipomoea* *sagittata, Lamium maculatum,* *Lapsana* *communis, Leersia* *oryzoides, Leonurus* *cardiaca, Lycopus* *europaeus, Lythrum salicaria, Lysimachia* *vulgaris, Lunaria* *rediviva, Mentha* *longifolia, Mycelis muralis, Myosoton* *aquaticum, Parietaria* *officinalis, Petasites* *albus, Petasites hybridus, Phalaris* *arundinacea, Physalis alkekengi,* *Poa nemoralis, Poa sylvicola, Pseudolysimachion longifolium, Pulicaria* *dysenterica, Rubus caesius, Rumex* *conglomeratus, Salvia glutinosa,* *Scrophularia* *umbrosa, Silene* *dioica, Smyrnium perfoliatum, Solidago* *gigantea, Stachys sylvatica, Symphyotrichum* *lanceolatum, Symphytum officinale, Tanacetum vulgare, Telekia speciosa, Trollius* *europaeus, Urtica* *dioica, Valeriana* *sambucifolia, Viola* *alba.* Only in Madeira: *Ageratina* *adenophora*, *Asparagus* *asparagoides*, *Bidens* *pilosa, Cardiospermum* *grandifolium, Ipomoea* *acuminata, Rubus* *ulmifolius, Tropaeolum* *majus.*  Bryophytes: *Brachythecium rivulare, Brachythecium rutabulum, Eurhynchium striatum, Plagiomnium cuspidatum, Plagiomnium elatum, Plagiomnium undulatum.*  Fauna  Invertebrates: *Larinioides* *cornutus*, *Gryllotalpa* *gryllotalpa*, *Calopteryx* *virgo*, *Amara* *sp.pl*.  Vertebrates: *Neomys* *anomalus*, *Crocidura* *leucodon*. |
| E5.5 Subalpine moist or wet tall-herb and fern fringe | The tall forb communities of Habitat type E5.5 are found at relatively cool and humid places in low and high mountain ranges throughout Europe, with their optimum in the subalpine zone; moreover, they can be found in the arctic regions of Scandinavia. They can be seen as a vicariant of the communities of habitat type E5.4, occurring at lower altitudes. In the mountains of Central Europe, the communities usually occur above 1,000 m altitude, but in Southern Europe they often don’t grow below 1,600 m. The stands occur along streams, between large rocks, under scrub (mainly of *Sorbus aucuparia*), in mosaic with *Alnus* and *Salix* scrub, and on the edge of forests. In spite of the high atmospheric humidity, bryophytes do not play an important role in the vegetation. At all these places, snow may accumulate during winter and the vegetation is unmistakeably chionophilous. Along streams, the communities may form long strips of hundreds of meters, mostly just a few meters wide, at other places they occur in the form of patches.  The height of the – generally one-layered – stand reaches up to 1.5-2 m, with tall herbs and grasses as dominants, sometimes with a high cover of ferns. The cover of the vegetation is almost always 100%. The species composition of the plant communities is very diverse, with a high number of endemic species, reflecting the isolated position of these ecosystems, similar to other high-mountain vegetation types. The endemic species belong to genera like *Aconitum*, *Alchemilla, Angelica, Cirsium*, *Geum* and *Ranunculus*. From a historic-geographic point of view, the occurrence of a number of species that nowadays dominate lowland meadows is interesting, like *Arrhenatherum elatius*. Widespread species in these conspicuous mountain communities are *Adenostyles alliariae*, *Veratrum album, Lilium martagon* and *Cicerbita alpina,* among others. The plant diversity is reflected in the distinction of various alliances, but they all belong to the class *Mulgedio-Aconitetea*. Most of the communities are natural, but also the semi-ruderal and eutrophic tall-forb communities near resting places of cattle (assigned to the alliance *Rumicion alpini*) belong to this habitat type.  Indicators of good quality:   * High species richness * Richness of regional endemics and rare species * Lacking of invasive and/or ruderal species * Dominance of tall-herbs, tall grasses or ferns   Characteristic species:  Vascular plants: *Achillea* *distans*, *Achillea* *grandifolia*, *Aconitum lamarkii*, *Aconitum  lycoctonum* subsp. *vulparia, Aconitum napellus*, *Aconitum nevadense*, *Aconitum tauricum*, *Aconitum vulparia*, *Aconogonon* *alpinum, Adenostyles* *alliariae*, *Adenostyles briquetii*, *Alchemilla* *glabra*, *Alchemilla glaucescens*, *Alchemilla obtusa*, Alchemilla *plicatula*, *Allium* *schoenoprasum*, *Allium victorialis, Angelica pancicii*, *Aquilegia* *bernardii*, *Aquilegia pyrenaica* subsp. c*azorlensis*, *Athyrium* *distentifolium*, *Athyrium filix-femina*, *Aruncus dioicus, Atropa baetica*, *Betonica* *jacquinii*, *Blechnum* *spicant*, *Calamagrostis* *arundinacea*, *Campanula* *serrata*, *Campanula trachelium* subsp. *athoa*, *Cardamine raphanifolia* subsp. *acris*, *Cardamine rivularis*, *Carduus personata, Carex frigida*, *Carex vulpina*, *Carum* *carvi, Chaerophyllum* *byzantinum*, *Chaerophyllum villarsii, Cerinthe* *glabra, Cicerbita* *alpina*, *Cicerbita plumieri*, *Cicerbita pancicii*, *Cirsium* *appendiculatum*, *Cirsium erisithales*, *Cirsium helenioides*, *Cirsium flavispina*, *Cirsium spinosissimum*, *Cirsium tymphaeum*, *Chaerophyllum* *aureum*, *Crepis* *paludosa*, *Dactylorhiza* *cordigera*, *Dactyorhiza saccifera*, *Delphinium* *elatum, Digitalis* *grandiflora, Doronicum* *austriacum*, *Doronicum columnae*, *Doronicum corsicum*, *Doronocum grandiflorum, Draba* *nemorosa, Dryopteris* *dilatata*, *Epilobium* *alpinum*, *Epilobium montanum*, *Erica* *terminalis*, *Eryngium* *alpinum*, *Heracleum* *elegans*, *Heracleum pyrenaicum,* *Heracleum ternatum*, *Heracleum transsilvanicum*, *Heracleum verticillatum*, *Hypericum* *corsicum*, *Hypericum tetrapterum*, *Festuca* *carpatica*, *Gagea* *fragifera, Gentiana* *asclepiadea, Gentiana lutea, Gentiana punctata, Geranium* *asphodeloides*, *Geranium palustre*, *Geranium phaeum*, *Geranium sylvaticum*, *Geum* *coccineum*, *Geum rivale*, *Lactuca* *alpina, Laserpitium* *latifolium, Laserpitium longiradium*, *Leucanthemum* *waldsteinii*, *Leuzea* *rhapontica*, *Lilium* *martagon, Lunaria rediviva, Molopospermum* *peloponesiacum*, *Myositis* *alpestris*, *Myosotis soleirolii*, *Narcissus nevadensis*, *Narthecium* *reverchonii*, *Oreopteris limbosperma*, *Pedicularis* *foliosa*, *Peucedanum* *ostruthium*, *Pinguicula* *balcanica, Pinguicula corsica,* *Phleum* *alpinum*, *Phyteuma ovatum, Poa* *supina, Polygonatum* *verticillatum*, *Prenanthes* *purpurea,* *Ranunculus* *aconitifolius, Ranunculus lanuginosus*, *Ranunculus platanifolius*, *Rhodiola* *rosea*, *Rumex* *alpinus*, *Rumex arifolius, Rumex pseudoalpinus, Salix* *helvetica, Salix lapponum, Saxifraga* *rotundifolia*, *Scrophularia* *auriculata*, *Scrophularia scopolii*, *Senecio* *alpinus*, *Senecio elodes*, *Senecio nemorensis*, *Senecio subalpinus*, *Telekia* *speciosa*, *Thalictrum aquilegifolium, Tozzia* *alpina,* *Trichophorum* *cespitosum*, *Trisetum* *fuscum*, *Trollius* *europaeus*, *Valeriana pyrenaica*, *Valeriana rotundifolia*, *Veratrum* *album*, *Viola* *biflora.* |
| E6.1 Mediterranean inland salt steppe | The vegetation of this habitat is dominated by succulent plants of the *Chenopodiaceae* family and perennial, rosette-forming *Limonium* species as well as other salt-tolerant Mediterranean plants and sometimes also albardín (esparto like) grass (*Lygeum spartum*) in the less saline stretches of the gradient. This habitat occurs in the Mediterranean area, in continental or coastal areas but far from the influence of the sea, under severe climatic drought conditions where endorrheic (non or poorly-drained) clay basins accumulate soluble salts diluted from the surroundings. Several circumstances need to occur for this to happen: a long and deep summer drought, geological material with abundance of soluble salts (often sulfates) and a flat or gentle topography in which such basins can take place, such as the large depressions of some fluvial systems. Under such conditions, soils are temporarily permeated (though not inundated) by saline water and subject to extreme summer drying, with formation of salt efflorescence which is conspicuous during the dry periods, particularly the summer, and forms a white crust of salt micro-crystals. The most characteristic vegetation is represented by the following species: *Sarcocornietea fruticosi* (*Limonietalia* and *Sarcocornietalia), Juncetea maritimi (Juncetalia maritimi), Thero-Suaedetea (Thero-Salicornietalia)* and *Saginetea maritimae (Frankenietalia pulverulentae).* Different communities belonging to these units appear in the interior salty steppes in a diversity of combinations depending on the geography, salt concentration and climatic conditions. Often they are surrounded by a ring of *Lygeum spartum* (albardín) or *Stipa tenacissima* (esparto) grassland in the foothill of the depression together with the succulents, a high number of narrow endemic species of *Limonium* occur in those communities and with a number of broader distributed reeds (*Juncus*) and annuals. This vegetation complex presents a phenology in which annuals develop in early spring and perennials in late summer, in a successive flowering pattern which is particularly useful for the local herding management which has to survive the very severe summer drought.  In many areas of the Iberian Peninsula, these salt steppes have been traditionally grazed by sheep or goats, and such use has been compatible with its conservation in good conditions, with all the halophile species and some others linked with grazing activity. Nevertheless, in recent times, as a result of an ancient belief in the local population that these areas could be transformed into arable land, some disastrous initiatives have taken place such as draining, tilling, fertilizing and others, which have caused severe damage to this habitat. This has been done in spite of being declared as a priority habitat by the European Union (EU), in part due to the pressure of the local rural population wills, with the goal of converting these poor and sterile areas into productive ones.  Indicators of good quality:   * Dominance of halophile species * A medium to high vegetation cover * Absence of nitrophilic species linked to human activities * No visible anthropic disturbances due to draining, tilling, building activities, rubbish accumulation or intensive trampling   Flora: Vascular plants. This habitat is characterized by the following halophytic perennials of inland salt steppes: *Arthrocnemun macrostachyum, Carex punctata* subsp*. lainzii, Elytrigia curvifolia, Frankenia corymbosa, Halocnemum strobilaceum, Gypsophila tomentosa, Helianthemum polygonoides, Limonium angustibracteatum, Limonium aragonense, Limonium caesium, Limonium carpetanicum, Limonium catalaunicum, Limonium cofrentanum, Limonium cordovillense, Limonium costae, Limonium delicatulum, Limonium dichotomum, Limonium erectum, Limonium furfuraceeum, Limonium hybericum, Limonium insigne, Limonium lobetanicum, Limonium majus, Limonium minus, Limonium pinillense, Limonium quesadense, Limonium ruizii, Limonium santapolense, Limonium soboliferum, Limonium squarrosum, Limonium stenophyllum, Limonium sucronicum, Limonium toletanum, Limonium tournefortii, Limonium viciosoi, Microcnemum coralloides, Puccinellia fasciculata, Puccinellia hispanica, Puccinellia pungens, Senecio auricula* subsp*. auricula, Senecio auricula* subsp*. castellanus, Sonchus crassifolius, Suaeda vera* subsp*. braun-blanquetii.*  Halophytic perennials: *Juncus acutus,* *Juncus maritimus, Juncus subulatus, Plantago maritima.*  Halophytic annuals: *Aeluropus littoralis, Frankenia pulverulenta, Halopeplis amplexicaulis, Hordeum marinum, Hymenolobus procumbens, Mesembryanthemum crystallinum, Mesembryanthemum nodiflorum, Parapholis incurva, Sagina maritima, Salicornia patula, Sphenopus divaricatus, Spergularia marina, Spergularia media, Suaeda maritima, Suaeda splendens.* |
| E6.2 Continental inland salt steppe | Salt steppes (also called alkali steppes) occur on plains in the Eurasian steppe and forest-steppe zones from the Great Hungarian Plain and adjacent areas through the Danube Lowland in Romania and Bulgaria to Ukraine, Russia, Kazakhstan and Mongolia. The matrix of the salt steppe is formed of steppe grassland dominated by *Festuca pseudovina* and *Artemisia santonicum* and grassland of *Puccinellia distans* agg. at muddy sites that are wet or shallowly flooded in spring but dry out for long periods in summer. Often these grasslands are open and species-poor. On less saline soils, generalist halo-tolerant species are common, including *Bromus hordeaceus*, *Elymus repens*, *Inula britannica*, *Plantago lanceolata* and *Poa bulbosa*. With increasing salt concentration, these species become rarer while obligate or facultative halophytes increase in frequency, for example *Cerastium dubium*, *Plantago maritima*, *Scorzonera cana* and *Tripolium pannonicum*.  Within this saline grassland matrix, patches of one to few square metres with different saline vegetation occur, reflecting small differences in microtopographic position and salt concentration: (1) species-poor to single-species stands of the annual chenopod *Camphorosma annua* are found in small depressions with very high salt concentration and nearly bare soil in Hungary and adjacent countries; (2) stands of perennial *Camphorosma monspeliaca* are found in similar habitats in Macedonia and Bulgaria, however, this vegetation can also be found on steep slopes and slope bases; (3) patches of open vegetation with *Pholiurus pannonicus* and *Plantago tenuiflora* are found in erosion troughs that are flooded in spring, but dry out for a long period in summer. Finally, species-poor stands of annual grasses *Crypsis aculeata* and *Heleochloa schoenoides* occur on bottoms of shallow saline lakes that are subject to slow draining in late spring and summer, but such communities are considered under habitat C3.5c.  This habitat occurs on Solonetz soils, which are characterized by high concentration of easily soluble salts, especially sodium and potassium carbonates. These soils are wet in spring and can be locally shallowly flooded, however they are dry in summer when polygonal cracks often appear on the surface. The columnar structure of the Solonetz soils and erosion by floods causes the development of complex microtopography of the salt steppe.  Salt steppes have traditionally been used as livestock pastures and this management continues in many areas until the present. They are less sensitive to overgrazing or abandonment than other types of lowland grasslands, because on the one hand they are well-adapted to disturbance and have a high resilience, and on the other hand competitive species have reduced ability to spread in saline habitats.  Large areas of salt steppe were destroyed or strongly altered by attempts of their agricultural improvement such as ploughing, fertilizing or drainage. On drained habitats salt concentration decreases and competitive non-halophytic grasses and dicots can spread. If this is combined with cessation of grazing, the salt steppe can change into closed grasslands composed of generalist non-halophytic species. On the other hand, some floodplain meadows changed into salt steppe after artificial drainage. These secondary salt steppes lack the microtopography typical of primary salt steppes and contain some species of floodplain meadows.  Indicators of good quality:   * Presence of obligate halophytic species * Presence of typical microtopography of the salt steppe * Existence in the grassland matrix of small patches with extreme ecology (spring flooding or very high salt concentration) and occurrence of specialist species * Moisture regime with wet soils in spring that dry out in summer * No spread of ruderal or competitive generalist herb species * Absence of the species of floodplain meadows * Absence of strong overgrazing * Large continuous area of this habitat   Characteristic species:  Flora, Vascular plants: *Artemisia santonicum*, *Bupleurum tenuissimum*, *Camphorosma annua*, *C. monspeliaca*, *Carex stenophylla*, *Cerastium dubium*, *Festuca pseudovina*, *Galatella sedifolia*, *Peucedanum officinale*, *Pholiurus pannonicus*, *Plantago coronopus*, *P. maritima*, *P. tenuiflora*, *Puccinellia distans* agg., *P. festuciformis* subsp. *convoluta*, *Ranunculus pedatus*, *Scorzonera cana*, *Trifolium retusum*, *Tripolium* (=*Aster*) *pannonicum* |
| E6.3 Temperate inland salt marsh | This habitat refers to inland salt marshes and meadows in temperate and continental regions, which are dominated by halophytic (salt-adapted) plants. In Western and Central Europe this habitat is found in places where fossil salt lies close to the surface or were relict sea water is present, resulting in brackish or saline ground and surface water. Such sites are extremely rare.  In Western and Central Europe the habitat occurs on several types of bedrock, like on marble in Lorraine, on travertine in the Auvergne, on so-called Zechstein in England, Germany and Poland, and on miocene salt rocks in Poland. This habitat is naturally found in places where fossil salt deposits have been uplifted to the surface in the form of domes or pillows or where salty water related to the salt stratums or relict seawater is present close to the surface. In the Atlantic regions plant communities belong to the (mainly coastal) classes *Thero-Salicornietea* and *Juncetea maritimi* and the alliance *Potentillion anserinae*. The species composition resembles that of coastal salt marshes (A2.5abc), but some coastal species are never found in inland sites and also the functioning of inland and coastal salt marshes is very different. A very specific case form the saline spring fens on travertine soils in the Slovakian Carpathians, with among others *Trichophorum pumilum*, *Pinguicula vulgaris*, *Parnassia palustris* and *Primula farinosa*, but these are considered as a subhabitat of D4.1a (Small-sedge base-rich fens and calcareous spring mires).  In more continental regions inland salt pans are more common, like in the Pannonian plain, Central Balkan and in the steppic areas of South-Eastern Europe. Here the habitat is found on hypersaline (solonetz and solonchak) soils, where it occurs as depressions within a matrix of alkaline steppes and as subhalophytic, mesic meadows. In these regions the habitat contains vegetation of the classes *Thero-Salicornietea* (alliance *Salicornion prostratae*) and *Festuco-Puccinellietea* (alliance *Juncion gerardii* and *Beckmannion eruciformis*).  Like in coastal salt marshes, within the habitat often a vegetation zonation is found, reflecting different levels of salinity, related with microtopography. Lower parts of the habitat in most cases are sparsely vegetated with *Salicornia europaea*, *S. emerici var. vicensis* (in Lorraine), *S. perennans* (= *S. prostrata*), *Suaeda maritima* , *Suaeda prostrata*, *Suaeda pannonica*, *Salsola soda, Spergularia salina* and *Spergularia maritima*, *Puccinellia distans* and sometimes *Puccinellia fasciculata*. In the Atlantic region on moist sites, the saline meadows and pastures resemble that of coastal salt marshes, with a combination of *Agrostis stolonifera*, *Juncus gerardi*, *Glaux maritima*, *Carex distans*, *Plantago maritima*, *Glaux maritima, Tetragonolobus maritimus, Triglochin maritima* and *Aster tripolium*, and on more brackish sites *Lotus tenuis*, *Trifolium fragiferum*, *Potentilla anserina*, *Alopecurus bulbosus*, *Alopecurus geniculatus*, *Festuca arundinacea*, *Blysmus rufus* and *Juncus compressus*.  Moist saline meadows in the continental region are characterised by *Juncus gerardi*, *Carex distans*, *Agrostis stolonifera*, *Aster tripolium* subsp. *pannonicus*, *Cirsium brachycephalum*, *Melilotus dentatus*, *Scorzonera parviflora*, *Mentha pulegium*, and *Lotus tenuis*. On drier edges communities with *Puccinellia distans* or *Puccinellia limosa* are found (alliance *Puccinellion limosae*), communities that are also found in (wetter parts of) salt steppes (E6.2). In South-Eastern Europe halophytic and sub-halophytic moist meadows that are dominated by *Elytrigia obtusiflorus (Elymus elongatus* subsp. *ponticus*), *Festuca arundinacea* and *Phacelurus digitatus* are included in this habitat.  Besides the dominance of halophytic and sub-halophytic plant communities, also part of the associated fauna is characteristic halophytic. Examples are the mott *Coleophora adjunctella* (living on *Juncus gerardi*), and the beetles *Hygrotus parallelogrammus*, *Enochrus bicolor* and *Bembidion minimum*.  Small stands of *Bolboschoenus maritimus, Schoenoplectus tabernaemontani* or *Phragmites australis* may be present, especially where the water table remains high during the year, but where these species form larger, brackish reedbeds, they are considered as a separate wetland habitat C5.4. In the continental regions in drier sites alkaline steppic grasslands are found, which are considered under habitat E6.2 (Continental inland salt steppes), and have some species in common. Mediterranean inland salt marshes and steppes are considered as a separate habitat under E6.1. Habitats with saline vegetation of the *Crypsietea* *aculeatae* are considered under habitat C3.5c.  The habitat can occur as a natural or semi-natural system. In the latter case sites are traditionally used as meadows or pastures. In natural sites succession is mainly limited or prevented by long-term inundation and high soil salinity. Desalinisation and abandonment of traditional management may lead to an increase of ruderal species and scrubs, and transitions towards other habitats.  In Western and Central Europe the habitat is naturally rare in Germany, Poland, Czech Republic, Slovakia, England, France and Italy. Also on the Balkan the habitat is relatively rare, and among others found in Macedonia and Bulgaria. Inland salt pans are more common in the Pannonian lowland and occur even more widespread further eastwards, in the steppe regions of the Ukraine, the Caspian Lowlands of Russia and the Central Asian (semi)deserts.  Although in some cases referred to as Annex 1-type 1340 and having similar vegetation, saline coastal sites that became relatively recently (approximately since the Middle Ages) isolated from the sea by natural dynamics or embankment are not included here, but are considered under coastal habitats (B-group).  Anthropogenic sites associated with salt industry or other present human activity are not considered under this habitat (like saline sites along roads resulting from salt deposition during winter). But abandoned salt mines or waste deposits, which now have a semi-natural character and harbour the characteristic species combination, may be included under the habitat.  Indicators of good quality:   * High water table during (at least) part of the season, resulting in regular disturbance * Dominance of halophytic and sub-halophytic species * Presence of rare, halophytic fauna * High soil salinity (ECe over 4 dS/m) * Maintenance of traditional management (extensive grazing, mowing) * Absence of ruderal species and shrubs * Absence of disturbance by man   Characteristic species (\*= also in E6.2):  Flora: *Agrostis stolonifera, Alopecurus bulbosus, Aster tripolium* (incl. subsp. *pannonicum = Tripolium pannonicum*)\**, Atriplex prostrata* (=*hastata*), *Bolboschoenus maritimus* (= *Scirpus maritimus*), *Beckmannia eruciformis*, *Blysmus rufus, Bupleurum tenuissimum, Carex cuprina, Carex distans*\**, Carex divisa, Centaurium pulchellum, Cirsium brachycephalum, Frankenia hirsuta, Glaux maritima, Halimione pedunculata, Halocnemum strobilaceum, Hordeum hystrix, Hordeum marinum, Hordeum jubatum, Juncus gerardi, Leontodon taraxacoides* (= *L. saxatilis*)*, Limonium vulgare, Lotus glaber* (= *L. tenuis*), *Melilotus dentatus, Odontites vulgaris* (= *O. serotina*) *, Plantago coronopus, Plantago maritima, Plantago tenuiflora, Potentilla anserina, Puccinellia distans, Puccinellia limosa*\**, Pulegium vulgare, Ranunculus sardous, Salicornia emerici, Salicornia europaea* (incl. *S. ramosissima*), *Salicornia perennans (= S. prostrata), Salsola soda, Samolus valerandi, Schoenoplectus tabernaemontani* (=*Scirpus lacustris ssp. tabernaemontani*), *Scorzonera parviflora*, *Spergularia media* (= *S.* *maritima*)\**, Spergularia marina* (= *S.* *salina*)\**, Suaeda maritima, Suaeda prostrata, Taraxacum bessarabicum, Trifolium fragiferum, Triglochin maritima.*  Fauna (examples):  Birds: 1. included in Birds Directive - *Crex crex, Coturnix coturnix, Luscinia svecica, Botaurus stellaris, Ixobrychus minutus, Rallus aquaticus, Porzana porzana, Gallinula chloropus, Circus aeroginosus, Vanellus vanellus, Limosa limosa, Gallinago gallinago, Tringa totanus*, 2. other:  *Anas aquerquedula, Perdrix perdrix, Tachybaptus ruficollis, Charadius dubius, Lanius excubitor, Riparia riparia, Acrocephalus schoenobaenus, A. arundinaceus, Saxicola rubetra, S. rubicola, Oenanthe oenanthe, Anthus pratensis, Motacilla flava, Emberiza calandra*.  Invertebrates: 1. aquatic *Coleoptera – Hygrotus parallelogrammus, H. nigrolineatus, Ochthebius auriculatus, O. marinus, Berosus spinosus, Hetrocerus parallelus, H. flexuosus, H. obsoletus*, 2. *Coleoptera*: *Dyschurius chalceus, D. salinus, Bembidion varium, B. fumigatum, B. aspericolle, B. minimum, Pogonus chalceus, Anisodactylus poecilioides, Dicheirotrichus obsoletus, Acupalpus elegans, Amara strandi, A. strenua,  A. convexiuscula*, 3. *Dolichopodidae* – *Micromorphus albipes, Thinophilus flavipalpis, T. ruficornis, Schoenophilus versutus, Syntormon filiger, Campsicnemus magius, C. pictornis, Melanostolus nigricilius, Tachytrechus notatus, Dolichopus clavipes, D. diadema, D. latipennis, D. sabinus, Medetera truncorum*. |
| E7.1 Temperate wooded pasture and meadow | These are open wooded landscapes created and maintained through traditional grazing, hay-making and silviculture. The wooded pastures are typical of the lowlands, hills and mountains throughout the nemoral zone, the wooded meadows mostly found in the mountains and riparian areas of Central Europe. Regional variations in climate and terrain, in purpose and origin, land use and disturbance regime make this habitat very diverse and dynamic with structure and species composition strongly influenced by the landowners and farmer/herders. Due to their semi-open character and their landscape scale, they can accommodate numerous species, many of which are rare and endangered. Other types are relatively species-poor with widely distributed components, but here combined in highly distinctive ways. Traditional wooded pastures and meadows characteristically express the locally distinctive social and economic history and are therefore of considerable cultural significance like high nature value farmland.  Deciduous trees are the usual canopy dominants, particularly *Quercus robur,* *Q. petraea* and *Fagus sylvatica* but also commonly *A. campestre, A. platanoides, Acer pseudoplatanus, Alnus glutinosa, Betula pendula, Carpinus betulus, Castanea sativa*, *F. angustifolia, Fraxinus excelsior, Populus alba, Populus nigra, Pyrus pyraster, Salix* spp*., Sorbus torminalis, Tilia cordata, T. tomentosa,* and *Ulmus glabra.* Typical coniferous trees are *Pinus* spp., *Picea abies* and *Larix decidua*. The spatial arrangement of trees may be close to a regular pattern, where the trees were deliberately planted, sparsely distributed under traditional management or, in ornamental parklands, arranged by landscape design. Individual trees may be of very great age and pollarded veterans can be a distinctive feature.  The open canopy can allow the establishment of a diverse understorey but grazing and/or mowing may largely prevent the development of saplings and shrubs. The species and their density depend on site characteristics, local tradition and management regimes but the most typical smaller trees and shrubs are *Crataegus laevigata, C. monogyna, Cornus mas, Corylus avellana, Cytisus scoparius, Euonymus europaeus, J. oxycedrus, Juniperus communis, Ligustrum vulgaris, Prunus spinosa, Rosa spp., Rubus canescens* with *Calluna vulgaris* a common sub-shrub. The composition of the herb layer depends on regional climate and terrain conditions as well as on the kinds of grazing and hay-making. The main herbs are grassland generalists such as species of *Dactylis, Lolium, Medicago* and *Trifolium* but plants more or less exclusive to silvipastoral habitats are poisonous taxa such as *Asphodelus spp., Dictamnus albus, Helleborus spp., Paeonia spp., Pulsatilla spp.* and *Veratrum nigrum.*  Old-growth and scrub- and coppice- wooded pastures, grazed orchards, meadow orchards have many different sub-types in the nemoral region, including the following: nemoral deciduous *hudewald* or park of lowland to submontane Fagetalia landscapes in western and central Europe; montane to subalpine deciduous, coniferous or mixed pastoral woodland or *Weidfeld* dominated by Fagus, Picea or Acer in the mountains of central, southern and southeastern Europe; nemoral lowland deciduous *hudewald*, park; thermophilous deciduous *hudewald* of colline to montane Quercetalia pubescentis landscapes in southern, south-east and south-central Europe; deciduous riparian and lowland *hudewald* with flooding regime of the great river basins, chiefly in eastern and south-eastern Europe; montane to subalpine coniferous pastoral woodland dominated by *Pinus* or *Larix* in the high mountains of temperate Europe; montane to altimontane coniferous or mixed *Pinus* and *Abies* wood-pasture of the mountains of the wider Mediterranean region; *Wacholderheide* pastures wooded with *Juniperus communis* of Fagetalia and Quercetalia roboris landscapes in lowland to montane north-western and central Europe; thermophilous deciduous coppice wood-pasture of Quercetalia pubescentis landscapes in southern and south-eastern Europe; subcontinental shibliak distributed in pastures of wood-steppe and Quercetalia pubescentis regions in south-eastern and south-east central Europe; submediterranean shibliak distributed in Quercetalia pubescentis regions of southeastern Europe; rangelands with tall juniper in southern and southern central European mountains, more widely distributed in Anatolia, the Black Sea area and the Middle East; ancient aristocratic parklands and royal hunting forests in England.  Indicators of quality:   * Abundance of old-growth, veteran trees * Regeneration of open-growth trees * Regular and deliberate management maintaining high nature and cultural value as well as agricultural value * Little regeneration of the woody element and no scrub encroachment over the grassland * No decrease in grazing pressure or frequency of mowing * No land-use intensification such as removal of the structural elements to extend the grassland, use of fertilizer and artificial seeding, increase of livestock density * No spread of non-native trees from planted stock or naturally invasive sources   Characteristic species:  Canopy vascular plants: *A. campestre, A. platanoides, Acer pseudoplatanus, Alnus glutinosa, Betula pendula, Carpinus betulus, Castanea sativa*, *Fagus sylvatica Fraxinus angustifolia, F. excelsior,* *L*arix decidua, Picea abies, *Pinus cembra*, *P, uncinata, Populus alba, Populus nigra, Prunus avium, Pyrus pyraster, Quercus robur,* *Q. petraea,* *Salix* spp*., Sorbus torminalis, Tilia cordata, T. tomentosa, Ulmus glabra.*  Understorey: *Crataegus laevigata, C. monogyna, Cornus mas, Corylus avellana, Cytisus scoparius, Euonymus europaeus, J. oxycedrus, Juniperus communis, Ligustrum vulgaris, Prunus spinosa, Rosa spp., Rubus canescens.*  Field layer vascular plants: *Asphodelus spp., Calluna vulgaris, Cytisus scoparius, Dactylis* spp.*,Dictamnus albus, Helleborus spp., Lolium* spp.*, Medicago* spp., *Paeonia spp., Pteridium aqulinium, Pulsatilla spp., Trifolium* spp., *Veratrum nigrum.*  Epiphytic cryptogams: species of *Evernia, Fuscopannaria, Ochrolechia, Parmelia, Pertusaria, Physcia, Physconia, Ramalina, Schistmatomma, Antutrichia curtipendula, Leucodon sciuroides, Neckera complanata, N. crispa.* |
| E7.2 Hemiboreal and boreal wooded pasture and meadow | These are open wooded landscapes of lowlands, hills and mountains of northern Europe, created and maintained to a significant degree through traditional grazing, hay-making and woodland (tree) management, mainly by pollarding. Variation in land use and disturbance regime as well as in their abiotic environment make wooded pastures very diverse and dynamic. The species composition and structure are strongly influenced by the conscious management by the owner/herder. Traditional wooded pastures express part of the local social and economic history and are therefore of considerable cultural significance and are considered as high nature value farmland areas. These are threatened by various factors, most of them related to land-use change (abandonment due to lack of grazing or hay-making, and tree cutting because of CAP rules, e.g. trees with higher than 3 meter crone diameter are not regarded as pasture).  The hemi-boreal and boreal wooded pastures and meadows occur in Fennoscandia and in Estonia. They are grazed mainly by cattle and sheep. The type also includes (particularly in Finland) deciduous forests established after slash-and-burn cultivation, that was a characteristic feature of the former land use in Finland. Wooded meadows were once abundant in northern Europe. The most common type of the wooded meadows are *Kratt* wood and deciduous leaf meadows. Wooded meadows are among the most diverse habitats of Europe. Some of the current wooded meadows in Estonia are amongst ecosystems with the world record in plant species diversity (up to 76 species of vascular plants on a square meter). However, not all occurrences of the habitat type are particularly rich in species.  Characteristic plant species of the canopy layer include *Betula* spp.*, Quercus robur, Fagus sylvatica, Tilia cordata, Alnus incana, Corylus avellana* and conifers(*Pinus sylvestris, Picea abies*)*.* The canopy cover typically varies between 10 and 35 %, and in the field layer meadow-like vegetation is more abundant compared to forest vegetation. Old, large oaks also occur in some pastures. Typically the shrub layer is missing or scarce, but *Juniperus communis* is rather common. Dominant plant species of the herb layer include graminoids like *Agrostis capillaris*, *Deschampsia* spp., *Festuca ovina*, *Luzula campestris* and *Poa pratensis*, and herbs like *Alchemilla* spp., *Fragaria vesca*, *Geranium sylvaticum* and *Trifolium repens*. The species composition is a mixture of meadow and forest species and therefore includes also many fringe species. Typical forest species are among others *Vaccinium myrtillus*, *Anemone nemorosa* and *Maianthemum bifolium*. Epiphytes may form an important added value, especially if there is oak, ash, elm or maple present among the trees.  Indicators of quality:  High presence and abundance of old-growth, veteran trees; Presence and abundance of epiphytes lichens; Forest regrowth, shrub encroachment, forest succession decrease the quality through the loss of the typical physiognomy; No land-use abandonment (e.g. high enough grazing pressure); No land-use intensification (e.g. too high livestock densities or fertilization); No spread of any non-native species  from planted stock or naturally invasive sources.  Characteristic species:  Trees/shrubs: *Alnus incana, Betula* spp.*, Corylus avellana, Fagus sylvatica, Fraxinus excelsior, Juniperus communis, Pinus sylvestris, Picea abies, Quercus petraea, Tilia cordata, Ulmus glabra, U. minor*  Understorey: *Ajuga pyramidalis, Antennaria dioica, Campanula rotundifolia, Fragaria vesca, Luzula campestris, Succisa pratensis, Veronica officinalis , V. chamaedrys*  Epiphytic bryophytes: *Diplotomma alboatrum, Gyalecta ulmi, Homalothecium sericeum*,*Lobularia pulmonaria, Orthotrichum stramineum, Ramalina* spp*., Sclerophora* spp*., Usnea* spp*.* |
| E7.3 Mediterranean wooded pasture and meadow | These are open wooded landscapes created and maintained through traditional grazing, hay-making and woodland (tree) management. Variations in land use and disturbance regime as well as in their abiotic environment make wooded pastures and meadows very diverse and dynamic. Due to their semi-open and patchy character, as well as to their habitat continuity, they accommodate numerous species, many of which are rare and endangered. The species composition and   structure are strongly influenced by the conscious management by the owners/herders. Traditional wooded pastures and wooded meadows express part of the local social and economic history and are therefore of considerable cultural significance. These habitats have a high nature and cultural value and considered as high nature value farmland areas. These are threatened by various factors, most of them related to land-use change.  The Mediterranean wooded pastures and meadows are typical in Spain, Portugal, Greece, South-Italy and South-France, and some parts of the Balkan. These have separated into old-growth wooded pasture; scrub and coppice wooded pasture.  In the western Mediterranean the most extensive wooded pastures are the dehesas (Spain) and montados (Portugal), where scattered evergreen trees coexist with pastures and arable lands. These habitats are dominated by scattered evergreen oaks Quercus ilex, Q. rotundifolia, Q. suber, Q. coccifera, while in other mediterranean wooded pasture are featured by Q.cerris, Q,frainetto, Q. ithaburensis, Q. petraea and Q. pubescens, Castanea sativa, Olea europea, Carpinus orientalis, and Fraxinus ornus.  The shrub layer is characterized by evergreen sclerophyllous bush and scrub (maquis, garrigue, mattoral, phrygana sensu lato) as Retama sphaerocarpa, Cytisus multiflorus, Phillyrea angustifolia, Cistus ladanifer, Cistus creticus, Q. coccifera, Pistacia lentiscus, Lavandula stoechas ssp., Genista hirsuta, Daphne gnidium, Asparagus acutifolius, Fumana sp., Halimium sp., Helianthemum annua, Tuberaria sp.. The herbaceous layer is usually composed of native annual and perennial vegetation (grasses - Lolium, Bromus, Hordeum etc., legumes - clovers, medicagos, serradela [Ornitophus sp.] etc., crucifers) which are used for grazing. Sometimes cultivated cereals (oat, barley, wheat, rye) are grown. Based on the management of the wooded component wooded pastures can be separated into old-growth with or without pollarding or coppice wood and shrub wooded pasture. The old-growth includes Sclerophyllous pastoral woodland, including the dehesa type, of Quercetea ilicis landscapes in Mediterranean Europe and Deciduous pastoral woodland of Quercetea ilicis landscapes in the Mediterranean. Coppice wood and shrub wooded pastures are mainly located in Spain, France, Italy and the Balkans. These types are the following: Grazed macchia/matorral of Quercetea ilicis landscapes in the Mediterranean; Rangeland mosaic with sclerophyllous or mixed scrub of the pseudomacchia type in southern and south-eastern Europe; Low evergreen open scrub-pastures of the garrigue type in Quercetea ilicis landscapes, interspersed with scattered sclerophyllous, coniferous and deciduous shade-giving trees and small groves, in the Mediterranean lowlands and lower mountains; Rangeland mosaic of montane grassland with sclerophyllous broadleaved trees and/or conifers, frequently lopped or pollarded, in the Mediterranean mountains.  **Indicators of quality:** High presence and abundance of old-growth, veteran trees; Regeneration of tall broad-canopy tree; Regular and deliberate management along with high nature and cultural value farmland guidelines; Forest regrowth, shrub encroachment, wood succession decrease the quality through the loss of the typical physiognomy followed by a decrease in small-scale habitat diversity; No land-use intensification (removal of the structural elements to enlarge the grassland; use of fertilizer and artificial seeding; too high livestock densities); No spread of non-native trees from planted stock or naturally invasive sources.  **Characteristic species:** *Quercus rotundifolia, Q. suber, Q. coccifera s.l., Q. ilex, Castanea sativa, Arbutus unedo, A. andrachne, Erica arborea, Pinus sp., Juniperus oxycedrus, Fraxinus ornus, Carpinus orientalis, Acer sempervirens, Cupressus sempervirens, Pistacia lentiscus, Ceratonia siliqua, Olea europea, Phillyrea latifolia, Pyrus spinosa, Retama sphaerocarpa, Cytisus multiflorus, Cistus ladanifer, C. salviaefolius and C. monspeliensis, C. crispus, Phillyrea angustifolia, Lavandula ssp., Genista hirsuta, Daphne gnidium, Asparagus acutifolius, Sarcopoterium spinosum, Prunus dulcis, Narcissus cantabricus, Ornithogalum ortophyllum subsp. baeticum, Romulea ramiflora, Fritillaria lusitanica, Evax pymaea, Tolpis barbata, etc.* |
| F1.1 Shrub tundra | Tundra is a treeless habitat, dominated by mosses, lichens, herbs and low shrubs, characteristic for arctic and subarctic regions, where the subsoil is permanently frozen (permafrost). The term is also used for physiognomic similar habitats in alpine areas above the timberline, but here it only refers to arctic and subarctic habitats.  Shrub tundra is a tundra type of the southern arctic belt characterized by abundance of medium small and small shrubs, especially *Ericaceous* species. This in contrast to the colder tundra of the middle and northern arctic belts, where mosses and lichens dominate (type F1.2). Permafrost is sporadic within the southern arctic, with mean temperatures of about 0 °C, and average July temperatures below 10 °C . Shrub tundra is a circumpolar arctic type of the tundra’s of Russia, Canada, Alaska and Greenland. In Europe the arctic zone (above the climatic limit of woodland) is mainly found in Russia, but small areas occur on the northern edges of Iceland and Norway, as well as on the islands Jan Mayen, Bjørnøya and the Svalbard archipelago.  In Finnmark, the northern region of Norway, the arctic belt is restricted to the lower altitudes at sea level. Dominant dwarf shrubs here are *Empetrum hermaphroditum*, accompanied by *Salix herbacea* , *Vaccinium myrtilus*, *Vaccinium uliginosum*, *Juncus trifidus, Festuca vivipara* and high abundance of mosses (*Racomitrium lanuginosum*, *Dicranum fuscescens*) and lichens (*Cetraria* *cucculata*, *C. ericetorum*). The habitat forms a gradual transition towards heathlands of the lower alpine zone, with a similar species composition (habitat F 2.2a ‘Alpine and subalpine ericoid shrub’). Differences between tundra and alpine heathland are the shorter growth period and lower soil temperatures in the arctic. Due to grazing (reindeer, rodents) the heathland occurs in mosaic with grasslands. Overgrazing leads to disappearance of lichen cover and specific species, like *Cladina stellaris*.  On Island, the same shrubs are characteristic of the tundra belt and, like in Norway, the transition towards boreal subalpine heathlands (habitat type F2.2a) is gradual. On young lava fields of Island vascular plants occur only scattered, and such pioneer stages of the habitat, dominated by the moss *Racomitrium langinosum*, sometimes accompanied by *R. ericoides*, are considered part of the shrub tundra.  Also on Jan Mayen, situated in the middle arctic belt, *Empetrum hermaphroditum* is the dominant species, growing together with the mentioned *Racomitrium* species and lichens. Here the type is found in a low, oceanic part of the island and – in contrast to other areas – there is no grazing.  On Svalbard shrub tundra is restricted to the warmest part of the island Spitsbergen, the “Innerfjord zone”. This comprises the coastal regions of the central fjords of Spitsbergen, where no sea fog and relatively few clouds result in a slightly warmer climate. Here about 75% of all vascular plants of Svalbard is found. Locally, shrub dominates the tundra. Here, the habitat type is considered a relict vegetation of post-glacial warmer periods. *Empetrum nigrum* and *Vaccinium uliginosum* are the most important species, and here and there *Betula nana* and *Rubus chamaemorus* are found. In the same part of Svalbard low shrubland dominated by *Cassiope tetragona* forms a transition to Moss and Lichen Tundra (F1.2).  **Indicators of quality:**  In good conditions the habitat shows the following characteristics:   * Dominance of dwarf shrubs, * No indication of overgrazing, * No erosion patterns, * No presence of non-native species (like *Lupinus nootkatensis*), * High cover and high diversity of lichens and mosses.   **Characteristic species:**  *Vascular plants: Betula nana, Cassiope tetragona, Empetrum hermaphroditum, Rubus chamaemorus*, *Salix ssp*., *Tofieldia pusilla, Vaccinium uliginosum* *Mosses: Racomitrium ericoides, Racomitrium lanuginosum* *Lichens: Cladina mitis, Cladina rangiferina, Cladina stellaris, Flavocetraria nivalis* |
| F1.2 Moss and lichen tundra | Moss and lichen tundra is a naturally treeless habitat restricted to areas with permafrost and characterized by a relatively thick and dense cover of mosses. Mean annual temperatures range from -7 to -1 °C. More important for the growing period of vegetation, which only starts in early summer, are the mean July temperatures, ranging from 2-3 °C in the north to 4-6 °C in the middle-arctic zone. Average annual precipitation is between 200 and 800 mm.  In Northern Europe, the habitat type is typically found in the lowlands and along the coast on acidic to neutral Mesozoic and Paleozoic bedrock (Svalbard, Bjørnøya) with *Tomentypnum* *nitens* and *Warnstorfia sarmentosa* as dominating species, while *Racomitrium lanuginosum* dominates on neutral to alkaline younger volcanic rocks (Jan Mayen, Iceland). The relief varies considerably. More eastwards in northern Russia the habitat occurs mainly in a flat or slightly hilly landscape. Permafrost leads to micro-patterns with slightly different relief within the habitat.  Characteristic vascular plants in Moss and lichen tundra are the dwarf shrubs *Dryas octopetala* and *Cassiope tetragona*, and *Salix herbacea* and *S. polaris* (in respectively neutral to alkaline and acidic snowbed-like, moist-soils), the sedges *Carex rupestris*, *C. nardina*, *C. misandra*, and *Luzula arctica* (on neutral to alkaline soils), as well as *Luzula confusa* (on acidic soils) and *Saxifraga oppositifolia*. While the vascular flora of the arctic region is relatively species poor, high numbers of lichens, mosses and fungi may be found. The species composition varies with changes in bedrock (alkaline - acidic), soil type (rocky to mesic), snow-cover and exposition.  On Svalbard four main types of Moss tundra may be distinguished: (1) Wet Moss tundra on calcareous bedrock, dominated by *Tomentypnum nitens*. (2) Dry Moss Tundra on calcareous soils with dominance of *Dicranum angustum*, (3) acidic Moss tundra with *Polytrichum strictum*, and (4) Wet Moss tundra on acidic bedrock dominated by *Sphagnum squarrosum*. Typical lichens of this tundra habitat are *Cetrariella delisei* (dominant on stony sites), *Cladonia mitis*, *Cetraria nivalis* and *Sphaerophorus globosus* (on acidic substrates). On Iceland, in the subarctic region, species-poor *Racomitrium lanuginosum* dominated habitats occur on relatively old lava. Such habitats are locally called ‘moss heath’ but are included here in ‘Moss and lichen tundra’. Vascular plants in these moss fields are heathland species, like *Carex bigelowii* or *Empetrum hermaphroditum*. The arctic island Jan Mayen is largely dominated by moss beds of *Racomitrium* *lanuginosum* and *R. canescens*, while – less frequently – also *R. fasciculare* occurs in this habitat. Here, very few plants are able to germinate in this moss tundra, that is only more open in places where it has been eroded, like on steep slopes. The habitat is found on dry slopes, but also on more foggy slopes.  Transitions occur towards more sparsely vegetated polar deserts (habitat H5.1b) in dry areas, tundra mires (habitat D4.2 with *Deschampsia alpina*, *Carex stans* and *Eriophorum scheuchzeri*) in wet locations, snow beds (habitat E4.1 and F2.1) in hollows and depressions with long lasting snow cover (dominated by *Poa alpina* and *Salix reticulata*), sparsely-vegetated stony riverbeds in valleys (habitat C3.5d), communities with different *Potentilla* species on screes (habitat H2.1 and H2.2), and shrub tundra with heathland species (F1.1) on Iceland.  Moss and lichen tundra is a circumpolar habitat type within the arctic regions of Russia, Canada, Alaska and Greenland. In the EU28+, the middle and northern arctic zone is limited to the Svalbard archipelago and to the islands of Jan Mayen and Bjørnøya. On Svalbard it is limited to a relatively small percentage of the total area, as the largest part is covered by glaciers or polar desert (type H5.1b). Additionally the habitat covers parts of Iceland, in the subarctic region. In addition to permafrost, moss tundra on Svalbard depends on the natural fertilizers birds and Svalbard reindeer. The typical Moss tundra can be found under bird cliffs but it is common in all parts of the north-arctic tundra zone on Svalbard.  **Indicators of quality:**  In good conditions the habitat shows the following characteristics:   * Very low cover of (dwarf) shrubs, * Diversity of microhabitats due to frost patterns (polygons) and cryoturbation * High diversity in mosses and lichens * Absence of human disturbance   **Characteristic species:**  *Vascular plants: Campanula uniflora, Carex bigelowii* subsp*. ensifolia, Carex misandra*, *Carex nardina, Carex rupestris, Cassiope hypnoides, Cassiope tetragone, Cerastium nigrescens* subsp*. arcticum, Deschampsia alpina*, *Dryas octopetala, Hierochloë alpina, Luzula arctuata, Luzula confusa, Pedicularis dasyantha, Salix herbacea, Salix polaris, Saxifraga oppositifolia, Silene acaulis*  *Mosses: Aulacomnium turgidum*, *Dicranum elongatum, Encalypta alpina*, *Hylocomium splendens*, *Polytrichum* species, *Pseudocalliergon turgescens*, *Racomitrium ericoides, Racomitrium lanuginosum*, *Sanionia uncinata*, *Tomenthypnum nitens*  *Lichens: Cladina mitis*, *Cetraria nivalis*, *Cetrariella delisei*, *Lecidea ementiens*, *Ochrolechia frigida* |
| F2.1 Subarctic and alpine dwarf Salix scrub | Subarctic and alpine snowbed and snow-patch communities dominated by dwarf willows. The habitat type occurs north of or above the climatic tree limit, but outside the permafrost zone. *Salix* species characteristic to this habitat type are usually under 10 cm in height, and rarely exceed 1,5 m. Dwarf scrub is well developed in boreal and arctic mountains and subarctic lowlands.  The habitat type occurs in boreal and arcto-alpine mountains of Fennoscandia, in the Alps, Pyrenees, Carpathians and Caucasus. Occurrences of the habitat type exist locally also in southern mountains in Europe. In mountains of the nemoral and warm-temperate zones, stands of dwarf willow scrub are of much smaller extent and are characteristic of late-lying snow patches.  The habitat type is found on both siliceous and calcareous bedrock, being more species-rich in the latter. There is no single characteristic species describing all the occurrences, but the vegetation varies in different geographic areas and according to the substrate. Communities vary from acidophile–acidocline vegetation with typical species like *Salix herbacea*, *Carex firma*, *Salix retusa*, *Aster alpinus* and *Carex sempervirens* (alliances *Salicion herbaceae*, *Cassiopo-Salicion herbaceae, Salici herbaceae-Caricion lachenalii*)  to calciphile–calcicline vegetation (alliances *Arabidion caeruleae*). Typical species of the latter are e.g. *Salix polaris, Salix reticulata*, *Salix retusa*, (incl. *Salix kitaibeliana*), *Poa alpina*, *Selaginella selaginoides* and *Bistorta vivipara.*  The communities are adapted to short growing season and late-lying snow, which lasts up to 8–10 months. The humus layer is thin and the soil is gravel or sand. After melting, the habitat can be rather dry in summer. Dwarf willows dominate the vegetation, but mosses and lichens are also abundant.  Snowbed communities dominated by grasses, forbs or mosses do not belong to this habitat type, but are included in type E4.1.  Indicators of good quality:  The following characteristics are indicators of good quality:   * Dominance of dwarf willows * Late-lying snow cover   Characteristic species:  Flora, Dwarf shrubs: *Salix herbacea, Salix polaris, Salix reticulata, Salix retusa, Salix kitaibeliana*  Herbs and grasses: *Alchemilla pentaphyllea*, *Antennaria alpina, Arabis caerulea, Aster alpinus, Bistorta vivipara, Carex bigelowii, C. firma, C. foetida, C. lachenalii, C. sempervirens, Cassiope hypnoides, Diphasiatrum alpinum, Dryas octopetala, Epilobium anagallidifolium, Erigeron uniflorus, Festuca ovina, Gnaphalium hoppeanum, G. supinum, Luzula alpinopilosa, Oxyria digyna, Pinguicula alpina, Poa alpina, Ranunculus glacialis, R. nivalis, R. pygmaeus, Saxifraga cernua, Selaginella selaginoides, Sibbaldia procumbens, Silene acaulis, Thalictrum alpinum, Tofieldia pusilla, Veronica alpina, Viola biflora* In Iceland additionally: *Phleum alpinum, Pyrola minor, Taraxacum* spp.  Mosses and liverworts: *Anthelia juratzkana, Athalamia hyaline, Conostomum* spp., *Blepharostoma trichophyllum, Dicranum* spp., *Distichium capillaceum, Hylocomium splendens, Kiaeria starkei, Kiaeria* spp*., Marsupella* spp.*, Pleurocladula albescens, Pohlia drummondii, Polytrichastrum alpinum, Polytrichum* spp., *Sanionia uncinata,*  Lichens: *Cetrariella delisei, Cetraria islandica, Cladonia coccifera, Lecidea caesioatra, Ochrolechia* spp., *Pertusaria* spp., *Psora decipiens, Solorina crocea, Stereocaulon alpinum, Stereocaulon* spp.  Fauna  *Mammals: Lemmus lemmus* |
| F2.2a Alpine and subalpine ericoid heath | Dwarf-shrub communities in arctic-boreal, alpine and subalpine regions dominated mostly by Ericaceous species such as *Calluna vulgaris*, *Empetrum* *hermaphroditum*, *Loiseleuria procumbens*, *Vaccinium myrtillus*, *V*. *gaultherioides*, *V*. *vitis-idaea*. Some chamaephytes, as well as hemicryptophytes occur constantly, usually with lower abundance values. The unit comprises mainly natural, partly semi-natural (or secondary distributed), acidophilous communities of dwarf-shrub heaths on siliceous bedrock. In some cases, the stands from calcareous bedrock are included as well, because of their distinctive physiognomy or/and soil characteristics that are different from those that are supposed to be on limestone bedrock because of the thick layer of undecomposed humus. These communities are nearly always mono-dominant and relatively species poor. Also here, species from the families Ericaceae and Empetraceae play an important role, as well as species from the genus *Dryas*. *Rhododendron*-heath in sheltered sites and *Loiseleuria*-heath on exposed ridges build close stands mainly in the southern part of the distributional range and only rarely in the arctic, due to ecological differences between arctic and high-alpine habitats, such as greater amounts of snow in alpine areas, and the relatively long, cold nights of the alpine summer compared to the continuous daylight of the arctic growing season. The vegetation of this habitat is mainly classified within the class *Loiseleurio-Vaccinietea* that comprises arctic-boreal tundra dwarf shrub and relict (sub)alpine acidophilous heathlands. Based on habitat variability, e.g. mass and length of snow cover and thickness and quality of soil, the communities can be divided into several subtypes: cryo- and xerophilous communities on shallow soils and mesophilous communities on deeper soils. Subalpine acidophilous, mesophilous communities of the *Rhododendro-Vaccinion* with a vicariate West Carpathian unit *Vaccinion myrtilli* (sometimes synonymised with the *Genisto-Vaccinion*), and the Balkan unit *Bruckenthalion spiculifoliae* represent another side of variability in comparison with the xero-, cryophilous communities of the *Loiseleurio procumbentis-Vaccinion*, which occur on windswept slopes and summits. All these vegetation types occupy mainly shallow and skeletal acidic soils and rarely basic bedrocks in places with a thick layer of litter and/or raw humus. In cold atlantic and subcontinental regions also heath communities of the alliance *Genisto-Vaccinion* (*Calluno-Ulicetea*) in montane to subalpine belts are included, heaths tolerating humid to hyperhumid climate. Further, communities belonging to the *Ericion carneae* (*Rhododendro hirsuti-Ericetea carneae*) from the subalpine and alpine zone, representing dwarf heath and short 'krummholz' on rocky calcareous soils, outcrops, lapies ('karren') and boulders are included into this habitat type. Finally, within this habitat type, plant communities of the order *Kobresio-Dryadetalia* (*Carici rupestris-Kobresietea*) may be found. These comprise chionophobous dwarf-shrub and cushion shaped wind-exposed fjell-field vegetation on the ridges and plateaus. The habitat is found almost in all mountains of Eurasia from the Balkan Peninsula to the Arctic (Pyrenees, Apennines, Alps, Carpathians, Dinarides, Scandinavia) and in montane regions of Eurasia and North America.  Indicators of quality:  This vegetation can be threatened by (over)grazing, burning, extirpation of shrub for cultivation, global warming and increased nutrient content. In the areas, where it presents secondary vegetation, it may be subject to afforestation or natural succession towards woodland.  The following characteristics are considered as indicators of good quality:   * dense stands of diagnostic Ericaceous species * absence or low cover of tree species * absence of tall and dense scrubs * no indication of overgrazing * presence and high cover of lichens (*Cladonia* and *Cetraria* species) * absence of nutrient-demanding species   Characteristic species:  Flora:  Vascular plants: *Agrostis rupestris, Antennaria dioica, Arctostaphylos uva-ursi, Avenella flexuosa, Avenula versicolor, Belardiochloa variegata, Brachypodium genuense, Bruckenthalia spiculifolia* *Calluna vulgaris, Carex curvula, Chamaerion angustifolium, Daphne striata, Dryas integrifolia, Dryas octopetala, Empetrum hermaphroditum, Erica carnea, Festuca supina, Genista germanica, Genista radiate, Hieracium alpinum, Huperzia selago, Juncus trifidus, Juniperus sibirica, Loiseleuria procumbens, Luzula luzuloides, Molinia arundinacea, Nardus stricta, Oreochloa disticha, Pedicularis lanata, Polygonum viviparum, Potentilla erecta, Pteridium aquilinum, Rhododendron ferrugineum, Rhododendron hirsutum, Rhododendron myrtifolium, Rhodothamnus chamaecistus, Salix glauca, Sesleria comosa, Solidago virgaurea, Vaccinium myrtillus, Vaccinium gaultherioides, Vaccinium vitis-idea.*  Mosses and lichens: *Alectoria ochroleuca*, *Cetraria islandica*, *C. nivalis*, *Cladonia arbuscula*, *C. coccifera, C. pyxidata, C. rangiferina, Dicranum scoparium, Fissidens osmundoides, Hylocomium splendens, Pleurozium schreberi, P. alpinum, Polytrichum strictum, Tortella fragilis*. |
| F2.2b Alpine and subalpine Juniperus scrub | *Juniperus* heaths are found on carbonate as well as on non-carbonate bedrock, from the upper montane to the upper subalpine belt. Rarely we can find these communities in the lower alpine belt of all European mountains, especially those where traditional management such as grazing still continues. It occurs as a primary community on rocks and large boulders or as a secondary vegetation on sites where subalpine forests (dominated by beech or spruce) or dwarf pine krummholz communities are the climax. Sometimes it can even be found in moorland. Dominant species in the habitat are *Juniperus communis* subsp*.* *alpine* (*= J. nana, J.sibirica*)*, Juniperus communis* subsp*.* *hemispherica and Juniperus sabina*.  These shrubs or dwarf shrubs form communities that tolerate extremely low temperatures in areas where deep and long snow cover during the winter serves as a shelter against freezing, desiccation and high solar radiation. If environmental conditions are suitable, communities may also develop on dry and sunny south exposed sites. *Juniperus* shrubs are able to grow as a procumbent dwarf shrub of only a few centimeters high, which can survive strong winds in the alpine vegetation belt. This plasticity allows these shrubs to form diverse and sometimes also floristically rich stands. The stands in the subalpine vegetation belt are a result of deforestation, subsequent soil erosion and grazing activities. Animals avoid eating the prickly *Juniperus* heaths and the shrubs are considered as undesired elements on pastures. They often are removed by cutting or burning. As a result of former or recent grazing, *Juniperus* heathlands form mosaics with related vegetation types such as dwarf shrub dominated by *Vaccinium* species or/and krummholz communities dominated by *Pinus mugo*.  Depending on the geological bedrock plant communities are either species poor (siliceous bedrock) or richer (calcareous bedrock). The vegetation is mainly classified within the class Loiseleurio-Vaccinietea that comprises arctic-boreal tundra dwarf shrub and relict (sub)alpine acidophilous heathlands. Based on habitat variability, e.g. mass and length of snow cover and thickness and quality of soil, as well as geographical pattern of distribution, the communities may be divided into more types, like acidophilous, mesophilous communities on deeper soils or dry communities on more shallow, drier soils mostly southward orientated.  Indicators of quality:  Due to the collapse of traditional farming systems, many areas in European mountains have been abandoned and processes of shrub and tree encroachment are going on. *Juniperus* shrubs play an important role in these processes as a succession stage of formerly deforested zone towards subalpine forests and krummholz. These processes may last long, however, due to severe mountain conditions. Controversially, developing of these *Juniperus* stands in the past was caused by intensive grazing in montane areas.  The following characteristics may be considered as indicators of good quality:   * Characteristic species richness * Dominance of diagnostic *Juniperus* species * Presence of regular moderate grazing regime * Absence of tree species or dense scrub layer (except for *Juniperus* species) * Presence of mosaics with other scrub and grassland types * Absence of nutrient-demanding species.   Characteristic species:  Flora:  Vascular plants: *Achillea distans, Arctostaphyllos uva-ursi, Avenulla versicolor, Bruckenthalia spiculifolia, Calamagrostis villosa, Calluna vulgaris, Campanula patula* subsp*. abietina, C. alpina, Carex sempervirens, Cotoneaster integerimmus, Cystus galanoi, Daphne blagayana, Daphne oleoides, Deschampsia flexuosa, Festuca supina, Genista versicolor, Gentiana acaulis, Hieracium intybaceaum, H. pannosum, Hypericum maculatum, H. richerii, Juniperus communis* subsp. *alpina, Juniperus communis* subsp. *hemispherica, Juniperus sabina, Nardus stricta, Oxalis acetosella, Phyteuma betonicifolium, P. persicifolium, Picea abies, Pinus mugo, Poa chaixii, Primula veris, Prunus prostrata, Pulsatilla vernalis, Pulsatilla alpina* s.l.*, Rhododendron ferrugineum, R. hirsutum, R. myrtifolium, Rubus idaeus, Sempervivum montanum, S. wulfenii, Senecio abrotanifolius, S. nemorensis* agg.*, Sesleria coerulescens, S. comosa, Trifolium alpinum, Vaccinium gaultherioides, V. myrtillus, V. vitis-idea.*  Mosses and lichens: *Alectoria ochroleuca, Cetraria islandica, Cladonia arbuscula, C. pyxidata, C. rangiferina, Dicranum scoparium, Hylocomium splendens, Pleurozium schreberi, Polytrichum alpinum, P. strictum, Sphagnum capillifolium.* |
| F2.2c Balkan subalpine genistoid scrub | This habitat encompasses genistoid dominated high mountain scrub in the Balkan, Apennines and southern outcrops of the Alps. It can be found mainly on carbonate and ultramaphic bedrock, in places also over siliceous bedrock. The genistoid scrub (mainly dominated by *Genista radiata*) can reach about one meter and forms dense communities. It prefers warm-humid habitats, where fog condensates or that are exposed to precipitation, mainly steep, sunny and rocky sites with shallow soil types, where more demanding plant species cannot thrive. It often appears on sites of degraded *Pinus mugo* communities. Above the timberline this habitat can form the climax vegetation and mosaics with alpine pastures, *Pinus mugo* and *Juniperus* scrub. It can thrive also in the subalpine vegetation belt, on clear cuttings, burnt sites, rocky pastures and similar habitats, or form the mantle vegetation of subalpine forests, on sites of *Fagus*, *Picea*, *Betula* and *Larix*. The dominant species of this habitat is mainly *Genista radiata*,but also *Genista holopetala and* *Genista hassertiana* can be regarded as an element of illyric-tertiary flora and have a relict character. Shepherds favor grasslands and they often cut or burn these shrubby-habitats to provide more grazing area, but on the other hand abandonment of traditional land use leads to an increase of the surface occupied by this habitat.  Indicators of quality:  This vegetation can be threatened by (over)grazing, burning, extirpation of shrub for cultivation, global warming and urbanization. In the areas where it presents secondary vegetation it may be subject to succession towards forest.  The following characteristics may be considered as indicators of good quality:   * dense stands with presence of diagnostic species * absence of tree species * moderate grazing * species richness   Characteristic species:  Flora: *Asperula cynanchica, Bromus fibrosus, Calamagrostis varia, Carex laevus, C. sempervirens, Cerastium decalvans, Daphne blagayana, D. oleoides, Dorycnium germanicum, Erica carnea, Genista hassertiana, G. holopetala, G. radiata, Hypericum alpinum, Iberis sempervirens, Juniperus communis* subsp*. alpinus, Linum tauricum, Polygala chamaebuxus, Scabiosa columbaria, Sesleria latifolia, S. robusta, S. varia, Thymus longicaulis; on non-carbonate bedrock we can find also: Avenella flexuosa, Calamagrostis arundinacea, Calluna vulgaris, Festuca scabriculmis, Phyteuma scheuzeri, Vaccinium myrtillus.* |
| F2.3 Subalpine deciduous scrub | This habitat type comprises (sub)alpine and (sub)arctic alder (*Alnus viridis*), willow (*Salix spp.*), dwarf birch (*Betula nana*) and other deciduous scrub. Also *Potentilla fruticosa* dominated scrub that appears in the Bulgarian mountains (F2.336) is included. The stand height of the habitat in most cases is between 1 and 5 meters. Low dwarf willow communities are excluded from this habitat and instead included in type F2.1. Also excluded in the (sub)alpine and (sub)arctic belts are willow scrub on alluvial soils (habitat F9.1) and willow scrub in waterlogged fens and mires (habitat F9.2). *Alnus viridis* scrub is found throughout the subalpine belts of all mountain ranges of central Europe. This shrub is a pioneer species in humid sites on deeper soils that are regularly disturbed, like on steep, north-exposed slopes where avalanches occur occasionally. On sites cleared by avalanches, *Alnus viridis* may be found in lower (montane) altitudes as well. It is found in the Alps and Carpathians. On Corsica a different subspecies *Alnus viridis* subsp. *suaveolens* grows in a similar habitat. *Salix* species (S*. appendiculata, S. glabra, S. hastata, S. waldsteiniana*) may dominate a lower shrub layer or – in lower altitudes – form its own scrub type in similar sites. The type contains several *Salix* species that are (regional) rare in the temperate mountain regions. Accompanying species are often from tall herb communities, for example, *Adenostyles alliariae* or *Cicerbita alpina*, or from subalpine heathlands. In the southern outcrops of the Alps and along the Dinarides, *Rhamnus fallax* dominates communities of this habitat. In the subarctic and boreal regions on similar slopes *Salix lapponum, Salix glauca, Salix hastata, Salix phylicifolia* may grow in a mixture of tall-herb species and *Vaccinium myrtillus, Phyllodoce caerulea,*and/or *Juniperus communis*. The same willows are found along creeks and rivers, as part of the habitat alluvial scrub (F9.1). The geological substrate of the habitat is diverse, covering for example both marl and limestone. The habitat appears in open sites with high soil moisture and moderate-rich in nutrients. The species of the type are well adapted to low temperature and snow accumulation. These deciduous scrubs are the pioneer communities on screes and in areas cleared by avalanches because the shrub species are able to regrow from roots and stumps. Therefore, they also have a significant role in the prevention of erosion and snow slides. Propitious sites for these communities can be found also along streams because of humidity, small soil partitions and disturbance caused by the water stream. The habitat can also appear as a succession stage in subalpine pastures or meadows, where grazing or haymaking is no longer maintained. These communities are mainly of secondary origin. But as they survive snow slips better than tree species, they can build permanent (paraclimatic) communities under the influence of avalanches or streams, in sites where tree species cannot survive.  Indicators of quality:  These habitats are mainly of secondary origin. They are threatened by logging or burning, erosion or snow slips, and channeling of streams, as well as by succession towards forest. The following characteristics can be considered as indicators of good quality:   * species richness of shrub species, * presence of breeding birds and other fauna, * long-term maintenance because of natural disturbance regime.   Characteristic species:  Flora (Vascular plants):  Shrubs/low trees: *Acer pseudoplatanus*, *Alnus viridis* subsp. *viridis*, *Alnus viridis* subsp. *suaveolens*, *Rhamnus fallax, Ribes alpinum, Salix alpina, Salix appendiculata, Salix bicolor, Salix caesia, Salix foetida, Salix glabra, Salix glaucosericea, Salix hastata, Salix helvetica, Salix laggeri, Salix lapponum, Salix phylicifolia, Salix silesiaca, Salix waldsteiniana, Sorbus aucuparia, Sorbus chamaemespilus, Vaccinium myrtillus.*  Herbs: *Aconitum spp*., *Adenostyles alliariae, Chaeropyllum hirsutum* subsp. *villarsii, Cicerbita alpina, Doronicum austriacum, Dryopteris dilatata, Geranium sylvaticum, Geum coccineum, Geum rivale, Geum urbanum, Hypericum maculatum, Lonicera alpigena, Lonicera xylosteum, Milium effusum, Polygonatum verticillatum, Saxifraga rotundifolia, Senecio ovatus, Sesleria coerulea, Stellaria nemorum, Thalictrum aquilegifolium, Veratrum album* agg., *Viola biflora*. |
| F2.4 Subalpine Pinus mugo scrub | Conifer scrub dominated by *Pinus mugo* (krummholz) occurring in the mountains of central and southeastern Europe above the timberline. This scrub is usually 0.5-3 m tall, depending on the wind exposure of the site and the height of winter snow cover. It occurs on Podzols or Leptosols over both calcareous and siliceous bedrock. On calcareous substrates *Pinus mug*o can be accompanied by *Rhododendron hirsutum*, *Rhodothamnus chamaecistus* or *Sorbus chamaemespilus*, in wetter places by *Alnus viridis*. Species composition of the herb and moss layer depends on the bedrock type and adjacent vegetation. Herb layer tends to be more species-rich on calcareous substrates. Dwarf shrubs such as *Vaccinium myrtillus* and *V. vitis-idaea* and lichens of the genera *Cladonia* and *Cetraria* are common especially on acidic bedrock. Bryophytes such as *Pleurozium schreberi* often reach a high cover. This scrub occurs in the Hercynic mountains of central Europe, Eastern Alps, Carpathians, Central Apennines, Dinaric Alps and high mountains of the Balkan Peninsula. These areas represent its entire geographical range globally. Near the northern limit of its range in the Hercynic mountains, the belt with *Pinus mugo* scrub occurs at altitudes of 1200-1450 m, while it ascends up to 2500 m in the Balkans. In the Alps Pinus mugo scrub occurs mainly in the oceanic north-eastern and south-eastern parts of the mountain range, while it is rare in the Central Alps. On talus slopes *Pinus mugo* scrub can occur also below the timberline. Pinus mugo scrub on peatlands does not belong to this habitat type. Under natural conditions, Pinus mugo scrub can be both tall and dense or short and open. It can be both species-rich and very species-poor. None of these characteristics indicates habitat quality.  The following characteristics can be considered as indicators of good quality:  • No visible disturbance by trampling, skiing, cutting or burning;  • Absence of ruderal, nutrient-demanding species;  • No indication of scrub origin through planting, especially in places where it is not native.  Characteristic species:  Flora, Vascular plants: *Adenostyles alliariae, Alnus viridis, Athyrium distentifolium, Avenella flexuosa, Bruckenthalia spiculifolia, Calamagrostis arundinacea, C. villosa, Daphne oleoides, Dryas octopetala, Erica carnea, Gentiana punctata, Homogyne alpina, Juniperus communis subsp. alpina, Pinus mugo (dom.), Rhododendron ferrugineum, R. hirsutum, R. myrtifolium, Rhodothamnus chamaecistus, Sesleria comosa, Solidago virgaurea, Sorbus aucuparia, S. chamaemespilus, Trientalis europaea, Vaccinium myrtillus, V. uliginosum, V. vitis-idaea*  Mosses: *Dicranum scoparium, Hylocomium splendens, Pleurozium schreberi, Rhytidiadelphus triquetrus*  Lichens: *Cetraria islandica*, *Cladina* spp., *Cladonia* spp. |
| F3.1a Lowland to montane temperate and submediterranean Juniperus scrub | Temperate and submediterranean scrubs, up to 7-8 m, with *Juniperus communis* subsp. *communis* are widespread in the lowland and low mountain regions of Europe, where these communities occur on nutrient poor, calcareous soils as well as on deep sandy soils. The edaphic conditions range from dry to rather moist. The first group is related to grasslands of the class *Festuco-Brometea*, the second one to heathlands of the class *Calluno-Ulicetea*. Apart from the dominant *Juniperus communis*, these vegetation types have hardly any species in common. On calcareous sediments, the grasses *Brachypodium pinnatum* and/or *Bromus erectus* are codominant, accompanied by a wide variety of species, including *Anthyllis vulneraria*, *Carlina vulgaris*, *Centaurea scabiosa*, *Dianthus carthusianorum*, *Euphorbia cyparissias*, *Sanguisorba minor* and *Scabiosa columbaria*. On sandy soils, *Calluna vulgaris*, *Genista pilosa* and *Genista anglica* are prominent dwarf-shrubs in the surrounding vegetation, together with *Deschampsia flexuosa*, *Carex pilulifera*, *Festuca filiformis* and a wide variety of mosses and lichens. The usual woody associates, particularly on neutral and calcareous soils, are *Rosa canina*, *Crataegus monogyna*, *Prunus spinosa*, *Cornus sanguinea* and *Rubus plicatus*. The junipers show a striking variety in growth forms, ranging from upright to prostrate, quite often occurring in mixed populations.  This habitat type often occurs in patchy mosaics with grasslands and heathlands. As such, these are part of old, pastoral landscapes, which require a specific management regime of extensive grazing. When abandoned and neglected, the succession will finally lead to woodland, where *Juniperus communis* may persist for a long time in the understory. Shrubs and small trees of *Juniperus communis* can become rather old, up to 200 years, but on the long term regeneration is a prerequisite, which is not always the case. Lack of favorable conditions for germination as well as a high grazing pressure by rabbits on juvenile plants may hinder rejuvenation. Of particular importance is the occurence of a large number of rare and endangered fungi.  Not included in F3.1a are the *Juniperus communis* formations of the subalpine and alpine regions of high mountains nor the Pannonic juniper-poplar steppe woods. The first group is assigned to Red List type F2.2b, the second group is classified under Red List type G1.7a.  Indicators of good quality:   * Mosaic of juniper shrubs with grasslands or heathland * Variety of growth forms of different age, including juvenile plants * Presence of rare fungi * Extensive grazing regime which guarantees the complex landscape settings and prohibits a complete succesion towards woodland   Characteristic species:  Vascular plants: *Juniperus communis*  Birds: *Anthus campestris*, *Caprimulgus europaeus*, *Lullula arborea*, *Oenanthe oenanthe*, *Sylvia borin*, *Sylvia curruca*  Insects: *Phymatodes glabratus* (beetle), *Thera juniperata* (butterfly), *Gonocerus juniperi* (bug). |
| F3.1b Temperate Rubus scrub | Deciduous or sometimes evergreen scrub dominated by bramble (*Rubus spp*) found in the Atlantic and Sub-Atlantic regions, and outside these regions in sites with a specific cool microclimate. Bramble scrub grows in ‘intermediate’ conditions (on not too wet or too dry soils, in not too warm or too cold climates), in intermediate succession stages or spatial transitions (from low herbaceous vegetation towards forest) and under a relatively stable microclimate. Most bramble species are not resistant towards grazing or mowing and also not towards flooding. The habitat contains – often species-rich – bramble scrubs of the open landscapes (intermediate succession stages), forest edges and some forest clear-cut areas. It also includes semi-natural structures of the cultural landscape dominated by brambles, like hedge rows, road verges and other structures separating parcels of agricultural land. In some cases they form spatial transitions to (higher) scrubs of the habitat F3.1e Temperate and submediterranean thorn scrub.  Within the habitat type, a main division can be made based on soil type. A first subtype contains bramble scrub of poor, sandy soils in north-western Europe, belonging to the class *Lonicero-Rubetea plicati*, alliance *Lonicero-Rubion silvatici*. A second subtype includes bramble scrub on nutrient richer or more base-rich soils, with a broader distribution in central and western Europe, and belonging to the class *Rhamno*-*Prunetea*, alliance *Pruno spinosae-Rubion radulae*. The latter subtype forms transitions towards habitat type E3.1e Temperate and submediterranean thorn scrub.  The type relates to inland (in general) long-lasting scrubs, relatively rich in bramble species. Temporary bramble communities on clear-cut forest areas on nutrient-rich or base-rich soils (alliance *Athyrio filix-feminae-Rubion idaei*) form a short-term succession stage towards *Sambuco racemosae-Salicion capreae*; both alliances together are considered part of habitat F3.1d Temperate woodland clearing scrub. Bramble scrubs in Atlantic dunes are considered part of type B1.6a Atlantic and Baltic coastal dune scrub. Also excluded from this habitat are the (sub)mediterranean bramble scrubs with *Rubus ulmifolius* as the main (and often only) species. *Rubus ulmifolius* has a broad ecology, and vegetation dominated by it in most situations is a mixture of *Rubus ulmifolius* with thorny shrubs of the class *Rhamno-Prunetea* (for example *Rosa spp.*). They are not bramble scrubs in a strict sense, and habitats of this type (alliance *Pruno spinosae-Rubion ulmifolii*), are considered as part of type F3.1e Temperate and submediterranean thorn scrub. Finally, also bramble scrubs dominated by non-European species, like *Rubus armeniacus*, are excluded.  Natural bramble scrubs as intermediate succession stages from grassland or heathland towards forest are restricted to Atlantic and Subatlantic lowlands and submontane areas of Central-Europe. Further eastwards (like in eastern Germany and the Czech Republic) brambles are mainly restricted to shaded conditions (forest understorey, forest edges), and the bramble habitat is more scattered in localities with specific conditions. Further northwards the number of brambles decreases quickly, with only a few species in southern Norway and south Sweden. Also southwards few species occur, and species-rich communities become rare. It is plausible that bramble scrubs have increased during the 20th century in parts of the distribution range, as in the 19th century the semi-natural landscape was much more open and more intensively grazed. On the other hand, during the 20th century severe losses will have happened in the cultural landscape, due to increasing parcel sizes (removal of hedges), eutrophication and invasion of non-native species (such as *Prunus serotina*).  *Rubus* in Europe is one of the most species-rich (and most complicated) genera in the temperate parts of Europe, with many taxa propagating by apomictic (non-sexual) mechanisms. In total, about 700 species have been described in *Atlas Flora Europaeae*, while about 1000 species are estimated to exist in Europe. Most of these species are considered to be relatively young, probably originating from a small set of relict species after the Ice Ages. The highest species richness of *Rubus* is found in Ireland, the United Kingdom, southern Denmark, the Netherlands, Belgium, Germany, northern France and the Czech Republic. Many of the *Rubus* species are regional endemics, giving this type a high importance from a biodiversity point of view. The most characteristic brambles in this Temperate bramble scrubs habitat are species of the *Rubus* subsection *Rubus* , which are deciduous. Especially the series *rhamnifolii* and *discolores* within this subsection, some of the most spiny groups of brambles, are well represented.  As well as for endemic bramble species, bramble scrubs are important for fauna, providing nectar for many insect groups when flowering, food for birds and mammals, and important hiding or nesting structures for many animal species.  Indicators of good quality:   * Presence of regional endemic species * Absence of alien species * High diversity in *Rubus* species   Characteristic species:  Mentioned are characteristic widespread species in the distribution range  and regional endemics from (mainly) Germany and the Netherlands. In Ireland, England, France, Belgium, Denmark and the Czech republic, the species composition of the habitat type is little known. Therefore the list of regional endemic species will lack characteristic species from these countries.  Flora: Vascular plants: *Rubus adpersus, Rubus amiantinus*, *Rubus ammobius*, *Rubus bertramii*, *Rubus bifrons*, *Rubus calvus*, *Rubus contractipes*, *Rubus discors*, *Rubus distractus*, *Rubus divaricatus*, *Rubus drenthicus*, *Rubus egregius*, *Rubus elegantispinosus*, *Rubus flexuosus*, *Rubus frederici*, *Rubus gelertii*, *Rubus geniculatus*, *Rubus glandithyrsos*, *Rubus grabowskii*, *Rubus gratus*, *Rubus hypomalacus*, *Rubus integribasis*, *Rubus laciniatus*, *Rubus laevicaulis*, *Rubus lasiandrus*, *Rubus lindleianus*, *Rubus macrophyllus*, *Rubus montanus*, *Rubus mucronulatus*, *Rubus mycrophyllus*, *Rubus nemoralis*, *Rubus nessensis*, *Rubus opacus,* *Rubus pallidus*, *Rubus passionis*, *Rubus phoenicacanthus*, *Rubus phyllostachys*, *Rubus plicatus*, *Rubus polyanthemus*, *Rubus praecox*, *Rubus pyramidalis*, *Rubus radula*, *Rubus raduloides*, *Rubus rubercadaver*, *Rubus rufescens*, *Rubus rudis*, *Rubus scissus*, *Rubus schlechtendalii*, *Rubus senticosus*, *Rubus silvaticus*, *Rubus sprengelii*, *Rubus steracanthos*, *Rubus sulcatus*, *Rubus taxandriae*, *Rubus trichanthus*, *Rubus vestitus*, *Rubus vigorosus*, *Rubus wahlenbergii*, *Rubus winteri.* |
| F3.1c Lowland to montane temperate and submediterranean genistoid scrub | A few meters high scrubland, dominated by species of the family *Fabaceae* (*Leguminosae*),  specifically species of the genera *Cytisus*, *Ulex*, *Adenocarpus*, *Genista* and/or *Retama*. The habitat occurs in the temperate, submediterranean and mediterranean region, where it is mainly found on sunny, dry, nutrient-poor, acidic soils, but exceptionally also grows on more base-rich soils. It is in most cases a secondary habitat, forming a stage in the succession from grassland or heathland towards (*Quercus*) forests and occurring as mantle vegetation along forests. The potential vegetation in the areas of this broom dominated habitat are forests dominated by *Quercus pyrenaica*, *Q. suber*, *Q. rotundifolia* and in more humid areas *Q. robur*, *Q. petraea* and *Fagus sylvatica*. The habitat is associated with agro-pastoral landscapes, and in such environment it may form a threat to heathlands and grasslands, as the shrubs encroach after abandonment of traditional management. Broom species easily germinate in fallow lands on nutrient-poor, mineral soils, where they have good competitive conditions because of the root nodules, containing bacteria that capture atmospheric nitrogen (Rhizobacteria). In Portugal rye cultivation became the major driving force behind the evolution of broom fields and – to a lesser extent – also triggered the development of other vegetation.  *Cytisus scoparius* may also dominate ruderal sites, like along roads, in dry riverbeds, on cultivated fields, in logged forests or on burned sites. In rocky areas on shallow soils, also primary habitats of this type may be found. In Spain, Portugal and France genistoid scrub can also grow as post-fire vegetation.  In Northwest and Central Europe this is a relatively species poor type, mainly dominated by *Cytisus scoparius* and – in the Atlantic regions – *Ulex europaeus*, and with *Orobanche rapum-genistae* as a characteristic species of the *Cytisus scoparius* scrub. Further south the type becomes more diverse. In southern Italy (Sicily and Calabria) a community of *Adenocarpus brutius* (*= Adenocarpus complicatus* subsp. *brutius* )and *Cytisus scoparius* with many endemics (including *Viola aethnensis* subsp. *messanensis*) occurs as secondary vegetation in relatively acidic, mesophilous sites where *Fagus sylvatica* or *Quercus ilex* forests are the climax.  In central Italy *Adenocarpus complicatus* subsp. *complicatus* forms scrub formations.  The highest diversity however is found on the Iberian Peninsula, where a broad range of high, genistoid shrubs may dominate, depending on the geographical region, elevation and soil conditions. Examples of such shrubs are *Cytisus multiflorus*, *Cytisus striatus* (subsp. *striatus* and subsp. *eriocarpus*), *Cytisus bourgaei (= C. scoparius* subsp*. bourgaei)*, *Genista cinerescens*, *Genista florida*, *Genista hispanica* subsp. *occidentalis*, *Genista polyantha*, *Adenocarpus argyrophyllus*, *Adenocarpus telonensis*, *Retama monsperma* and *Retama sphaerocarpa*. These communities in Spain and Portugal are ranked under various denominations such as *retamal* (dominated by *Retama* or *Adenocarpus* species), *piornal* (*Genista*-dominated) and *escobonal* (large brooms, for instance *Cytisus*).  Almost all communities of the habitat are grouped in the class *Cytisetea scopario-striati*, although sometimes *Cytisus scoparius* and *Ulex europaeus* also participate in the *Calluno-Ulicetea* or in the *Rhamno-Prunetea* (the analogue mantle-scrub on richer soils). For the communities in the southeastern Balkan the assignment to classes and alliances has not been worked out yet.  In several other habitat types genistoid shrubs may become dominant. In Atlantic coastal dunes scrub with *Cytisus scoparius* and *Ulex europaeus* may be found, but those are part of habitat ‘Atlantic dune scrub’ (B1.6a). Individual shrubs of these two species may grow in a heathland or matorral, for example *Ulex europaeus* forma *maritimus* and *Cytisus scoparius* subsp. *maritimus* in heathlands on rocky coasts; in such cases the communities should be considered as part of those heathland or matorral habitats. Only if the shrubs form a relatively closed and relatively high community, the habitat type F3.1c is present. In (montane to) subalpine and oromediterranean belts of mountains *Cytisus oromediterraneus* (=*C. purgans*) and *Echinospartum* species form (relatively low) scrub, but those communities (equivalent to HD Annex 1-type 5120) are part of the Oro-Mediterranean habitat type F7.4a (Western Mediterranean mountain hedgehog-heath). The relatively low scrub dominated by *Genista hispanica* subsp*. occidentalis*, classified in the class *Festuco hystricis-Ononidetea striata*, also is considered part of F7.4a.  Indicators of good quality:  The habitat tends to develop a high and relatively closed structure, while trees are absent. However, often the more open patches, mosaics with other habitats, have the highest biodiversity of plant species and animals. Indicators of good quality are:  ·      Relatively open scrubland in mosaic with other types;  ·      Presence of endemic shrub species;  ·      Presence of *Orobanche rapum-genistae* (Northwestern Europe);  ·      Absence of trees.  Characteristic species:  Vascular plants: *Adenocarpus anisochilus, Adenocarpus argyrophyllus, Adenocarpus aureus* subsp*. aureus, Adenocarpus complicatus*  subsp. *brutius , Adenocarpus complicatus*  subsp. *complicatus*  *, Adenocarpus decorticans, Adenocarpus hispanicus (*subsp*. gredensis,* subsp*. hispanicus,* subsp*. neilense), Adenocarpus lainzii, Adenocarpus telonensis, Cytisus cantabricus, Cytisus commutatus, Cytisus ingramii , Cytisus scoparius , Cytisus scoparius ssp. bourgaei, Cytisus grandiflorus ssp. cabezudoi, Cytisus multiflorus, Cytisus striatus (*subsp*. eriocarpus,* subsp*. striatus), Dianthus pinifolius*, *Echinospartum ibericum ssp. ibericum, Genista cinarescens, Genista cinerea* subsp*. speciosa, Genista florida (*subsp*. florida,* subsp*. polygaliphylla), Genista hispanica* ssp *occidentalis, Genista obtusiramea, Genista polyanthos, Orobanche rapum-genistae, Retama monosperma, Retama sphaerocarpa, Silene frivaldszkyana, Teucrium salviastrum, Ulex europaeus* (subsp*. europaeus,* subsp*. latebracteatus*)*.* |
| F3.1d Balkan-Anatolian submontane genistoid scrub | This habitat type comprises a complex of open shrub, herbaceous and chasmophytic plant communities dominated by the species complex of *Genista rumelica*/*Genista lydia.* It is an endemic type distributed to the southeastern part of the Balkan Peninsula (Southern Bulgaria and Northern Greece) and Asia Minor. The *Genista rumelica* communities are more widely distributed but restricted to the Balkans (endemic), whereas the communities of *Genista lydia* also occur in the western part of Anatolia. These communities are found mostly in lowland areas and lower parts of mountains on unstable sites (screes, steep slopes, rocky substrates). The genistoid scrubs grow mainly on sunny, dry, stony slopes with shallow soils of various bedrock (chalk, sandstones, volcanic stones). However, *Genista rumelica* prefers calcareous substrata. Because of its open structure the habitat is species rich with many elements from the *Thero-Brachypodietea* grasslands amongst which annual grasses (*Brachypodium distachyon*, *Poa bulbosa*, *Psilurus incurvus*, *Bromus squarrosus*), perennial grasses (*Koeleria splendens*, *Chrysopogon gryllus*) and many Balkan endemics (*Achillea coarctata*, *Dianthus pinifolius*, *Silene frivaldszkyana*). The communities can occupy secondary, degraded areas: screes and eroded places, replacing destroyed or degraded forest, mostly of different oak species, Oriental Hornbeam or Black Pine especially in Eastern Rodopi Mts. The habitat is characterized by open and complex structure consisting of patches with annual grasslands and low (0.5-1) genistoid scrublands where the tree individuals and high shrubs are either absent or in low numbers. The more open mosaics with other habitats exhibit the highest biodiversity (plant and animal species).  Indicators of quality:  · Relatively open scrublands in mosaic with other vegetation types;  · Presence of endemic shrub and herbaceous species;  · Absence or low number of trees and high (2-3 m) shrubs.  Characteristic species:  Flora, Vascular plants  *Achillea coarctata*, *Alyssum murale*, *Brachypodium distachyon*, *Bromus squarrosus*, *Carpinus orientalis*, *Cephalaria laevigata*, *Chrysopogon gryllus*, *Cleistogenes serotina*, *Dianthus pinifolius*, *Dichanthium ischaemum*, *Fraxinus ornus*, *Genista lydia*, *G. rumelica*, *Jasmium fruticans*, *Juniperus oxycedrus*, *Koeleria* spp., *Melica ciliata*, *Minuartia setacea*, *Orlaya grandiflora*, *Poa bulbosa*, *Psilurus incurvus*, *Scabiosa ochroleuca*, *S. triniifolia*, *Sedum hispanicum*, *Silene frivaldszkyana*, *Stipa capillata*, *Teucrium chamaedrys*, *Thymus* spp. |
| F3.1e Temperate and submediterranean thorn scrub | This habitat is an inland scrub type of about 1.5 to 3 meter high, made up of deciduous shrubs or low trees species of the order *Prunetalia*, of which many have thorns and many produce berries. These scrubs occur in temperate and submediterranean lowlands and low mountains in Europe, but sometimes are found in dry and rocky localities in higher mountains. The habitat includes *šibljak*, a deciduous submediterranean scrub type from the Balkan, of which the plant communities are grouped in the order *Fraxino orni-Cotinetalia*.  The habitat occurs in forest edges and openings, as more-or-less temporary succession stages from grassland to forest, and as hedge structures in cultural landscapes. The scrub is in most cases found on dry to mesic, well-drained, relatively base-rich and poor to moderate nutrient-rich soils. In most cases it is a secondary vegetation, found in sites where *Carpinion betuli*, Querci*on pubescenti-petraeae*, *Fagion sylvaticae* or *Aremonio-Fagion* are the climax forests, but some stands may grow on more extreme, primary sites, like on shallow, rocky soils and cliffs. The habitat also may occur semi-naturally as part of a mosaic with grassland and forest in extensively grazed areas. On more acidic, nutrient-poor soils in general *Rubus* scrub (F3.1b) or genistoid scrub (F3.1c) is found, or rather marginally developed mantles with *Frangula alnus* and *Sorbus aucuparia*, which can be considered part of the forest habitat.  The composition of the shrub layer varies over the wide range. Most characteristic species in Central and Western Europe are *Prunus spinosa*, *Rhamnus catharticus*, *Crataegus monogyna* and many species of *Rosa*, including many apomictic species. In some cases non-thorny shrubs may dominate. Saplings of trees are common, and one or a few trees may grow out taller than the scrub formation, indicating succession towards forest. Also the herb layer varies over the range, depending on the soil type and climatic region. It consists of a combination of species from adjacent forest, grassland and tall-herb communities. Climbing herbs are a characteristic feature of this habitat, including *Hedera helix*, *Clematis vitalba* and *Tamus communis*.  In the warmer (submediterranean) parts of the range and on dry, calcareous and south-exposed sites in temperate regions, *Prunus mahaleb*, *Acer monspessulanum*, *Ligustrum vulgare*, *Viburnum lantana*, *Cornus mas*, *Cotoneaster integerrimus, Cotoneaster tomentosus* and *Amelanchier ovalis* are characteristic species, in sites where forests of the alliance *Quercion pubescenti-petraeae* are the climax. Some of these shrubs are also typical in šibljak, a deciduous scrubland on shallow soils in the Balkan. Šibljak is supposed to be the primary vegetation in many sites, but it has extended after clearing of forests. Other characteristic deciduous shrubs and low trees of the šibljak are *Paliurus spina-christi, Fraxinus ornus, Cotinus coggygria*, *Syringa vulgaris* and *Rhamnus intermedia*. On Sicily and Corsica *Berberis aetnensis* is a dominant species of this habitat in the supra-mediterranean mountain belts, where it forms transitions towards oromediterranean hedgehog heath (F7.4b). *Berberis hispanica* fills such a position in oromediterranean mountains of Spain. However, communities with *Berberis cretica* in Greece are included in habitat F7.3 (phrygana).  Some Mediterranean species may occur in šibljak, like the evergreen shrubs *Ruscus aculeatus* and *Phillyrea latifolia* and the climbers *Smilax asper*, *Clematis flammula* and *Asparagus acutifolius*, but if evergreen shrub species become co-dominant, the scrub is a form of Submediterranean pseudomaquis (habitat F5.3), of which some communities are classified in the order *Fraxino orni-Cotinetalia* as well. *Hippophaë rhamnoides* may be one of the thorny shrub species occurring in the thorn scrub habitat, but the physiognomically and ecologically distinct scrubs dominated by *Hippophae rhamnoides* on xeric, dry, gravelly river terraces, rarely subjected to flooding, are considered as a subset of the alluvial scrub (type F9.1).  *Prunus spinosa* and other characteristic species may also occur in other scrub types, like those dominated by *Rubus* species (type F3.1b) or *Juniperus* species (F3.1a). *Buxus sempervirens* dominated scrub is included under F5.3. In boreal and subarctic zones *Salix* species dominate the scrubs on similar soils, and such communities are grouped under habitat F2.3, together with subalpine scrubs. *Prunus fruticosa* is a shrub that may become dominant in moist grasslands on cacareous soils in the hemiboreal region. For Bulgaria relict stands of this type have been described as a separate habitat type under the Habitats Directive. The syntaxonomical position of these low scrubs is unclear, but they are not considered here as part of thorn scrub. *Rubus* species may be locally dominant in the habitat, but in other cases they form its own habitat (F3.1b) as a “pre-mantle” formation in front of the thorn scrubs. In more mesic sites and in oceanic regions *Corylus avellana* may become mono-dominant, forming its own habitat F3.1g. Thorn scrubs in dunes are described under B1.6a and B1.6b.  The habitat has its main distribution in Western and Central Europe and on the Balkan. In the Mediterranean region it is restricted to mountains, to the north the habitat reaches to South-Scandinavia. In cultural landscapes it is one of the most important habitats in terms of diversity and functioning, the latter especially for animal species which find here shelter, breeding sites and food (berries). It is also one of the habitats which increase in dry grassland and agricultural fields after abandonment.  Indicators of quality:  The following aspects may be used as parameters for good quality:   * Diversity of scrub species * Presence of rare Rosa species * Absence of non-native species * Presence of berries in autumn as a food source for mammals and birds * Presence of flowers in spring as a nectar source for insects   Characteristic species:  Flora, shrubs/low trees*: Acer campestre, Acer monspessulanum, Acer tatarica, Amelanchier ovalis, Berberis aetnensis, Berberis hispanica, Berberis vulgaris ssp. cantabrica, Berberis vulgaris ssp. vulgaris, Carpinus betulus, Cornus mas, Cornus sanguinea, Corylus avellana, Corylus colurna, Cotinus coggygria, Cotoneaster granatensis, Cotoneaster integerrimus, Cotoneaster nebrodensis, Cotoneaster tomentosus, Crataegus granatensis, Crataegus laciniata, Crataegus laevigatus, Crataegus monogyna, Crataegus orientalis, Crataegus transalpina, Euonymus europaeus, Euonymus verrucosus, Hippophae rhamnoides, Ilex aquifolium, Ligustrum vulgare, Ligustrum vulgare, Paliurus spina-christi*, *Prunus institia*, *Prunus mahaleb, Prunus ramburii, Prunus spinosa, Pyrus elaeagrifolia, Pyrus pyraster, Malus sylvestris, Rhamnus alpinus, Rhamnus catharticus, Rhamnus intermedia, Rhamnus saxatilis, Ribes alpinum, Ribes uva-crispa, Rosa agrestis, Rosa canina* agg., *Rosa dumalis*, *Rosa micrantha*, *Rosa montana*, *Rosa obtusifolia, Rosa pouzinii, Rosa pendulina, Rosa rubiginosa, Rosa sherardii, Rosa sicula, Rosa tomentosa, Rosa villosa, Rosa vosagiaca, Rubus caesius, Rubus canescens, Rubus dalmaticus, Rubus idaeus, Rubus ulmifolius, Sambucus nigra, Sorbus aria, Syringa vulgaris, Ulmus minor, Viburnum lantana, Viburnum opulus.*  Flora, climbers: *Asparagus acutifolius*, *Clematis flammula*, *Clematis recta, Clematis vitalba, Hedera helix, Humulus lupulus, Lonicera arborea, Lonicera periclymenum, Lonicera splendida, Lonicera xylosteum, Smilax asper*, *Tamus communis.*  Fauna, mammals: Hazel dormouse (*Muscardinus avellanarius*)  Fauna, birds: Cirl Bunting (*Emberiza cirlus*), Yellowhammer (*Emberiza citrinella*)*,* Melodious Warbler (*Hippolais polyglotta*), Red-backed shrike (*Lanius collurio*)*,* Tree sparrow (*Passer montanus*)  Fauna, butterflies: *Aporia crataegi*, *Dysauxes punctata*, *Iolana iolas*, *Satyrium acaciae*, *Satyrium pruni*, *Satyrium spini*, *Thecla betulae*, *Meganola togatulalis*, *Iphiclides podalirius*, *Synanthedon stomoxiformis*, *Rhagadea pruni* |
| F3.1f Low steppic scrub | This is dwarf scrub, usually less than 1m tall, occurring in the forest-steppe and steppe zones across central Europe, in the Pannonian Basin and adjacent areas, in the Danube lowlands in Romania and Bulgaria and the forest-steppe and steppe zones from south-eastern Poland through Ukraine to Russia and central Asia. It develops on both shallow leptosols near rock outcrops and on deep soils such as chernozems, kastanozems, phaeozems, cambisols or luvisols. Often it forms small stands of clonally growing dominant species on relatively mesic sites in dry grassland areas, for example in small terrain depressions with winter snow accumulation, on north-facing slopes, or at the edges of tall scrub or dry woodland; or it is found in extrazonal complexes of continental dry grassland vegetation. In some places it is a permanent natural vegetation type, in others it is a successional stage of dry grassland after abandonment.  Indicators of good quality:  This habitat often contains rare species of continental steppe and forest-steppe, which may occur at the western limit of their geographic range or at isolated sites west of their continuous range. Of particular conservation value are low and open stands that are rich in species, especially if they directly border on natural or semi-natural steppic grasslands. On the other hand, the spread of shrubs, especially of the hybrid *Prunus x eminens*, can indicate degradation of valuable dry grassland habitats. In these stands ruderal species such as *Artemisia vulgaris* and *Elymus repens* can be common.  The following characteristics can be considered as indicators of good quality:   * High species richness * Occurrence of rare species, especially those of continental distribution * Absence of ruderal, nutrient-demanding species * Absence of alien species * Long-term habitat stability, with no rapid successional trends * Occurrence in habitat complexes with dry grassland vegetation   Characteristic species:  Flora: Vascular plants: *Caragana frutex , Cotoneaster integerrimus , C. melanocarpus , Elymus hispidus, Festuca rupicola, F. valesiaca, Fragaria viridis, Geranium sanguineum, Melica ciliata, M. transsilvanica, Poa angustifolia, Polygonatum odoratum, Prunus x eminens , Prunus fruticosa , Prunus tenella , Rosa gallica , Rosa pimpinellifolia (= R. spinosissima), Spiraea chamaedryfolia , Spiraea crenata , Spiraea media.*  Mosses: *Hypnum cupressiforme, Rhytidium rugosum, Thuidium abietinum.* |
| F3.1g Corylus avellana scrub | This is permanent scrub dominated by *Corylus avellana* mostlytypical of exposed coastal and upland situations with a humid Atlantic climate. The hazel forms a low canopy up to 3m tall, wind-shaped in more exposed situations, with multi-stemmed stools that are self-renewing by the production of new growth from the centre and slow clonal expansion. On shallower soils, stools tend to be more close-grown, with fewer thicker rigid stems and the scrub more shady; on deeper soils and in more sheltered situations, wider-spaced, multi-stemmed stools prevail with a lighter interior. Damage from winter storms also contributes to stem turnover and grazing/browsing can open up the canopy and prevent regeneration ultimately creating a parkland effect where older individual hazels can survive, sometimes acquiring a tree physiognomy.  The field layer varies according to the character of the soils which can be highly calcareous to slightly acid, shallow and skeletal to deeper and loamy and the often irregular topography favours complex mosaics with local instability of the surface. High precipitation usually maintains the soils in a moist condition, but local ground water seepage can further enhance wetness. The herb contingent is usually of the more Atlantic Carpinion type, more or less calcicolous according to the soil reaction, with an obvious vernal component in which *Hyacinthoides non-scripta, Anemone nemorosa* and *Primula vulgaris* often figure, and a sometimes luxuriant fern flora. Less limey soils can have a grassier flora with a summer cover of *Pteridium aquilinum.* Towards the north of the range, *Trollius europaeus* and *Cirsium helenioides* provide a distinctive phytogeographical element.  The cryptogam flora can be very rich and distinctive in less disturbed stands. Shadier and more humid interiors favour a luxuriant bryophyte flora over soil, rocks and the hazel stool bases, an ‘elfin’ aspect in which broader Atlantic and some specialist oceanic species are especially striking. The lichen flora is also particularly indicative of venerable stands with more light-demanding *Graphidion* species typical of smoother bark in less shady situations, *Lobarion* species on rougher bark and in shadier stands, both contingents including some internationally rare taxa. Hazel is ectomycorrhizal and a number of fungi can add to the floristic richness of the scrub.  The habitat described above occurs in Ireland and the United Kingdom, where it is found in locations where wind and shallow soils prevent the growth of trees. However, also in Central Europe permanent hazel scrub is found, in places where soil conditions prevent succession towards forest, for example on steep hillsides. Here also the scrub is in most cases growing on limestone, but occasionally also on other soil types. In this more continental region the herb layer consists of dry grassland and forest edge species, like *Epipactis atrorubens*, *Campanula persicifolia*, *Brachypodium pinnatum* and *Melampyrum nemorosum*. Such scrub communities are classified in the alliance *Berberidion vulgaris*.  Indicators of good quality:   * Presence of at least some continuous cover of healthy multi-stemmed hazel bushes without any overtopping tree canopy * Diverse herb layer, often with complex mosaics over uneven topography * Rich and diverse cryptogam flora * Grazing and browsing at moderate levels at most * Absence of signs of coppicing * Absence of invading oceanic aliens e.g. *Rhododendron ponticum.*   Characteristic species:  Flora: Shrub canopy: *Corylus avellana*.  Herbs (Atlantic region): *Anemone nemorosa, Asplenium phyllitis, A. trichomanes, A. viride, Athyrium filix-femina, Blechnum spicant, Brachypodium sylvaticum, Circaea intermedia, Cirsium helenioides, Deschampsia cespitosa, Dryopteris filix-mas, Geum urbanum, Hyacinthoides non-scripta, Mercurialis perennis*, *Oxalis acetosella, Primula vulgaris, Pteridium aquilinum, Trollius europaeus, Viola riviniana.*  Bryophytes: *Cololejeunea minutissima, Drepanolejeunea hamatifolia, Eurhynchium striatum, Frullania teneriffae, Harpalejeunea molleri, Isothecium myosuroides, Kindbergia praelonga, Loeskobryum brevirostre, Neckera pumila, Plagiochila bifaria, Plagiochila exigua, Pseudosleropodium purum, Ulota aalvescens, U. phyllantha, Zygodon conoideus.*  Lichens: *Arthonia cohabitans, A. excipiendia, A. ilicinella, Artholthelium macounii, Arthothelium orbilliferum, Bactrospora homalotropa, Eopyrenula septemseptata, Fuscopannaria sampaiana, Gomphyllus calycoicdes, Graphis alboscripta, Lecanora cinereofusca, Leptogium brebissonii, L. cochleatum, L. hibernicum, Lobaria pulmonaria, L. virens, Melaspilea atrodies, Mycomicrothelia atlantica, Parmelia testacea, Pseudocyphellaria intricata, P. norvegica, Pyrenula coryli, P. hibernia, P. laevigata, Thelotrema macrtocporum.*  Fungi: *Chromocyphella muscicola, Encoelia glauca, Hymenochaeta corrugata, Hymenocyphus fructigenus, Hypocreopsis rhododendri, Hypoxylon fuscum, Lactarius pyrogalus, Leccinum pseudoscabrum, Sarcocypha austriaca.* |
| F4.1 Wet heath | Typical Atlantic to sub-Atlantic heathland, dominated by *Erica tetralix*, is found on moist to wet, nutrient-poor acidic soils and shallow peats in sandy and rocky landscapes of Southwestern Norway, the northwest-European plain and the warmer Atlantic regions of France and northern Iberia, becoming rare southwards and eastwards with some scattered localities in the Baltic States. In many cases, the habitat exists due to human activities, like grazing, sod cutting or mowing and continuation of traditional management is needed for its maintenance. In other situations it forms a natural succession stage towards woodlands.  In its heartland, *Erica tetralix* is accompanied by *Carex panicea, Trichophorum cespitosum, Juncus squarrosus, Drosera rotundifolia, Gentiana pneumonanthe, Lycopodiella inundata, Sphagnum compactum, S. tenellum, S. molle* and *Narthecium ossifragum,* typical Ericion tetralicis. Such vegetation may also be found on the margins of bogs where the peat cover thins, on drained peatlands and on the shores of oligotrophic waters and in seepage areas on the edge of brook valleys.  In the last situation, Molinietalia species such as *Dactylorhiza maculata* and *Pedicularis sylvatica* occur. *Molinia caerulea* is itself a common species of the habitat and may become dominant if there is some strong water table fluctuation during the year, either natural or through anthropogenic deterioration of the hydrology, or after burning.  Much more rarely, *Erica tetralix*-dominated wet heath is found in fen areas in the Northwestern plain (Netherlands, Germany, Poland), where it forms a late succession stage in the development of transitional mires (alliance Oxycocco-Ericion) when accompanying species can include *Phragmites australis, Sphagnum palustre, Drosera rotundifolia, Molinia caerulea* and *Aulacomnium palustre*.  In the warmer and more humid oceanic climate of south-west England, Brittany and south-west France wet heath can also include *Erica vagans, E. ciliaris, E. mackaiana* and *Ulex minor* and in the foothills of northern Iberia *Erica tetralix* is accompanied by *Genista micrantha, Genista anglica, Potentilla erecta* and *Thymelaea dendryobryum.*  In landscapes which include drier acidic soils the habitat forms mosaics with F4.2 Dry heath where *Calluna vulgaris* usually dominates but where *Erica tetralix* may remain abundant on intermediate soils and on north-facing slopes or become dominant where a thickening humus layer maintains a moister surface or where moisture collects in depressions left by sod cutting. In dunes, *Erica tetralix* vegetation may be part of B1.5a *Empetrum* heathlands or B1.8a Wet dune slacks.  Indicators of good quality   * Dominance of *Erica tetralix* * No overwhelming encroachment of grasses (notably *Molinia caerulea*), shrubs (for example, *Myrica gale*) or trees (for example, *Betula pubescens*). * Occurring as part of a wider heath landscape, forming mosaics with drier heath, mires and water bodies. * Long continuation of management (grazing, mowing, sod-cutting or combinations of these).   Characteristic species:  Vascular plants: *Calluna vulgaris*, *Carex panicea*, *Drosera rotundifolia*, *Erica ciliaris*, *Erica mackaiana*, *Erica tetralix*, *Genista micrantha,* *Gentiana pneumonanthe*, *Juncus squarrosus*, *Molinia caerulea, Myrica gale, Narthecium ossifragum*, *Thymelaea dendryobryum, Trichophorum cespitosum ssp. germanicum,* *Trichophorum cespitosum ssp. cespitosum,* *Ulex minor*  Mosses: *Campylopus brevipilus*, *Gymnocolea inflata*, *Sphagnum compactum*, *S. molle, S. palustre, S. tenellum*  Fauna:  Reptiles: *Vivera berus ssp. berus*  Insects: *Maculinea alcon* |
| F4.2 Dry heath | Heaths dominated by sub-shrubs of the genera *Erica, Calluna, Vaccinium* and *Daboecia*, with some species of woody, often spiny, legumes of the genera *Ulex* and *Genista*, grasses and other ligneous plants, occurring on siliceous soils, often podsolised but rarely or never waterlogged. This habitat has its main distribution in Atlantic Europe, a region of oceanic climate with high precipitation and a low continentality, with some extensions towards interior areas of the continent in some siliceous mountains and on sandy plains. To the north, where it extends to the western coasts of Norway, it behaves like a thermophilic unit under the warming effect of the Gulf Stream and, in the south, like a montane high moisture-demanding vegetation. Its optimum, in terms of floristic richness, is probably related with glacial refugia and is in SW Atlantic Europe, particularly in the northern and western Iberian Peninsula, areas from which the habitat has extended outwards. From NW Morocco, where it is found in the rainy areas of the western Rif, its range encompasses western and northern Iberia, western France, British Isles, Belgium, The Netherlands, NW Germany, Denmark, and SW Sweden, with some important occurrences in the inner Central European siliceous mountain systems. These heaths are transitional to subalpine and boreal heathlands of the Vaccinio-Piceetea (type F2.2a), common in northern Scotland and Scandinavia, while in the south there are transitions to the Mediterranean siliceous scrubs of the Cisto-Lavanduletea. In Central Europe (Czech Republic, Hungary) several pannonic species are associated with this habitat.  In most situations out of its primary stations, this habitat is associated with a particular well-defined and intense disturbance regime. Since early times (probably since the Neolithic), mowing, burning and grazing have been the main practices carried out by humans on heathlands and nowadays rural abandonment and the relaxation of such activities have triggered secondary succession and led to its disappearance in many locations. Many of the areas formerly and nowadays still covered by heaths are secondary stands resultong from such human interventions. Primary stations of this habitat type are most probably linked to the coastal cliffs of Atlantic SW Europe, where shallow soils in the rocky habitats provide the adequate conditions for preventing succession and even an adequate refuge for survival during Pleistocenic ice ages. Dry heaths form dense sub-scrubs in which dominance is dependent on the type of management: high fire frequency combined with grazing leads to the dominance of graminoids, even to a sort of grassland with small heaths; regular mowing without grazing leads to the dominance of heathers, gorses and ferns (particularly *Pteridium aquilinum*), in a treatment much oriented to obtaining large quantities of vegetative material for cattle bedding and for manuring. The model of management is particular for each of the regions involved and adapted to the natural conditions and to the associations present in those places.  In the vast range through which dry heaths develop, there can be quartzic coastal non-dune sands with *Calluna vulgaris* and *Empetrum nigrum* in northern Europe, mesophile or xerophile heaths on siliceous, podsolic soils in moist Atlantic and sub-Atlantic climates of plains and low mountains of Southern, Western, Central and Northern Europe and true coastal heaths occurring on maritime cliff tops where they survive under the strong wind conditions, low salt spray and low temperature oscillation regime determined by the proximity to the sea, originating typical prostrate maritime formations.  Indicators of good quality:   * dense scrubs with many herbaceous plants: ferns, grasses, etc, without having a clear dominance of one particular species, nor heathers neither gorses or grasses. * evenness in the species populations, especially characteristic fauna, depending on microclimate and horizontal and vertical structure * presence of rare and/or threatened species * Absence of exotic species * Absence of nitrophilous species * Absence of trees and tall shrubs invading with lack of management * Presence of lichens and/or bryophytes * Presence of old *Calluna* shrubs with cycles of regeneration * Signs of traditional management including a low frequency fire, mowing, grazing, etc.   Characteristic species:  Vascular plants: *Agrostis curtisii, Allium ericetorum, Avenula lodunensis, Avenula sulcata, Calluna vulgaris, Carex asturica, Cistus psilosepalus, Cistus salviifolius, Cytisus lotoides, Daboecia cantabrica, Drosophyllum lusitanicum, Empetrum nigrum, Erica andevalensis, Erica australis* subsp*. australis, Erica australis* subsp*. aragonensis, Erica cinerea, Erica ciliaris, Erica mackaiana, Erica scoparia, Erica umbellata, Erica vagans, Erythronium dens-canis, Genista anglica, Genista germanica, Genista pilosa, Genista triacanthos, Genista tridens, Halimium alyssoides, Halimium ocymoides, Halimium umbellatum, Hypericum linariifolium, Lavandula viridis, Lithodora prostrata, Luzula lactea, Pedicularis lusitanica, Polygala microphylla, Pseudarrehnatherum longifolium, Pteridium aquilinum, Pterospartum tridentatum* subsp*.cantabricum, Pterospartum tridentatum* subsp*. lasianthum, Pterospartum tridentatum* subsp*. tridentatum, Satureja salzmanii, Scorzonera humilis, Serratula tinctorea, Simethis matthiazii, Stauracanthus boivinii, Stauracanthus vicentinus, Thymelaea coridifolia, Thymelaea dendrobryum, Thymus villosus, Tuberaria globulariifolia, Tuberaria lignosa, Tuberaria major, Ulex airiensis, Ulex europaeus, Ulex galli* subsp*. gallii, Ulex gallii* subsp*. breoganii, Ulex gallii* var*. humilis, Ulex jussiaei, Ulex micranthus, Ulex minor, Vaccinium myrtillus, Vaccinium vitis-idaea, Viola lactea.*  Bryophytes*: Hylocomium splendens, Pleurozium schreberi, Hypnum jutlandicum*  Lichens: *Cladonia spp, Cladina spp, Cetraria spp.*  Birds: *Caprimulgus europaeus, Sylvia undata*  Reptiles: *Coronella austriaca, Lacerta schreiberi* |
| F4.3 Macaronesian heath | Shrub communities of Azores, Madeira and the Canaries dominated or co-dominated by *Erica*, *Daboecia* or *Calluna* that are either i) pioneer, ii) permanent in thin soils or iii) seral or hedge of mature macaronesian forests (i.e. G2.7, G2.3). Although *Erica azorica*, *E. playcodon* subsp. pl. and *Erica canariensis* (= E. arborea sensu auct. can. & mad. non L.) may participate in the G2.7, G2.3 forest habitats, we strictly circumscribe the F4.3 type to the i), ii) and iii) conditions adding also iv) being nanophanerophytic. See also the G2.7 factsheet. This is a heterogeneous habitat with relation to biogeography, composition, structure and ecological context. Two main subtypes should be considered:  1) *Azorean heathland*. Azorean heahlands include several variants. i) A community dominated by *Daboecia azorica* with *Thymus caespititius* sitrictly permanent in pyroclast or volcanic rock nutrient-poor acidic leptosols, in the supratemperate belt of the Pico mountain (Pico island); ii) permanent communities of *Calluna vulgaris* with *Huperzia dentata* in recent lava fields (sometimes with post-XV century age); iii) *Erica azorica* pioneer communities that colonize former patches of *Juniperus brevifolia* mesotemperate microforest (G3.9c – *Culcito macrocarpae-Juniperenion brevifoliae* suballiance) and that collapsed by gravitational disturbance, *i.e.* catastrophic soil mass movements removing the juniper microforest, its  blanket bog, the peat layer, and the placic (iron-pan) horizon. This heath is part of a ‘cyclic-climax’ dynamics that will lead again, by sucession, to juniper microforest and the above referred  geomorphology; iv) Thermotemperate, occasionally thermomediterranean (S. Miguel island)  low altitude, *Erica azorica*  with *Morella faya* (= *Myrica faya*) heathland seral of *Picconia azorica* mature woodlands (G2.3 – *Myrico fayae-Pittosporion undulatti*) or permanent community in leptosols and rock outcrops or younger lava fields. A special variant of the later case are the *Corema azorica* termophyllous heaths in lava-fields up to 20 m.s.m.  2) *Madeiran and Canarian heathland*. Several variants of the habitat can be recognized. i) Shrub , sometimes tall-shrub, communities dominated by *Erica canariensis*, *E. platycodon* subsp. *platycodon* or *E. platycodon* subsp. *maderincola* along with *Morella faya*, *Ilex canariensis* (and sometimes in Madeira *Picconia excelsa*) that are the tall hedge of the laurel /heathy  forests (G2.7, G23 – *Ixantho-Laurion, Sibthorpio-Clethrion and Polysticho-Ericion*) or many times their first seral stage (they are included in *Myrico-Ericion* in both archipelagos). Therefore, sometimes they include elements of the laurel forest (*Laurus, Prunus, Viburnum*, etc.). The *Erica platycodon* subsp. *maderincola* mantles of tree-heath forests in the summits of Madeira are, nevertheless, species-poor. In thin, rocky or dry soils it can have a permanent character. ii) Heath / broom communities that are, in general, seral stages of laurus /heathy forest, in concrete:-  the second seral stage following the *Myrico-Ericion* stage. In steep, near-vertical slopes, they are admitted to be permanent communities. Along with the *Erica* species mentioned in 2) of low height, it also includes *Erica maderensis* (summits of Madeira only) and several species of genus *Teline, Adenocarpus, Argyranthemum, Echium, Chamaecytisus* that can be co-dominant in the heath /broom variant (see characteristic species, flora).  Indicators of good quality:  As its biogeography and ecological is so diverse, there isn´t a unique set of bioindicators of degradation. Thus, on each habitat stance, the loss of characteristic set of bioindicators must be evaluated in comparison to well-conserved descriptions of it (published phytosociological tables, for instance). In general, poorer versions tend to be dominated by just one or two species, few characteristics, less elements of the laurel /heathy forest and more plants of grassy stages. Also, the presence of aliens tends to be greater. In the case of the Azores: *Pittosporum undulatum, Clethra arborea, Melaleuca sp. pl., Metrosideros excelsa, Banksia integrifolia, Solanum mauritianum, Laurus azorica x nobilis, Hedychium gardneranum, Criptomeria japonica (*shrubby), *Acacia* sp. pl.; in the case of Madeira and the Canaries: *Ulex*, *Cytisus scoparius, Arundo, Acacia, Hackea, Callotropis, Opuntia, Ailanthus, Eucalyptus*, etc..  Characteristic species:  Vascular plants: For subtype #1): D*aboecia azorica* (dom.), *Erica azorica* (dom.), *Thymus caespititius* (dom.), *Calluna vulgaris* (dom.), *Dyphasiastrum maderense, Huperzia dentata, Huperzia suberecta, Palhinhaea cernua, Grammitis marginella subsp. azorica, Hypericum foliosum, Oreopteris limbosperma, Vaccinium cylindraceum* (dom.), *Corema azorica* (dom.)*.* Also those of habitat G2.7 in the Azores tend to occur to some extent, especially: *Euphorbia stygiana, Myrsine retusa, Viburnum treleasi* and *Ilex azorica, Rubia agostinhoi (s. str.)* For subtype #2) : *Erica canariensis (= E. arborea sensu auct. can. & mad. non L.), Erica platycodon subsp. platycodon, E. platycodon subsp. maderincola, Erica maderensis, Morella faya (=Myrica faya), Ilex canariensis, Picconia excelsa, Marcetella maderensis, Andryala pinnatifida subsp. pinnnatifida, Bencomia caudata, Cedronella canariensis, Hypericum inodorum, Rubia fruticosa subsp. periclymenum, Bystropogon canariensis, Bystropogon punctatum, Dracunculus canariensis, Gesnouinia arborea, Hypericum grlandulosum, Hypericum grandifolium, Phyllis nobla, Sideritis canariensis, Sideritis macrostachys, Rhamnus glanulosus, Smilax canariensis, Canarina canariensis, Convolvulus canariensis, Cryptotaenia elegans, Adenocarpus foliosus, Chamaecytisus proliferus, Chamaecytisus canariae, Chamaecytisus palmensis, Cistus chinamandensis, Teline canariensis, Teline pallida, Teline uerifolia, Teline splendens, Teline stenopetala subsp. microphylla, Teline stenopetala subsp. stenopetala, Teline maderensis, Argyranthemum pinnatifidum subps. pinnatifidum, Argyranthemum pinnatifidum subsp. montanum, Bunium brevifolium, Echium candicans, Plantago arborescens subsp. costae, Plantago malato-belizii, Sideritis candicans.* |
| F5.1 Mediterranean maquis and arborescent matorral | This habitat includes the evergreen sclerophyllous or lauriphyllous shrub vegetation with a more or less closed canopy structure (maquis), the low, sparse, garrigue-like silicicolous maquis of western Mediterranean, as well as the communities of low arborescent cover and with a usually thick, high evergreen shrub stratum, occurring in the Mediterranean biogeographical zone. Maquis and arborescent matorral may represent pre-forest communities, replacement stages of the climax forests, or permanent communities on xeric sites. High maquis includes scrub of *Arbutus* spp., *Erica* spp., *Juniperus* spp., *Phillyrea* spp. and low maquis includes communities of *Cistus* spp., *Erica* spp., *Genista* spp., *Lavandula* spp. Primary matorral occurs on ecologically marginal sites, but more often this habitat is derived from degraded broad-leaved evergreen, thermophillous deciduous or conifer forests. Juniperus spp., *Ziziphus* spp., *Laurus nobilis* and *Quercus coccifera* may codominate. The habitat includes a broad variety of plant communities and so, it does not exhibit any specific ecological preference. It mostly occurs in the thermo- to meso-Mediterranean belts but it extends from the intermediate between tropical and Mediterranean zones (scrub steppes of the arid Iberian, North Africa, Anatolia and central Cyprus) to the supra-Mediterranean zone (*Cistus ladanifer* shrublands of the Iberian peninsula and southern France). The habitat does not show any relationship with one specific substrate and it is found on acid (e.g. Ericion arboreae; Arbuto unedonis-Laurion nobilis), decalcified (e.g. *Cistus laurifolius* maquis) and alkaline soils. Grazing and fire are two of the most influential factors shaping the habitat’s physiognomy, acting at varying and usually contradictive ways. *Cistus monspeliensis* maquis can be favoured from fire events and may dominate the landscape after fires. On the other hand, fire in *Juniperus* ssp. arborescent matorrals can be a big threat to the habitat due to the low resistance to and poor recovery from fire of *Juniperus* species. With increasing summer aridity and human pressure, maquis resembles to garrigues as they become low and sparse. Moreover low, garrigues-like maquis are rather frequent in fire-prone regions. This habitat, besides the primary, edaphic- or climatic-controlled stands at marginal sites, has a strong plagioclimax character and so, its occurrence and quality mainly depends on the occurrence of low to intermediate disturbances at an acceptable periodicity.  Indicators of quality:   * Dense horizontal and vertical vegetation structure * No indication of overgrazing * Absence of active secondary succession towards forest ecosystems (absence of trees) * Absence of grass encroachment * Species richness of the stands * Absence of invasive species * Absence or low cover of ruderal species   Low levels of soil compactness, well developed Ah soil horizon and  are good indicators of absence of over grazing that can result to degradation towards garrigues. On the other hand, the level of tree and grass encroachment and, generally, presence and abundance of a given set of typical species or functional traits (i.e. morphological, physiological and life history characteristics) can be used as proxy indicators of biodiversity levels and succession stage. Absence of invasive and/or ruderal taxa should be also considered as indication of good habitat quality.  Characteristic species:  *Acacia albida, Arbutus unedo, Calluna vulgaris, Ceratonia siliqua, Cistus albidus, C. crispus, C. incanus, C. ladanifer, C. laurifolius, C. monspeliensis, C. populifolius, C. psilosepalus, C. salvifolius, Cupressus sempervirens, Erica arborea, E. cinerea, E. lusitanica, E. scoparia, J. oxycedrus, J. phoenicea, J. thurifera, Laurus nobilis, Lavandula stoechas* subsp*. luisieri, L. stoechas* subsp*. pedemontana, L. stoechas* subsp*. stoechas, Myrtus communis, Olea europaea* subsp. *cerasiformis, O. europaea var. sylvestris, Phillyrea angustifolia, P. latifolia, Pistacia lentiscus, Quercus coccifera, Q. faginea, Q. ilex, Q. pyrenaica, Q. rotundifolia, Q. suber, Rhamnus alaternus, Tetraclinis articulata, Viburnum tinus, Zelkova abelicea, Ziziphus lotus* and *Z. spina-christi.* |
| F5.3 Submediterranean pseudomaquis | Submediterranean pseudomaquis are distributed at the southern part of Europe and especially in its eastern part. They comprise transition vegetation between Mediterranean evergreen maquis scrub and continental deciduous schibljak scrub (Mucina et al. 2014) and they are characterized by the co-occurrence of evergreen and deciduous woody species (e.g. AdamoviÄ‡ 1906, Horvat et al. 1974). The former species are more thermophilous and tolerant to drought, while the latter are more demanding in soil moisture and nutrients, but also more frost tolerant. Pseudomaquis are distinguished mainly on the basis of their physiognomy (mixed scrub formations with evergreen and deciduous species) and they correspond to different plant communities (Bergmeier 1990), which have been classified within different orders, such as *Quercetalia ilicis*, *Fraxino orni-Cotinetalia*, *Quercetalia pubescenti-petraeae* and *Prunetalia spinosae* (Rodwell et al. 2002). However, they are usually characterized by the occurrence of the evergreen species *Quercus coccifera*, *Juniperus oxycedrus,* *Phillyrea latifolia* and *Buxus sempervirens*, and the one of the deciduous species *Carpinus orientalis*, *Ostrya carpinifolia*, *Fraxinus ornus*, *Quercus pubescens* and *Acer monspessulanum*. Furthermore, the herb flora of pseudomaquis is usually characterized by the occurrence and high frequency and cover of deciduous forests species (e.g. species of *Quercion frainetto*).  In most cases, the occurrence of pseudomaquis is not considered as climax vegetation, but the result of degradation of deciduous, broadleaved forests, because of disturbances like fire, grazing and unregulated logging or clear cuttings. Although pseudomaquis are more often found on calcareous substrates, they occur also on siliceous ones. The soil, regardless the substrate, is usually rocky and of small depth. They occur in low altitudes (e.g. 100 m), but more often are found within the lower part of mountain belts (e.g. 500-800 m).  Indicators of good quality:   * No fragmented canopy of the shrub layer; * Regeneration of the dominant woody species; * Herb layer composed mainly of species of forest habitats; * Absence or low cover of ruderal or light-loving species; * Low levels of soil compactness, absence of trampling and erosion (especially in the form of rills and gullies), high cover of litter and well developed Ah horizon.   Characteristic species:  *Acer campestre*, *Acer monspessulanum*, *Asparagus acutifolius*, *Brachypodium sylvaticum*, *Buxus sempervirens*, *Campanula trachelium*, *Carpinus orientalis*, *Cornus mas*, *Cotinus coggygria*, *Crepis fraasii*, *Fraxinus ornus*, *Hedera helix*, *Helleborus cyclophyllus*, *Hippocrepis emerus*, *Juniperus communis¸ Juniperus oxycedrus*, *Lathyrus laxiflorus*, *Ligustrum vulgare*, *Lithospermum purpurocaeruleum*, *Melica uniflora*, *Ostrya carpinifolia*, *Paliurus spina-christi*, *Phillyrea latifolia*, *Physospermum cornubiense*, *Pistacia terebinthus*, *Potentilla micrantha*, *Quercus cerris*, *Quercus coccifera*, *Quercus pubescens*, *Rosa arvensis*, *Ruscus aculeatus*, *Stipa bromoides*, *Syringa vulgaris*, *Viola alba*. |
| F5.5 Thermomediterranean scrub | Low to medium-sized scrub in the arid and semiarid South Mediterranean areas in southeast Spain, south Sicily, the southern Aegean islands, and south Cyprus, further in lowland Mediterranean North Africa and the Near East. They often form dense or sometimes more widely spaced, frequently spiny shrub patches. Open ground in between supports numerous xerophilous herbaceous plants and subshrubs. Sclerophyllous species are dominant (e.g., *Pistacia lentiscus*, *Periploca angustifolia*) as well as deciduous shrubs (e.g., *Zizyphus lotus*) and dwarf palms (*Chamaerops humilis*). Depending on the region and aspect of the vegetation, formations have been referred to as retamal (dominated by broom shrubs; mainly covered by habitat F3.1c), palmetto (dwarf palm), tomillar (dominated by needle-leaved or otherwise microphyllous *Labiatae*) or garrigue (dominated by *Cistus*, *Pistacia* and other shrubs). Most types of thermo-Mediterranean arid scrub are 2-3 metres tall, and they occur abundantly along the arid to semiarid North African Mediterranean coasts, being represented only in a few areas in Europe. Woodlands of *Tetraclinis* and *Ziziphus* reach 5-6 m.  Thermo-Mediterranean arid scrub occurs on a wide variety of bedrock and exclusively on dry soils. Rocky calcareous or dolomitic lithosols, sandy soils or eroded marly, gypsum and argillite sites are most common. On marly and argillaceous soils it is often affected by soil flow-off. The scrub is frequently wind-exposed, sometimes moderately halophytic if on sea cliff tops. Some subtypes of thermo-Mediterranean scrub may be replaced by woodland in the course of succession but scrub of the most arid and most exposed sites tends to be stable under current conditions and is considered natural or seminatural vegetation, particularly in SE Spain (*Murciano-Almeriense* province). Some stands are hardly accessible and thus only little affected by human influence. Many of the stands are however browsed by domestic animals (goats), sometimes severely.  Due to the extremely variable species composition and wide geographical range, thermo-Mediterranean scrub forms numerous plant associations and alliances and is part of several phytosociological classes. Dominant plants are *Periploca angustifolia*, *Tetraclinis articulatus*, *Gymnosporia europaea* and *Zizyphus lotus*, but in all the cases the shrubland is extremely dense, inextricable and spiny, being practically impenetrable. It produces abundant organic matter which favors the soil formation, being a valuable habitat type for soil protection and against erosion. Among the widespread plant communities occurring in this habitat are some of those dominated by *Pistacia lentiscus* (throughout the South Mediterranean), and most stands of *Euphorbia dendroides* (from the Balearic Islands to the East Mediterranean) and *Periploca angustifolia* (from Spain and Northwest Africa to the South Aegean). Many other habitat-specific shrubs, dominant or not, are restricted to single islands or island groups, such as *Euphorbia melitensis* dwarf shrublands on Malta, *Cytisus aeolicus* in Sicily, *Genista ephedroides* in Sardinia and *Genista majorica* on the Balearic island of Mallorca.  Indicators of good quality:   * Absence of greenhouse farming * No construction or building works, garbage dumping, solar panels, traffic, or other serious habitat impact. * No evidence of overgrazing * Absence of alien species such as *Oxalis pes-caprae* (the latter recognizable above ground only in early spring)   Characteristic species:  Vascular plants: *Ampelodesmos mauritanicus*, *Asparagus abus, Asparagus horridus, Calicotome intermedia, Chamaerops humilis, Cytisus aeolicus, Euphorbia dendroides*, *Euphorbia melitensis, Genista ephedroides*, *Genista majorica, Maytenus europaeus, Periploca angustifolia, Osyris quadripartita, Pinus halepensis, Pistacia lentiscus, Retama raetam* subsp*. gussonei, Rhamnus angustifolius, Tetraclinis articulatus, Zizyphus lotus*. |
| F6.1a Western basiphilous garrigue | Scrub vegetation dominated by xerophytic chamaephytes, mostly of cushion-shaped, nano-phanerophytes and sometimes tuffed perennial grasses and hemicryptophytes, on shallow or eroded soils derived from rocks with alkaline reaction of the western Mediterranean subregion. Common substrata are limestone (calcium carbonate rich), dolomitic (magnesium carbonate rich) and ultramafic rocks with alkaline reaction. The habitat type F6.1a is, in most cases, seral vegetation stage following degradation of zonal forests distributed from the thermo to meso-mediterranean, seldom to the low supra-mediterranean, semi-arid to sub-humid vegetation belts. In rocky outcrops or crests it may have a permanent character and form the climax vegetation. Also in semi-arid regions, such as those in the Murcia-Almerian province, it may stand as permanent vegetation in large areas.  The habitat is frequently dominated by shrubs of the families *Labiatae* and *Fabaceae* of neomediterranean character. It comprises a broad diversity of plant communities, especially in Spain, and includes many local endemic taxa, thus having a high conservation value. This vegetation has historically expanded its area due to soil erosion after the destruction of woodlands for agriculture and cattle grazing. It may also be promoted by wildfires, as most plants are R-strategist seeders and fire-prone. The biogeographic and bioclimatic variability allows the recognition of three subgroups (vegetation orders): *Rosmarinetalia* (dry to subhumid central and west Iberian limestone), *Antyllidetalia terniflorae* (semi-arid limestone and marl Murcia-Almerian province) and *Convolvuletalia boissieri* (dolomite and ultramafic), containing in total thirteen alliances.  As basiphilous garrigues have enormous syntaxonomic and floristic diversity in the western Mediterranean, some degree of interpretation is needed. We follow the concept of Mucina *et al.* (2014) with several modifications. The core concept is that of chamaephyte- and nano- phanerophyte-dominated scrub on eroded or thin soils in substrata with alkaline reaction, either derived from limestone, dolomitic (rich in magnesium carbonate)  or sometimes ultramafic rock, in thermo-mediterranean and meso-mediterranean belts. The vegetation corresponds to a large part of the class *Rosmarinetea officinalis* (in the sense of Rivas-Martínez et al., 1991, = *Ononido-Rosmarinetea* in Mucina et al.) and mostly to the widespread dry to sub-humid order *Rosmarinetalia.* Also the semi-arid limestone communities of the Murcia-Almerian province (order *Anthyllidetalia terniflorae*) are included. Gypsum communities (order *Gipsophylletalia*) are excluded (included in F6.7), but magnesium-prone ones are included (order *Convolvuletalia boissieri*). The equivalent habitats in west european calcareous mountains, mostly in supra and oro-mediterranean thermotypes, sometimes in sub-mediterranean temperate bioclimate are excluded and systematized in F6.6, F6.7 and F7.4. By the same reasoning all hedgehog heath (order *Erinacetalia anthylis*) is excluded and belongs to F7.4. The following syntaxa, in many cases ascribed to *Rosmarinetea* are thus excluded from F6.1a: *Erysimo-Jurinetalia bocconei* (F7.4b), *Festuco-Ononidetalia striatae* (F74.a). Also, not following Mucina et al., mountain garrigues of the following alliances are excluded: *Polygalo-Genistion corsicae, Helianthemo-Aphyllantion monspeliensis* (F6.6), *Alyssion bertolonii* (F7.4a), *Artemisio albae-Saturejion montanae* (F7.4a), *Lavandulo latifoliae-Genistion (Echinospartion) boissieri* (F6.6), *Siderito incanae-Salvio lavandulifoliae* (F6.6). However *Cisto eriocephali-Ericion multiflorae* is included to stand for an Italo- Thyrrenean irradiation of the east-mediterranean *Cisto-Micromerietea* class or otherwise considered in *Rosmarinetea* (West Mediterranean). Garrigues in limestone sea-cliffs (order *Helichrysetalia italici*) are excluded and classifiable in either F7.1-2 (west Mediterranean coastal garrigues) or B3.1-3b (Mediterranean and Black Sea rocky shores).  Indicators of good quality:  Apart from  the primary ecological niches of the habitat  (crests and rocky outcrops), it’s presence is s dependent on disturbances of low to moderate degree;  otherwise, it is expected to  be substituded along the  succession process by  forest communities. Although such processes are slow or even ‘locked’ by persistence of disturbance or feeble water capacity, the whole mosaic of garrigues and other habitats (grasslands, forests) in dry sub-humid types with shallow soils should be balanced by active management (burning or traditional agriculture and grazing). At its permanent positions on  rock crests no management is required for the conservation of the habitat. Species rich, “saturated” variations of the habitat need the emphasis to be given on conservation, while  the species-poor pioneer stages  are of lower conservation value but potentially these evolve into more species rich communities.. Another indicator of the habitat’s good quality is the presence of the majority of its local characteristic species.  Characteristic species:  Flora, Vascular plants:  *Anthyllis cytisoides*, *Anthyllis gandogeri*, *Aphyllanthes monspeliensis*, *Argyrolobium zanonii*, *Asperula brachysiphon*, *Astragalus chlorocyaneus*, *Astragalus granatensis*, *Atractylis humilis*, *Bupleurum fruticescens*, *Cephalaria leucantha*, *Cheirolophus intybaceus*, *Cistus albidus*, *Convolvulus lanuginosus*, *Coris* *monspeliensis*, *Coronilla lotoides*, *Coronilla minima* subsp. *minima*,  *Digitalis obscura*, *Dorycnium pentaphyllum*, *Elaoselinum tenuifolium*, *Fumana ericoides*, *Fumana* *hispidula*, *Fumana procumbens* subsp. *procumbens*, *Fumana thymifolia*, *Globularia alypum*, *Helianthemum syriacum*, *Helianthemum violaceum*, *Hippocrepis squamata*, *Koeleria vallesiana*, *Ononis angustifolia*, *Picris* *hispanica*, *Rosmarinus officinalis*, *Sideritis incana*, *Staehelina dubia*, *Thesium divaricatum*, *Thymelaea* *ruizii*, *Thymus vulgaris,Valeriana tuberosa,  Aristolochia pistolochia*, *Astragalus alopecuroides*, *Astragalus glaux*, *Catananche caerulea*, *Centaurea pinae*, *Cephalaria leucantha*, *Cistus clusii*, *Cytinus ruber*, *Dianthus hispanicus*, *Elaeoselinum hispanicum*, *Euphorbia flavicoma*, *Euphorbia hispanica*, *Euphorbia isatidifolia*, *Euphorbia nicaeensis*, *Fritillaria boissieri*, *Fumana montana*, *Fumana laevipes*, *Fumana laevis*, *Globularia vulgaris*, *Halimium atriplicifolium*, *Hedysarum europaeum*, *Helianthemum apenninum* subsp. *apenninum*, *Helianthemum asperum*, *Helianthemum cinereum* subsp. *rotundifolium,* *Helianthemum rotundifolium*, *Helianthemum croceum* subsp. *stoechadifolium*, *Helianthemum hirtum*, *Helianthemum marifolium*, *Hippocrepis bourgaei*, *Iberis nazarita*, *Klasea leucantha*, *Klasea pinnatifida*, *Lavandula latifolia, Leuzea conifera*, *Linaria aeruginea*, *Linum suffruticosum*, *Lithodora fruticosa*, *Ononis minutissima*, *Ononis pusilla*, *Onosma hispanica*, *Orobanche latisquama*, *Paronychia aretioides*, *Rosmarinus palaui, Ruta chalepensis, Satureja barceloi*, *Satureja obovata*, *Scorzonera* *hispanica* subsp. *crispatula,* *Serratula flavescens* subsp. l*eucantha*, *Serratula pinnatifida*, *Sideritis fruticulosa*, *Teucrium bicoloreum*, *Teucrium capitatum*, , *Teucrium hanseleri*, *Thymelaea elliptica*, *Thymelaea tinctoria*, *Viola arborescens, Cistus creticus, Genista corsica, Centaurea caballeroi, Centaurea dufourii, Cistus creticus, Cytinus pityusensis, Dianthus multiceps, Dianthus pungens, Erica multiflora, Genista dorycnifolia, Genista lucida, Genista trichoacantha, Guillonea scabra, Helianthemum caput-felis, Helianthemum cavanillesianum, Helianthemum molle, Helianthemum origanifolium, Hippocrepis fruticescens, Lavandula dentata, Ononis microphylla, Polygala rupestris, Satureja nervosa, Satureja rodriguezii, Sideritis albicaulis, Sideritis cardoana, Sideritis tragoriganum, Teucrium integrifolium, Teucrium spinescens, Teucrium x coeleste, Thymelaea sanamunda, Thymus aestivus, Ulex parviflorus, Vincetoxicum apodum, Aristolochia bianorii, Centaurea antennata, Lotus tetraphyllus, Phlomis italica, Satureja innota, Teucrium album, Anthyllis lagascana*, *Anthyllis onobrychioides*, *Arenaria pseudarmeriastrum*, *Centaurea rouyi*, *Dianthus fontqueri*, *Salvia mariolensis*, *Satureja valentina*, *Teucrium homotrichum*, *Thymelaea argentata*, *Thymelaea valentina*, *Thymus piperella, Dianthus contestanus, Linaria hegelmaieri, Thymelaea velutina, Genista pillosa subsp. jordanii, Cistus creticus subsp. eriocephalus, Dorycnium hirsutum, Fumana arabica, Micromeria nervosa, Teucrium flavum, Thymelaea tartonraira, Cytisus plumosus, Helianthemum andalusicum, Helianthemum hirtum subsp. bethuricum, Hyacinthoides vicentina subsp. vicentina, Iberis microcarpa, Klasea neglecta, Rosmarinus xmendizabali, Satureja micrantha, Sideritis lusitanica, Sideritis grandiflora, Sideritis reverchonii, Teucrium eriocephalum, Teucrium rixanense, Thymbra capitata, Thymus longiflorus, Thymus lotocephalus, Ulex scaber*, *Asperula hirsute, Genista hirsuta subsp. algarbiensis, Staureja graeca subsp. micrantha, Serratula baetica subsp. lusitanica, Sideritis algarviensis subsp. lusitanica, Teucrium algarbiensis, Teucrium lusitanicum, Thymus lotocephalus, Biscutella vicentina, Sideritis algarviensis* subsp. *algarviensis, Teucrium vicentinum, Ulex erinaceus, Bartsia aspera, Iberis procumbens subsp. microcarpa, Serratula estremadurensis, Sideritis hirsuta subsp. hirtula, Thymus zygis subsp. sylvestris, Ulex densus, Armeria platyphylla, Galium balearicum, Hypericum ericoides, Sideritis sericea, Vincetoxicum balearicum, Anthyllis balearica, Astragalus balearicus, Euphorbia balearica, Genista valdesbermejoi, Helichrysum microphyllum, Hypericum balearicum, Linaria pruinosa, Ononis crispa, Sonchus willkommii, Teucrium subspinosum, Anthyllis terniflora*, *Anthyllis* x*media*, *Astragalus hispanicus*, *Centaurea intybacea*, *Cistus carthaginensis*, *Convolvulus sericeus*, *Coris* *rivasiana*, *Elaeoselinum tenuifolium*, *Helianthemum* *cinereum*, *Helianthemum hispidulum*, *Helianthemum* *scopulorum*, *Hippocrepis scabra*, *Klasea mucronata*, *Linum jimenezii*, *Onobrychis stenorhiza*, *Paronychia* *suffruticosa*, *Satureja canescens*, *Sideritis murgetana*,*Teucrium gracillimum*, *Teucrium murcicum*, *Thymus hyemalis, Centaurea spachii, Fumana fontanesii, Helianthemum almeriense, Helianthemum guerrae, Helianthemum marminorense, Matthiola rigualii, Sideritis chamaedryfolia, Sideritis ibanyezii, Sideritis pusilla, Teucrium carthaginense, Thymus ciliatus, Thymus murcicus, Sideritis leucantha, Teucrium carolipaui, Thymus xdiazii, Vella lucentina, Dianthus charidemi, Sideritis osteoxyla, Sideritis granatensis, Teucrium cavanillesianum, Teucrium charidemi, Teucrium almeriense, Teucrium hieronymi, Teucrium xguemesii, Teucrium xportusmagni, Anabasis articulata, Diplotaxis intricata, Euzomodendron bourgeanum, Herniaria almeriana, Limonium album, Limonium carthaginense, Limonium estevei, Limonium tabernense, Moricandia foetida, Salsola papillosa, Sideritis alhamillensis, Teucrium lanigerum, Helianthemum hieronymi, Sideritis bourgaeana, Sideritis leucantha subsp. incana, Sideritis pauciflora, Sideritis serrata, Teucrium franchetianum, Teucrium martinii, Thymus antoninae, Thymus funkii, Thymus xparadoxus, Anthyllis polycephala, Anthyllis ramburii, Anthyllis tejedensis, Centaurea granatensis, Convolvulus boissieri, Digitalis laciniata, Erodium astragaloides, Festuca plicata, Fumana baetica, Fumana paradoxa, Helianthemum suffruticosum, Helianthemum neopiliferum, Helianthemum pannosum, Helianthemum raynaudii, Hippocrepis eriocarpa, Onobrychis argentea, Ononis cephalotes, Pterocephalus spathulatus, Thymus granatensis, Andryala agardhii, Anthyllis rupestris, Arenaria caesia, Arenaria racemosa, Arenaria tomentosa, Armeria trevenqueana, Armeria longiaristata, Centaurea genesii-lopezii, Chamaespartium undulatum, Erodium boissieri, Erysimum cazorlense, Festuca segimonensis, Globularia spinosa, Hedysarum costaetalentis, Helianthemum frigidulum, Jasione segurensis, Leucanthemopsis spathulifolia, Lithodora nitida, Rothmaleria granatensis, Santolina elegans, Scabiosa pulsatilloides, Scorzonera albicans, Silene tejedensis, Alyssum atlanticum, Anthyllis plumosa, Arenaria delaguardiae, Cistus parviflorus, Digitalis integrifolia, Erysimum rondae, Helianthemum estevei, Helianthemum viscidulum, Lavandula lanata, Sideritis arborescens, Sideritis occidentalis, Teucrium reverchonii, Teucrium serranum, Thymelaea angustifolia, Thymus baeticus, Thymus sabulicola, Alyssum malacitanum, Armeria carratracensis, Centaurea carratracensis, Genista lanuginosa, Halimium serpentinicola, Klasea baetica, Scorzonera baetica, Staehelina baetica, Ulex baeticus.* |
| F6.1b Western acidophilous garrigue | Xerophytic shrub communities of Mediterranean nano-phanerophytes with rolled or densely hairy leaves, rich in aromatic compoundsdominated by *Cistaceae*, *Labiatae* and sometimes by spiny brooms (*Genista* spp. ) that are always seral stages of forests or high-scrubs (mostly *Quercetea ilicis*); distributed from the thermo- to the lower supra- mediterranean vegetation belts with semi-arid to subhumid bioclimatic conditions, always in acidic, silicate-derived soils, excluding ultramafic substrata  with alkaline reaction. These communities occur on shallow,  frequently eroded soils with very acidic raw organic matter (mor type humus) throughout the Western Mediterranean subregion. Their range  has been expanded  due to human disturbances, namely the destruction of woodlands, and subsequent burning, grazing and agriculture. After abandonment of agricultural fields, after burning or after management of forest landscapes in Mediterranean bioclimates these communities act primarily as pioneer woody vegetation, being composed mostly of R-strategists, partly summer-deciduous seeder shrubs, which are also radiation-prone (heliophilous). As long as the disturbance regimes are kept (fire, tilling) shrub encroachment  might  occur and successional processes halt at the garrigue stage for a long time; hence  the garrigues may have a quasi-permanent character. Garrigues are characterized by high *taxa* diversity and also a great bio-coenotical and biogeographical differentiation, harboring many endemics. There are two main groups of communities following the  nature of the substratum: those on hard silicate (*Lavanduletalia stoechadis*) rocks and those  on loose-sand dunes and palaeodunes (*Stauracantho-Halimietalia commutati*). Several subtypes (alliances) may be recognized according to biogeography in the span of western Mediterranean region of Europe:  1. *Cistion ladaniferi*: garrigues of *Cistus* spp. and *Lavandula stoechas* at the thermo- to the supra- mediterranenan oceanic bioclimatic belts distributed to the north-central-Levantine Iberia, south coast of France, up to  Italy to  the coast of Liguria.  2. *Cistion laurifolii*: garrigues dominated by *Cistus laurifolius* and *Lavandula pedunculata* s.l. at the meso- to supra-mediterranean semi-continental bioclimatic belts distributed to  west-central Iberian..  3. *Ulici argentei*-*Cistion ladaniferi*: garriguesdominated by *Cistus ladanifer* and *C. monspeliensis* and co-dominated by *Lavandula sampaioana* (various subsp.), *L. luisieri, Genista hirsuta, Ulex borgiae, U.eriocladus, U. argenteus* distributed to central south-western Iberian (luso-estremadurensian and betic provinces).  *4. Calicotomo villosae-Genistion tyrrhenae*: Italo-Thyrrenean garrigues on  volcanic substrata at  the thermos-mediterranean belt, dominated by *Genista tyrrhena, G. cilentina, Erica multiflora, Cistus spp.., Calicotome villosa, Ampelodesmos mauritanica*.  *5. Teucrion mari*: garrigues dominated by *Teucrium marum, Stachys glutinosa, Cistus creticus, Phagnalon rupestre subsp. annoticum, Helychrysum italicum subsp. microphyllum, Genista corsica, G. sardoa, G. ephedroides, G. sulcitana, Santolina insularis, Euphorbia cupanii* at the meso- to thermos-mediterranean belts of Sardinia and Corsica.  6. *Coremation albi*: endemic-rich garriguescommunities dominated by *Stauracanthus genistoides* (= *S. lusitanicus*), *S. spectabilis, Halimium halimifolium, H. calycinum, Ulex australis* subsp. *australis* and U. *australis* subsp*. welwitschianus, U. argenteus* subsp. *subsericeus, Thymus camphoratus, Thymus capitellatus, Thymus albicans* subsp*. donyanae*  on consolidated dunes and palaeodunes distributed from the Portuguese coasts to the coasts of Andalusia. This subtype is characterized by the following genera  with endemic species:  *Armeria, Dianthus, Thymus, Avenula* and *Sideritis* (see flora).  *Note on the circumscription of the habitat*  Due to vagueness and broadness of the historical ‘garrigue’ concept, the circumscription of the habitat F6.1b should become  more precise. Thus, we circumscribe the habitat F6.1b to contain typical nano-phaneropytic (dwarf scrub) garrigues, seral of forests, on acidic silicate-derived soils, excluding chamaephytic mountain vegetation and sea-cliff vegetation. Taking Mucina *et al.* [EuroVegChecklist] (ined.) as syntaxonomic reference, the habitat includes the major part of the *Cisto-Lavanduletea stoechadis* vegetation class; hence, the following units or *syntaxa* with physiognomic and ecological  affinities to *Cisto-Lavanduletea* are excluded: chamaephytic cushion scrub vegetation of Corsica Sardinia and Sicily occurring at the  upper supra- to mountain- and oro- mediterranean belts assigned to *Carici-Genistetea lobelii* and *Rumici-Astragaletea siculi* -only on Mount Etna) is excluded (F7.4b); *Armerio sardoae- Genistion salzmanii* is excluded (considered *Carici-Genistetea lobelii*); tall-broom (*Genistetea*) communities seral of forests are excluded (F3.1c *Cytisetea scopario-striati*); xerophytic cushion chamaephytic scrub under the influence of salty wind is excluded (F7.1-2 or B3.1-3b: *Helichrysetalia italici*, *Crithmo-Staticetea* or *Rosmarinetea*); *Staehlino-Ulicion baetici* is excluded due to ultramafic siliceous alkaline substrata (F6.1a *Rosmarinetea officinalis*); *Teucrion mari* and *Calicotomo villosae-Genistion tyrrhenae* are considered separate alliances and are included in F6.1b; any type of vegetation of F5.1/2 (*Pistacio-Rhamnetalia alaterni*, *Quercetea ilicis*), namely *Quercion fruticosae* is excluded. All *Cisto-Micromerietea* vegetation from the Eastern Mediterranean subregion is excluded, due to strict biogeographic circumscription of the habitat to the Western Mediterranean ; thus, only territories west of Italy, including the Thyrrenian coast, Sicily, Corsica, Sardinia, Malta and the Baleares are included  ( the Adriatic coasts of Italy and territories eastwards are not included). All heathland habitats (F4.2) are excluded. *Erica multiflora* communities on limestone, even if decarbonated are excluded (*Cisto eriocephali-Ericion multiflorae*, *Cisto-Micromerietea* or *Rosmarino-Ericion multiflorae*, *Rosmarinetea*). Those communities including *E. multiflora* on substrataother than limestone are included. Semi- nitrogen or salt prone shrub vegetation is also excluded (F6.8a - *Pegano-Salsoletea* class).  Indicators of good quality:  As acidic garrigues are considered seral vegetation stages of woodlands, their maintenance in the landscape mosaic depends on the persistence of disturbance: cutting, fire, grazing and agricultural abandonment. Due to the pioneer character of this vegetation type, primary colonization stages after bare ground are species-poor  basal communities lacking  most specialized plants and poccessing less conservation value. Meta-stability of the garrigues stage for some time is necessary to reach coenotic saturation, i.e. defined by the presence of its full characteristic set of bio-indicators. Thus, as most garrigues follow plowing in managed forest-agricultural context, some patches are to be kept without disturbance for greater time. As much as more characteristic-indicator species are present, the greater the value of the communities.  In general, short periods between plowing should be avoided (< 15 years). In a greater time span, garrigues may be replaced by taller woody vegetation due to progressive ecological succession. The later should be taken on account when managing a landscape mosaic.  Characteristic species:  Due to the high number of species that the habitat contains as a whole, only the dominant taxa and taxa belonging to characteristic bioindicator sets at the  alliance level are listed.  **Vascular plants**:  *Calluna vulgaris* subsp*. elegantissima, Cistus salviifolius, Cytinus hypocistis* subsp*. macranthus, Halimium viscosum, Orchis mascula* subsp*. olbiensis, Orchis champagneuxii, Orchis picta, Cistus crispus, Cistus ladanifer, Cistus monspeliensis, Cistus salvifolius, Cistus populifolius, Cytinus hypocistis* subsp*. hypocistis, Narcisssus concolor, Narcissus triandrus* subsp*. palidulus, Helichrysum serotinum, Thymus mastichina, Centaurea hanryi, Dianthus multiaffinis, Hypericum australe, Lavandula stoechas, Calicotome spinosa, Cytisus catalaunicus, Genista pillosa, Thymus vulgaris, Arctostaphylos uva-ursi* var*. crassifolia, Aster aragonensis, Cistus laurifolius, Lavandula pedunculata, Lotus corniculatus* subsp*. carpetanus, Thymus leptophyllus, Erophaca baetica (=Astragalus lusitanicus), Centaurea sagredoi, Centaurea tartesiana, Genista hirsute* subsp*. hirsute, Lavandula stoechas* subsp*. luisieri, Lavandula sampaioana* subsp*. sampaiona, Lithodora prostrate* subsp*. lusitanica, Sideritis lacaitae, Sideritis marianica, Sideritis paulii, Thymelaea lythroides, Ulex argenteus, Ulex borgiae, Ulex eriocladus. Genista polyanthus, Thymus camphoratus* subsp*. congestus, Ulex airensis, Genista tyrrhena, Genista cilentina,Genista aspalathoides, Genista demarcoi, G. desoliana, Genista gasparrini, Teucrium marum, Stachys glutinosa, Helichrysum italicum* subsp*. microphyllum, Phagnalon rupestre* subsp*. annoticum, Genista Corsica, Genista sardoa, Genista ephedroides, Genista sulcitana, Santolina insularis, Euphorbia cupanii, Armeria macrophyll, Armeria pinifolia, Armeria rouyana, Armeria velutina, Cistus libanotis, Dianthus broteri* subsp*. hinoxianus, Fritillaria lusitanica* subsp*. stenophylla, Halimium calycinum, Halimium halimifolium* subsp*. halimifolium, Halimium halimifolium* subsp*. multiflorum, Halimium verticillatum, Iberis linifolia* subsp*.welwitschii, Lavandula sampaioana* subsp*. lusitanica, Stauracanthus genistoides, Stauracanthus spectabilis* subsp*. spectabilis, Stauracanthus genistoides* subsp*. vicentinus, Thymus albicans* subsp*. albicans, Thymus albicans* subsp*. donyanae, Thymus camphorates* subsp*. camphoratus, Thymus capitellatus, Ulex australis* subsp*. australis, Ulex australis* subsp*. welwitschianus, Ulex aregenteus* subsp*. subsericeus, Helichrisum picardii* var*. virescens, Avenula hackelli, Klasea algarviensis, Sideritis perezlarae.* |
| F6.2 Eastern garrigue | Evergreen, open, low scrub communities of the meso-, thermo- and occasionally supra-Mediterranean zones of Greece, southern Albania, western and eastern coasts of the Adriatic Sea, Cyprus and southern Anatolia, Black Sea coasts in Crimea, southern Bulgaria, European part of Turkey and northern Anatolia, as well as in the Mediterranean-Steppic zone of southern Thrace. Here are included all the sclerophyllous communities with scanty and low physiognomy due to the increased summer aridity and human pressure. The scrub communities with: a) conspicuous spiny cushion structure (F7), b) abundant thermo-Mediterranean shrub species (F5.5) and c) *Erica arborea* and *Arbutus* spp. forming high macchia vegetation (F5.2) are excluded from this unit.  This habitat type includes:  a)    garrigues dominated by *Quercus coccifera*, the most widespread xerophyllous scrub communities in the eastern meso-Mediterranean,  b) xerophyllous low scrub communities with *Cistus* spp., *Rosmarinus* *officinalis* of the eastern Ionian, Aegean and eastern Mediterranean coastlands and more to the inland,  c) low scrub communities (garrigues) of the western and eastern coasts of the Adriatic Sea (Illyrian garrigues) dominated by, *Erica manipuliflora*, *Erica multiflora*, *Rosmarinus officinalis, Spartium junceum* and dwarf shrubs like *Cistus* spp. and *Dorcynium hirsutum*,  d) Mediterranean-type xerophyllous open low scrub communities (Black Sea garrigues) dominated mostly by *Cistus incanus* and *Cistus salvifolius* (distributed along the Black Sea coasts - in Crimea, southern Bulgaria, and European part of Turkey and northern Anatolia, as well as of the Mediterranean-Steppic zone of southern Thrace). The most typical Mediterranean species, including evergreen shrubs like *Myrtus communis, Arbutus unedo* and *A. andrachne*, occur at the Anatolian coast of the Black Sea. Specific communities (not typical garrigues, as the dominant species are perennial herbs and short semi-shrubs) are distributed on flysch slopes of the Crimean Peninsula.  All the types of garrigues assigned to the habitat F6.2, as geographically and floristically/ecologically differentiated above, are dominated by (or are rich in) *Quercus coccifera, Rosmarinus officinalis*, *Erica manipuliflora, Cistus incanus*, *C. salvifolius* and *Dorcynium hirsutum,* low shrubby *Juniperus oxycedrus*, or *J*. *phoenicea*, *Lavandula stoechas* or *L. angustifolia*, labiate shrubs or robust perennials like *Teucrium fruticans*, *Phlomis* spp., *Salvia triloba*, S. *argentea*, *S*. *eichlerana*, *S*. *pomifera*, *Stachys* spp., broom-like shrubs of the genera *Genista*, *Chamaecytisus*, *Teline,* *Ebenus cretica* (in Crete), dwarf, shrubby composites of the genera *Helichrysum*, *Phagnalon*, *Scorzonera*, shrubs dominated by *Erica manipuliflora*, low bushes of *Arbutus andrachne*, *Globularia alypum*, dwarf shrubs of the genera *Helianthemum* or *Fumana*, shrubs of the genus *Thymelaea*, *Bupleurum fruticosum* shrubs and, finally, the low, pre-desert formations with *Ziziphus spp.*, *Acacia albida*, *Capparis spinosa*, *Rhamnus palaestina*, *Rhus tripartita* of the Levant and southern Anatolia.  Garrigues are the result of retrogressive succession after degradation of evergreen Mediterranean forest and macchia (maquis) vegetation and maintained by grazing and fire. The floristic composition of garrigues reflects the diverse geographical position, altitudinal zones and human impact. The garrigues at the Black Sea coasts represent one of the latest stages of degradation of the mixed xerothermic oak forests and pseudomaquis in areas with transitional-Mediterranean climate. They differ from the typical Mediterranean garrigues by the prevalence of deciduous species and the absence of typical Mediterranean species.  Indicators of quality:  · Low levels of soil compactness and absence of active secondary succession  · Communities rich in perennial and annual herb species, shrub and semi-shrub species  · Presence and abundance of a given set of typical (diagnostic) species or functional traits (i.e. morphological, physiological and life history characteristics)  · Dominance of low shrub and semi-shrub species  · Open habitat conditions  · Moderate grazing  · Absence of fire  · Absence of alien, invasive and/or ruderal species  · Occurrence of rare and/or threatened species mostly with Mediterranean origin  · Sporadic presence of maquis and forest species.  Characteristic species:  *Arbutus andrachne, Bupleurum fruticosum, Capparis spinosa, Cistus creticus, C. laurifolius, C. salvifolius, Dorcynium hirsutum, Ebenus cretica, Erica manipuliflora, E. multiflora, Fumana* spp*., Globularia alypum, Helianthemum* spp.*, Helichrysum* spp*., Juniperus oxycedrus, J. phoenicea, Lavandula angustifolia, L. stoechas, Phagnalon graecum, Phlomis cretica, P. floccosa, P. fruticosa, P. lanata, Quercus coccifera, Rhamnus palaestina, Rhus tripartita, Rosmarinus officinalis, Salvia argentea, S. eichlerana, S. pomifera, S. triloba, Stachys cretica, Teucrium fruticans, Thymelaea tartonraira, Ziziphus lotus, Z. spina-christi* |
| F6.6 Supramediterranean garrigue | Open scrub on calcareous substrata formed by ligneous plants of Mediterranean floristic character which represent degradation seral stages in the supra levels of the Mediterranean region. They replace basically *Quercus rotundifolia, Quercus ilex, Quercus faginea* and *Juniperus thurifera* forests. This habitat type is found in the base-rich mid elevation terrains in the Baetic mountains, central Iberian high plateau (meseta), Pyrenees piedmonts, southern France and southern Alps piedmonts, Apennine. It is present also in Portugal and Greece. These garrigues have been historically expanded by fire, a common practice of traditional sheepherding which has been the main land use along centuries. This is in apparent contradiction with the abundance of narrowly distributed species, but this is probably due to the fact that, in their primary stations, the patches of this habitat were isolated and distant from each other, favoring speciation. After the arrival of the Neolithic period (about 8 to 7000 years BP in western Mediterranen areas), humans transformed the landscape completely reversing the relative abundance of the previously existing habitats as they needed open large areas for their herds causing that the formerly restricted scrub areas became general in the landscape. Nowadays, with the abandonment of traditional sheepherding, of firewood collection and charcoal fabrication, forests and woodlands are recovering and this habitat, some decades ago extensively represented, is in clear regression, although still far from being in danger. Structural similar communities in siliceous sites of the supramediterranean zones of the mountains of Sardinia and Corse, with *Genista salzmanni* as an important species, are considered part of the oro-mediterranean hedgehog heaths of habitat F7.4b.  Indicators of good quality:  Optimal conditions for this type entail that the typical structure of the vegetation to be represented, i.e. scrub of low height and low cover in a matrix of open soil. The following characteristics may be considered as indicators of good quality, but these indicators differ in different regions:  • Presence of dwarf ligneous plants, particularly endemics, including threatened species  • High to medium cover of vascular plant vegetation, particularly chamaephytes  • Low cover of encroaching tall grasses and shrubs  • Absence of nitrophilic and alien species indicating heavy human influence  Characteristic species:  Vascular plants: *Allium chrysonemum, Anthyllis vulneraria* subsp*. arundana, Aphyllanthes monspeliensis, Arenaria arcuatociliata, Arenaria vitoriana, Artemisia alba, Aster willkommii* subsp. *catalaunicus, Astragalus bourgaeanus, Astragalus clusianus, Astragalus turolensis, Carthamus araneoasus* subsp. *macrocephalus, Carex halleriana, Carthamus araneosus* subsp. *pseudomitissimus, Centaurea alba* subsp. *costae, Centaurea alba* subsp. *maluqueri, Centaurea boissieri, Centaurea emigrantis, Centaurea gadorensis, Centaurea monticola, Centaurea resupinata* subsp. *prostrata, Cephalaria linearifolia, Coronilla minima, Crocus nevadensis* subsp*. marcetii, Dianthus algetanus, Dianthus anticarius* subsp*. subbaeticus, Dianthus costae, Echinospartum boissieri, Erysimum favargeri, Erysimum fitzii, Euphorbia spinosa, Fumana ericifolia, Genista cinerea, Genista elias-sennenii, Genista hispanica, Genista pseudopilosa, Genista pumila, Genista salzmanii, Genista scorpius, Genista lobelii, Genista pulchella* subsp*. villarsii, Genista teretifolia, Helianthemum appeninum, Helianthemum oelandicum* subsp*. italicum, Helianthemum rossmaessleri, Hippocrepis commutata, Hippocrepis rupestris, Hippocrepis scorpioides, Hypericum coris, Knautia arvensis* subsp*. collina, Knautia subscaposa, Lavandula angustifolia* subsp*. angustifolia, Lavandula angustifolia* subsp*. pyrenaica, Lavandula latifolia, Leucanthemum favargeri, Leucanthemum pallens, Leucanthemum vulgare* subsp*. monserratianum, Linum campanulatum, Linum suffruticosum* subsp*. differens, Nepeta hispanica, Onobrychis argentea* subsp*. hispanica, Onobrychis reuteri, Phlomis crinita* subsp*. composita, Plantago discolor, Ptilostemon hispanicus, Ranunculus malessanus, Salvia blancoana, Salvia lavandulifolia* subsp*. lavandulifolia, Salvia lavandulifolia* subsp*. pyrenaeorum, Salvia lavandulifolia* susbp*. vellerea, Salvia oxyodon, Salvia phlomoides* subsp*. boissieri, Salvia phlomoides* subsp*. phlomoides, Salvia pseudovellerea, Satureja intricara* subsp*. gracilis, Satureja montana, Scabiosa macropoda, Scorzonera hirsuta, Scorzonera reverchonii, Sideritis flaviflora, Sideritis laxespicata, Sideritis pungens, Stachys heraclea* subsp*. valentina, Staehelina dubia, Teucrium aragonense, Teucrium leonis, Teucrium lucidum, Teucrium luteum* subsp*. contortostylum, Teucrium luteum* subsp*. similatum, Teucrium webbianum, Thymelaea pubescens, Thymus clandestinus, Thymus fontqueri, Thymus funkii* subsp*. burilloi, Thymus mastigophorus, Thymus membranaceus, Thymus orospedanus, Thymus tenuifolius, Thymus vulgaris, Veronica tenuifolia.* |
| F6.7 Mediterranean gypsum scrub | Open scrub on gypsum-rich substrata growing in dry to semiarid Mediterranean climate, mostly distributed in the central and south-eastern Iberian Peninsula and with small representations in some Mediterranean islands (Sicily and Cyprus). It develops on sedimentary evaporitic bedrocks rich in gypsum (gypsisols in the FAO soil classification), locally called aljezares (from Arabic aljez = gypsum) of Triassic, Oligocene and Miocene ages. Many of the species of this type are linked to this particular edaphic conditions, being called gypsohytes or gypsophilous species. Many of them are narrow endemics of Iberian or even more restricted distribution, particularly among the scrub species, but also some of the annuals. A few of them are also present in North Africa (*Helianthemum squamatum, Lepidium subulatum, Ononis tridentata*) or in other countries in the Mediterranean Europe (*Chaenorhinum exile, Ctenopsis gypsicola*). The richness of endemics is higher in the centre and the south of the Iberian Peninsula than in the northern part of the habitat’s range (Ebro Depression), being highest in the southeast (Almeria, Murcia and Alicante). In addition to the gypsophytes, a number of basiphilous scrub plants of wider distribution and ecology occur, such as *Rosmarinus officinalis* and *Thymus* species. Remarkably, also among the lichens, one endemic exists: *Diplotomma rivas-martinezii*. Other lichen species of the habitat have a wide distribution over the Middle East and Central Asian arid territories, suggesting an old connection with these areas during the desiccation of the Mediterranean Sea in the Messinian episode (Upper Miocene). The EU28 area of this type is restricted to parts of peninsular Spain where gypsum outcrops occur under severe dry climatic conditions and tiny representations in Cyprus and Sicily. It occurs also in some areas of North Africa.  The typical structure of this habitat is formed by three main elements: (1) a chamaephytic scrub of low height (5-60 cm) and low cover in a dispersed formation, (2) a hard lichen crust covering the soil in between the shrubs, and (3) an ephemeral therophytic community appearing in rainy springs, populating the space between shrubs in early summer. This state is quite stable and natural succession is slowed down because of the extreme conditions of soil, slope and severe drought. A moderate sheep grazing pressure is compatible with an optimal state for preventing succession towards shrubland (maquis with *Juniperus* and *Quercus coccifera*) and perennial grassland (*Machrochloa tenacissima, Brachypodium retusum*). The appearance of this habitat, humble, dry and open, entails an idea of poverty and aridity largely extended in the mentality of most of the human society. For that reason, very often those gypsum scrubs have been despised and its area used as landfills, for wind turbines, for quarrying gypsum, and other uses, even after the approval of the Habitat Directive by the European Union in which they were declared as a Priority Habitat. In addition to this and despite its importance, many attempts have been made to perform restoration of woodlands, mostly with pines (*Pinus halepensis*), which have mostly failed due to the severe soil and climate conditions.  Indicators of good quality:  The following characteristics may be considered as indicators of good quality, but these indicators differ in different regions:  • Presence of gypsophytes, particularly endemics, including threatened species  • Scrub of low height and low cover  • High cover of open soil covered by lichen crust  • Low to moderate cover of vascular plant vegetation, particularly chamaephytes  • Low cover of encroaching tall grasses and shrubs  Characteristic species:  Vascular plants: Gypsophytes: *Astragalus castroviejoi (\*\*), Boleum asperum (\*\*), Brassica repanda subsp. gypsicola (\*\*), Brassica villosa subsp. tinaei (\*\*), Campanula fastigiata (t), Centaurea hyssopifolia (\*\*), Chaenorhinum exile (t), Chaenorhinum grandiflorum subsp. grandiflorum (t\*\*), Chaenorhinum reyesii (t\*\*), Coris hispanica (\*\*), Ctenopsis gypsicola (t), Diplotaxis harra subsp. crassifolia, Erysimum metlesicsii (\*\*), Euphorbia minuta subsp. moleroi (\*\*), Ferula loscosii (\*\*), Gypsophila struthium subsp. struthium (\*\*), Gypsophila struthium subsp.hispanica (\*\*), Hedysarum boveanum subsp. palentinum (\*\*), Helianthemum alypoides (\*\*), Helianthemum marifolium subsp. conquense (\*\*), Helianthemum squamatum, Herniaria fruticosa (\*\*), Koeleria vallesiana subsp, castellana (\*\*), Lepidium subulatum, Limonium aragonense (\*\*), Limonium lobetanicum (\*\*), Limonium mansanetianum (\*\*), Limonium viciosoi (\*\*), Narcissus pachybolbus, Ononis tridentata subsp. angustifolia var. angustifolia, Ononis tridentata subsp. angustifolia var. edentula (\*\*), Ononis tridentata subsp. crassifolia (\*\*), Ononis tridentata subsp. tridentata, Orobanche georgii-reuteri (on Lepidium subulatum \*\*), Orobanche gypsogena (\*\*), Orobanche resedarum (\*\*), Reseda stricta subsp. funkii (t\*\*), Reseda stricta subsp. stricta (t), Reseda suffruticosa (t\*\*), Santolina viscosa (\*\*), Sedum gypsicola, Teucrium balthazaris (\*\*), Teucrium lepicephalum (\*\*), Teucrium libanitis (\*\*), Teucrium pumilum (\*\*), Teucrium turredanum (\*\*), Thymus lacaitae (\*\*).*  t = therophytes, \*\* narrow endemics.  Frequent non gypsophytes: *Brachypodium retusum, Genista scorpius, Helianthemum syriacum, Lithodora fruticosa, Rosmarinus officinalis, Thymus vulgaris.*  Mosses: *Aloina aloides, Crossidium crassinerve, Riccia crustata, Tortula revolvens var. obtusata, Trichostomum crispulum. Lichens: Acarospora placodiiformis, Acarospora reagens, Buellia zoharyi, Diploschistes diacapensis, Fulgensia desertorum,Lecidea gypsicola, Lepraria isidiata, Psora decipiens, Squamarina lentigera, Teloschistes lacunosus, Toninia sedifolia*. |
| F6.8 Mediterranean halo-nitrophilous scrub | In this type we have included not only the halo-nitrophilous but also the nitrophilous (with a lower content of salt) communities dominated by perennial plants, often ligneous or hemicriptophytes with large size, frequent in ruderal environments (nearby human dwellings, borders of tracks and ways, etc.) in dry to arid regions in the Mediterranean, Irano-Turanian and North Saharo-Arabian regions. Some botanical groups are highly represented in its flora such as *Chenopodiaceae*, *Artemisia, Santolina* and in many areas the grass *Lygeum spartum* is also abundant. Soluble nitrates and phosphates resulting from organic matter decomposition remain on the soil for long time, due to the scarcity of rainfall. This permits the life of long-living nitrophilous plants, such as shrubs, and thus, the development of a nitrophilous scrub. Such conditions of aridity also favor accumulation of salt in the soils, and many of these formations are adapted to a certain salt tolerance (halo-nitrophilous). Characteristic species are often archeophytes and neophytes native to other Mediterranean areas or even from tropical countries. The habitat type is present in the center and south of the Iberian Peninsula, in S- Italy, Sicily, Sardinia and the Aegean islets (Greece), as well as on the Canaries and Madeira archipelagos. Its diversity is highest in the arid and semi-arid thermo and infra Mediterranean areas of the Iberian Peninsula. In agrarian landscapes of the Mediterranean region submitted to a long historic human pressure, this habitat contributes substantially to the local biodiversity and landscape quality, being often also grazed by the local sheep and goat races.  Indicators of good quality:  In nitrophilous habitat good quality entails the degree of disturbance and of human influence necessary to maintain populations of the ruderal and nitrates depending species.  Characteristic species:  Flora, Vascular plants:  Continental Europe: *Artemisia arborescens, Artemisia barrelieri, Artemisia campestris* subsp. *glutinosa, Artemisia herba-alba* subsp. *herba-alba, Artemisia herba-alba* subsp. *valentina, Artemisia lucentica, Atriplex glauca, Atriplex halimus, Ballota hirsuta, Camphorosma monspeliaca, Capparis spinosa* var. *canescens, Carthamus arborescens, Commicarpus africanus, Euphorbia matritensis, Fagonia cretica, Frankenia thymifolia, Hammada articulata, Haplophyllum linifolium, Hohenackeria polyodon, Ipomoea indica, Ipomoea purpurea, Krascheninnikovia ceratoides, Launaea arborescens, Lycium barbarum, Lycium europaeum, Lycium intricatum, Marrubium alysson, Mercurialis tomentosa, Nicotiana glauca, Peganum harmala, Plumbago europaea*, *Ricinus communis, Ruta angustifolia, Salsola genistoides, Salsola oppositifolia, Salsola vermiculata, Santolina canescens, Santolina chamaecyparissus* subsp. *squarrosa, Santolina impressa, Santolina oblongifolia* subsp. *obtusifolia, Santolina pectinata, Santolina rosmarinifolia* subsp. *ceratophylla, Santolina rosmarinifolia* subsp. *rosmarinifolia, Santolina rosmarinifolia* subsp. *semidentata, Senecio malacitanus, Sideritis hirsuta* subsp. *danielii, Solanum linneanum, Suaeda mollis, Withania frutescens, Withania somnífera, Zygophyllum fabago*.  Canaries and Madeira: *Argyranthemum broussonetii, Argyranthemum frutescens* subsp. *frutescens, Argyranthemum frutescens* subsp. *succulentum, Artemisia ramosa, Artemisia thuscula, Atriplex glauca* subsp. *ifniensis, Bosea yerbamora, Ceballosia fruticosa, Calendula maderensis, Chenolenoides tomentosa, Cheirolophus canariensis, Convolvulus caput-medusae, Descurainia millefolia, Forsskaolea angustifolia, Frankenia capitata, Gonospermum fruticosum, Herniaria canariensis, Lavandula canariensis, Lavandula pinnata, Lavatera acerifolia, Lobularia canariensis* subsp. *marginata, Lotus glaucus, Lotus sessilifolius* var. *pentaphyllus, Nicotiana paniculata, Plantago arborescens, Rumex lunaria, Salsola brevifolia, Salsola portilloi, Salsolab vermiculata* subsp. *frankenioides, Salsola tetrandra, Salvia canariensis, Schizogyne glaberrima, Schizogyne sericea, Suaeda ifniensis, Withania aristata*. |
| F7.1 Western Mediterranean spiny heath | Rare, extremely local and isolated, cushion-forming scrubs, often with spiny species, located in the clifftops of rocky coastal stretches, dispersed along the coasts of south Portugal, Northeast Spain and southern France, the Balearic and Thyrrenian Islands (Corsica, Sardinia, Malta and Pantellaria) up to the southern Italian Peninsula (Gulf of Taranto). It is submitted to the constant wind actions and to the salinity transported by the spray reaching particularly during the strong wind episodes. The rocky shallow soils and the steep slopes prevent from further development of vegetation, being considered this habitat as a permanent community of coastal clifftops in the Mediterranean area. These clifftop scrubs are characterized by irregular cover at their optimal phases, depending on the slope and the soil depth. Most of the stands of this habitat are quite inaccessible and the threats seem so be low.  Indicators of quality:  • no signals of human activity: trampling, building, trash, etc.  • presence and abundance of narrow-endemic species  Characteristic species:  Vascular plants: *Anthyllis fulgurans, Anthyllis hermanniae subsp. hystrix, Armeria ruscinonensis Astragalus balearicus, Astragalus massiliensis, Centaurea balearica, Centaurea horrida, Euphorbia pithyusa, Genista acanthoclada* subsp*. sardoa, Genista corsica, Genista morisii, Helichrysum italicum, Helichrysum saxatile* subsp*. errerae, Launaea cervicornis, Matthiola pulchella, Plantago subulatum, Sarcopoterium spinosum, Teucrium subspinosum, Thymelaea hirsuta*. |
| F7.3 Eastern Mediterranean spiny heath (phrygana) | This habitat includes low, thorny and chamaephytic communities of hemispherical shrubs, widespread at low and middle altitudes in the eastern Mediterranean and Anatolian regions. These phrygana communities occur at the coastal thermo-, meso- and the supra-Mediterranean zones of the Aegean islands, of mainland Greece and the Ionian islands, of coastal Anatolia and Crete (up to 1200 m a.s.l.), and are much more widespread and diverse than the western Mediterranean spiny shrub communities (F7.1-2). The *Sarcopoterium spinosum*-dominated communities, by far the commonest phrygana facies, are widespread in the Aegean archipelagos and Crete, with local outposts in continental Greece, the Ionian islands and coastal Anatolia. In this habitat are also included varied communities of supra- and oro-Mediterranean levels of Crete resulting from the broad contact between phryganas and hedgehog-heaths, with *Euphorbia acanthothamnos, Verbascum spinosum, Berberis cretica, Phlomis cretica, Satureja thymbra, Sideritis syriaca, Hypericum empetrifolium, Origanum microphyllum, Micromeria juliana, Helichrysum italicum* subsp*. microphyllum, Genista acanthoclada* and *Astragalus angustifolius*. Here are also included phrygana communities rich in *Cistus, Erica* and *Genista* species which  occur on calcareous (*Hyperico empetrifolii-Micromerion graecae*, *Micromerion julianae*, *Helichryso sanguinei-Origanion syriaci*), as well as on non-calcareous substrates (*Helichryso barrelieri-Phagnalion graeci*, *Hyperico olympici-Cistion cretici*, *Helichryso sanguinei-Origanion syriaci*), such as granite, gneiss and phyllitic schists, on serpentine, on hard and soft marls, on volcanic soils, and on sand. The distribution range of the *Helichryso barrelieri-Phagnalion graeci* includes Peloponnesus and Crete, the Ionian and the Aegean sides of the Greek mainland, the Central and South Aegean islands and the Aegean coast of Anatolia northward to approx. 39o N (Barbero & Quezel 1989, Mucina et al. 2009), i.e. a region where vegetation linked to the thermo-mediterranean belt is widely distributed (Quezel & Barbero 1985), although the communities of the alliance are not strictly limited to low altitudes (also vegetation relevés from the Pilion peninsula middle altitudes are placed in the Helichryso barrelieri-Phagnalion graeci). The distribution range of the *Helichryso sanguinei-Origanion syriaci* includes Cyprus, Turkey, Syria and Lebanon, where it occurs on calcareous and marl substrates as well as on serpentines and metamorphic substrates, at altitudes ranging from the sea level to 1200 m (thermo-, meso- and supra- Mediterranean vegetation belts). The distribution range of the *Hyperico olympici-Cistion cretici* and the *Micromerion julianae* includes Northern Greece (Central Macedonia, Thrace), Central Greece (Thessaly), where the phrygana communities occur on non-calcareous and calcareous substrates respectively. Included here are also the thorny cushion communities of the Thracian wooded steppe zone enclaved between the Black Sea, the Sea of Marmara and the Aegean, with *Sarcopoterium spinosum* and *Astragalus* *thracicus.* These are distributed in northeastern Greece and Turkey-in-Europe, with local representatives in the xerothermic oak belt of the hills and rim of the Northern Thracian plain (East Rumelian plain) of southeastern Bulgaria, in particular, in the Bakadzicita hills of the Yambol Tundzja basin and in the foothills of the eastern Rhodopes. Finally, the cushion-forming thermo-mediterranean summer-deciduous phrygana communities of Cyprus are assigned to the *Sarcopoterio spinosi-Genistion fasselatae* alliance. They are mostly characteristic of the Cyprian central plains (thermo- and meso- Mediterranean altitudinal levels: 0-800 m a.s.l.), with a semi-steppic batha appearance (Irano-Turanian affinities) formed by *Sarcopoterium spinosum, Thymbra capitata, Lithodora hispidula, Onosma fruticosum, Galium suberosum*. They are distributed on sandy and loamy soils. This habitat can be of primary origin or having a climax character especially in the islands of the Aegean, as well as in the coastal zones of Anatolia, Cyprus, Syria and Lebanon. It is often the result of retrogressive succession of evergreen sclerophyllous vegetation.  Indicators of quality   * Low levels of soil compactness * Absence of active secondary succession * Low degree of shrub and grass encroachment * Mosaics of the phyrgana communities with screes, rocks, boulders * Patchiness of shrubs with herbs/grasses, and potentially arborescent shrubs (e.g. *Pistacia lentiscus, Quercus coccifera, Juniperus phoenicea*) or single trees * Natural, undisturbed relief * Absence or low cover (<5%) of invasive and/or ruderal species   Characteristic species  *Cistus creticus, C. salviifolius, Erica manipuliflora, Genista acanthoclada, Hypericum empetrifolium* subsp*. empetrifolium, Hypericum olympicum, Satureja thymbra, Helichrysum stoechas* subsp*. barrelieri, Calicotome villosa, Helichrysum sanguineum, Micromeria myrtifolia, Origanum syriacum, Phlomis viscosa, Teucrium brevifolium, Daphne gnidioides, Lactuca triquerta, Daphne sericea, Lomelosia argentea (=Scabiosa argentea), Fagonia cretica, Lomelosia brachiata (=Pterocephalus palaestinus), Onosma frutescens, Sarcopoterium spinosum, Genista fasselata, Euphorbia acanthothamnos, Verbascum spinosum, Berberis cretica, Phlomis cretica, Sideritis syriaca, Origanum microphyllum, Micromeria juliana, Micromeria graeca, Helichrysum italicum* subsp. *microphyllum, Centaurea spinosa, Stachys spinosa, Ballota pseudodictamnus, Lithospermum hispidulum, Fumana arabica, F. thymifolia, Teucrium divaricatum, T. polium, Salvia triloba, Phagnalon graecum, Phlomis fruticosa.* |
| F7.4a Western Mediterranean mountain hedgehog-heath | This habitat consists of scrub or shrubby vegetation dominated by prostrate ligneous plants of pulviniform habit, i.e. simulating a hedgehog. They live in high mountainous areas, mostly in upper supra- and oro-mediterranean levels, usually between 1,600 and 2,300 m Aslin mountains of the central and southern Iberian Peninsula. This habitat type is presentin the siliceous mountains (*Cytision oromediterranei*, *Genisto versicoloris-Juniperion hemisphaericae*) and in the calcareous ones (*Pruno prostratae-Juniperion sabinae*, *Xeroacantho-Erinaceion anthyllidis*); while in the dolomitic substrata of the Baetic ranges, the endemic-rich alliance *Andryalion aghardii* is represented. Junipers and hedgehog legumes, often spiny, are the dominant and representative elements of this habitat, which is adapted to conditions of cold and drought typical of the Mediterranean mountains. The flora is rich in narrow endemics due to speciation, which is enhanced by isolation between mountain summits. Endemics are much more numerous on limestone or dolomite than in siliceous substrata. This habitat type constitutes, in most of the stands, the potential natural vegetation of the oro-mediterranean belt but there are also secondary, anthropo-zoogenic downslope extensions of the high-altitude formations which can be considered seral scrubs; at these lower altitudes, the primary stands of this habitat are in the crests and steep slopes. Due to human influence (grazing, burning), those extensions have historically increased and currently occupy somewhat larger areas than they would under strictly natural conditions. This habitat type has been traditionally used by an extensive husbandry with local transhumance of sheep and goat herds moving along the different altitudinal levels, and thus leading to a moderate grazing pressure.  Indicators of good quality:  In optimal conditions, this type shows a structure of dense scrub or shrubland of high to medium cover with prominent cushion shaped (hedgehog) ligneous plants in mosaic with a grassland of hard grasses in the open spaces. The following characteristics may be considered as indicators of good quality:   * Abundance of endemics, including threatened species. * High to medium cover of vascular plant vegetation, particularly prostrate shrubs and chamaephytes. * Absence of signals of disturbance by trampling, skiing or burning. * Absence of ruderal, nutrient-demanding species.   Characteristic species:  Vascular plants: *Anthyllis vulneraria* subsp*. microcephala, Arenaria alfacarensis, Armeria lanceobracteata, Artemisia villosa, Astragalus nevadensis* subsp*. andresmolinae, Astragalus nevadensis* subsp*. muticus, Astragalus nevadensis* subsp*. nevadensis, Astragalus sempervirens* subsp*. giennensis, Bupleurum spinosum, Centaurea boissieri* subsp*. funkii, Cytisus balansae* subsp*. nevadensis, Cytisus oromediterraneus, Echinospartum barnadesii* var*. hirsutum, Echinospertum ibericum* subsp*. pulviniformis, Erinacea anthyllis, Genista longipes* subsp*. gadorensis, Genista longipes* subsp*. longipes, Genista longipes* subsp*. viciosoi, Genista sanabrensis, Genista versicolor, Hippocrepis castroviejoi, Hippocrepis nevadensis, Juniperus alpina, Juniperus hemispaherica, Juniperus sabina, Prunus prostrata, Satureja intricata, Scabiosa andryalifolia, Sideritis carbonellis, Sideritis giennensis, Sideritis glacialis* subsp*. virens, Teucrium lerrouxii, Teucrium oxylepis, Thymus gadorensis, Vella castrilensis, Vella spinosa, Veronica tenuifolia* subsp*. fontqueri.* Dolomitic species*: Andryala aghardii, Anthyllis rupestris, Anthyllis tejedensis, Arenaria caesia, Arenaria racemosa, Arenaria tomentosa, Armeria trevenqueana, Armeria villosa* subsp*. longiaristata, Centaurea ginesii-lopezii, Chamaespartium undulatum, Convolvulus boissieri, Erodium boissieri, Erysimum cazorlense, Festuca plicata, Festuca segimonensis, Fumana procumbens* subsp*. baetica, Globularia spinosa, Hedysarum costatalentis, Helianthemum frigidulum, Helianthemum neopiliferum, Helianthemum pannosum, Jasione crispa* subsp*. segurensis, Leucanthemopsis spathulifolia, Lithodora nitida, Ononis cephalotes, Rothmaleria granatensis, Santolina elegans, Scabiosa pulsatilloides, Scorzonera albicans, Silene boryi* subsp*. tejedensis, Thymus granatensis.* |
| F7.4b Central Mediterranean mountain hedgehog-heath | This habitat includes high-mountain thorny-cushion dwarf scrub in the Central Mediterranean region. In terms of structure and ecology it is similar to the hedgehog heaths from the West-Mediterranean (F7.4a) and the East-Mediterranean (F7.4c). It is however distinguished as a separate, vicariant type, because of its different species composition, with many endemics. The dominant species are chamaephytes, morphologically similar to those in the West and East Mediterranean hedgehog heath. In the Central Mediterranean region the characteristic shrubs belong to the genera *Aspalathus*, *Genista* or *Armeria.* Central Mediterranean hedgehog heath is found in the supra-mediterranean and oro-mediteranean belts of the islands of Elba, Sardegna and Sicily and of the Southern Apennines and Cantabrian mountains. It is found both on acidic and calcareous soils, mainly on very windy sites that are exposed to an intense solar radiation.  Spiny *Astragalus*-species dominate primary stations above or near the timberline. Due to deforestation or grazing, such communities may have a downslope expansion. In lower altitudes they also grow on rocky ridges that are free of trees. In the Central Mediterranean the following *Astragalus* species are important in the mountain hedgehog heath: *Astragalus calabrus* in the Sila Massive of Calabria, *Astragalus gennargenteus* on Mount Gennargentu (Sardinia) and in the mountains of Corse, *Astragalus nebrodensis* (= *Astragalus siculus* subsp. *nebrodensis*) in the Madonie mountain chain of Sicily, *Astragalus siculus* on Mount Etna (Sicily), and relict stands of *Astragalus sirinicus* in the southern Appennines. These *Astragalus*-communities contain a high amount of endemic vascular plants, amongst which several species of *Viola*. In the Central Mediterranean region only the Mount Etna is sufficiently high to allow an optimal development of the thorny *Astragalus* dominated belt. In the other mountain groups the *Astragalus*-associations occur rather localized near the top of the mountains.  *Genista* dominated hedgehog-heath occurs mainly below the timberline, and in most cases is considered a secondary habitat, although it may form the climax vegetation on strongly wind-swept locations. In general such communities have a lower percentage of endemics than the *Astragalus*-communities, and a higher frequency of broader Mediterranean species, amongst which many therophytes. Examples of characteristic species are *Genista salzmannii* on Sardegna and Corse, *Genista desoleana* on Elba and *Genista cupanii* on Sicily. *Genista*-dominated scrub forms transitions towards *Juniperus communis* ssp. *nana* (Corse) or *Juniperus hemisphaerica* (Sicily) dominated dwarf scrub (F2.2b), in general found on deeper and more humid soils. *Berberis aetnensis* is a common species of both the *Juniperus*-dominated and the *Genista*-dominated dwarf scrub. On Sardegna and Corse mountain hedgehog heath is often found in mosaic with patches of oro-mediterranean grassland (E1.5c).  In Calabria spiny heaths are found on Mont Aspromonte, dominated by *Armeria aspromontana*, *Potentilla calabra* and *Centaurea poltiana*. *Armeria nebrodensis* is one of the dominant species in hedgehog heath on acidic soils in the Madonie mountains of Sicily.  Spiny scrub communities in the warmer parts of the Alps and Pyrenees, like those dominated by *Astragalus sempervirens* subsp*. sempervirens*, *Genista lobelii* or *Genista hispanica*, are not included in this habitat, but in F6.3 (supra-mediterranean garrigues). Spiny heathlands in the warmer parts of the Alps, like those dominated by *Genista lobelii* and *Genista pulchella* ssp. *villarsii* (alliance *Genistion lobelii*) or by *Astragalus sempervirens* (alliance *Ononidion cenisiae = Avenion sempervirentis*) are considered part of F6.6.  Indicators of good quality:  In good condition the habitat has a low structure and is rather open, forming mosaics with bare soil or grassland types. Indicators of good quality are:  ·     No or little presence of trees,  ·     Low hedgehog-like vegetation structure,  ·     Forming landscape mosaics with grasslands or bare soil.  Characteristic species:  Flora  Vascular plants: *Alyssum robertianum*, *Anthyllis hermanniae*, *Armeria aspromontana*, *Armeria brutia*, *Armeria canescens*, *Armeria multiceps*,  *Armeria nebrodensis*, *Armeria sardoa*, *Astragalus calabrus*, *Astragalus genargenteus* (= *A. sirinicus* ssp. *gennargenteus*), *Astragalus nebrodensis*, *Astragalus siculus*, *Berberis aetnensis*, *Centaurea poltiana*, *Centaurea sarfattiana*, *Cerastium boisserianum*, *Genista corsica*, *Genista cupanii*, *Genista desoleana*, *Genista lobelioides* (= *G. lobelii* var. *lobelioides*), *Genista salzmannii* (*= Genista lobelii* var. *salzmannii*), *Helichrysum italicum* ssp*. italicum*, *Juniperus communis*, *Plantago humilis*, *Plantago subulata*, *Plantago serpentina*, *Potentilla calabra*, *Prunus spinosa*, *Rosa seraphini*, *Rumex aetnensis,Ruta corsica, Scleranthus vulcanicus, Senecio aetnensis, Teucrium marum, Thymus herba-barona, Viola aethnensis*, *Viola corsica*, *Viola nebrodensis*. |
| F7.4c Eastern Mediterranean mountain hedgehog-heath | This diverse habitat includes both the primary cushion heaths of the high, dry mountains of the East Mediterranean region with low, cushion-forming often spiny shrubs, and the secondary, zoogenic downslope extensions of these high-altitude formations. More specifically, it includes: (a) the shrubby formations of dry, usually calcareous rocky places with strongly eroded humus-carbonate soils, with large amounts of skeletal material and rock outcrops including the spiny hedgehog-heaths, the cushiony formations of dwarf suffrutescents and/or the bush-dominated facies of stripped grasslands, (b) the downslope extensions of the high altitude formations in zoogenic forest clearings of the mountains of Greece, of the Moesian zone and of the central Balkan peninsula which are dominated by the same species, or specifically montane or steppic taxa (often *Genista*-dominated), and (c) the high altitude hedgehog-heaths that are developed on relatively humus-rich rendziniform soils at or above treeline and dominated by large hemispherical tussocks of the tragacanths *Astragalus rumelicus*, and/or *Astragalus parnassi*. Varieties, distinguished by the dominant taxa, include the tragacanth dominated cushion heaths of the eastern Mediterranean; the *Genista acanthoclada* dominated formations; the summit communities of Mt. Troodos (in Cyprus) with Berberis cretica, *Sorbus aria* subsp. *cretica* (= *S. graeca*) that also include the restricted endemics *Astragalus echinus, Alyssum troodii, Teucrium cyprium, Nepeta troodi, Satureja troodii, Onosma troodi* and *Scorzonera troodea*; the endemic-rich hedgehog-heaths of calcareous mountains of Aegean islands and mount Athos (in Greece); as well as the hedgehog-heaths of high mountains of Crete with *Astragalus creticus* subsp. *creticus, Astragalus angustifolius, Acantholimon androsaceum, Berberis cretica, Daphne oleoides, Prunus prostrata, Euphorbia acanthothamnos, Verbascum spinosum* and *Sideritis syriaca*.  Indicators of good quality:  • High species richness and occurrence of endemic species  • Low shrub cover (chamaephytes, nano-phanerophytes) more than 30%  • Significant presence of perennial grass species  • Regular grazing  • No indication of strong erosion eg. gully formation  • Absence or low cover of ruderal/nitrophilous species (species of Stellarietea or of the Artemisietea)  • Long-term habitat stability: absence of progressive or retrogressive succesional trends  Characteristic species:  *Acantholimon androsaceum, Achillea ageratifolia, Agropyron cristatum, Alyssum kionae, Alyssum troodii, Anthyllis aurea, Artemisia alba, Asperula cynanchica, Aster alpinus, Astragalus angustifolius, A. creticus subsp. creticus, A. echinus subsp. rumelicus, A. lacteus, A. parnassi, Berberis cretica, Bothriochloa ischaemum, Bromus riparius, B. scoparius, Centaurea chrysolepis, Cirsium hypopsilum (C. cylleneum), Convolvulus cochlearis, Daphne oleoides, Eryngium amethystinum, E. pusillum, Euphorbia acanthothamnos, Festuca dalmatica, F. stojanovii, F. thracica, Festucopsis sancta, Fumana procumbens, Genista acanthoclada, Globularia stygia, Hyacinthella leucophaea, Hypericum rumeliacum, Juniperus hemisphaerica, Linum flavum, Marrubium velutinum subsp. cylleneum, Minuartia stellata, Nepeta troodi, Onosma troodi, Paronychia kapela, Prunus prostrata, Rhodax canus, Rindera graeca, Satureja montana subsp. kitaibelii, S. troodii, Scorzonera troodea, Sesleria coerulans, Sideritis clandestina, S. scardica, S. syriaca, Sorbus aria subsp. cretica, Teucrium cyprium, T. montanum, Thymus boissieri, T. hirsutus, T. jankae, T. striatus, T. teucrioides, and Verbascum spinosum.* |
| F7.4d Canarian mountain hedgehog-heath | Canarian high-mountain volcanic semi-desert scrub, restricted to the subalpine zone of Tenerife and La Palma. The main occurrence of this rare and unique habitat type concerns the Cañadas del Teide on Tenerife, where it covers several square kilometers of the comparatively flat bottom of this huge caldera, one of the largest in the world. The dominant shrub species here is the striking hemispherical ‘hedgehog’ species *Cytisus supranubius* (up to 2 m), accompanied by a set of smaller species from different plant families showing a similar growth form, e.g. *Nepeta teydea* (*Lamiaceae*), *Pterocephalus lasiospermus* (*Dipsacaceae*) and *Descurainea bourgeana* (*Brassicaceae*). Every year, during its flowering period in May, *Cytisus supranubius* is painting the lava landscape in a bright white, in honor of its Spanish name ‘*retama blanca’*. Another prominent species in this open habitat is the pillar-shaped *Echium wildpretii*, which appearance reminds us of the *Senecio* and *Lobelia* communities in the arid belt of East-African tropical mountains above the timber line. The caldera is situated above 2,000 m and almost never gets any precipitation. It is thought that the dead remains of the flower stalks of the various species are able to catch and transport water during periods with fog. In addition to the limited supply of water, the extreme soil conditions strongly determine plant growth in this bare volcanic landscape.  The habitat type further comprises two scree communities at the summits of the Canaries, one on Tenerife and one on La Palma. On Tenerife, *Viola cheiranthifolia* is found on the flanks of the Teide, above the caldera, and on La Palma, *Viola palmensis* is growing in the highest parts of the island. Both the hedgehog and the scree communities are permanent natural vegetation.  This mountain habitat type is of particular conservation value as it houses a set of endemic and extremely rare species, which even do not (or hardly) occur outside the range of the habitat. Another conspicuous feature is that these communities do not support the occurrence of more widespread species, as is the case in other endemic ecosystems. Where the endemic habitat types of the Canary Islands at lower altitude are generally accompanied by many mediterranean species, this is not the case in these high-altitude hedgehog and scree communities. As a consequence, the habitat type is rather poor in species (5-10 species in general).  Indicators of good quality:   * Presence of rare and endemic species. * Absence of ruderal, often more nutrient-demanding species. * Absence of alien species (grasses and shrubs). * Long-term habitat stability, with no successional trends.   Characteristic species:  Vascular plants: *Adenocarpus viscosus* var. *spartioides* (dom), *Adenocarpus viscosus* var. *viscosus* (dom), *Argyranthemum teneriffae, Arrhenatherum calderae, Bencomia exstipulata, Cheirolophus teydis (= Cheirolophus argutus), Cytisus supranubius (= Spartocytisus supranubius;* dom*). Descurainea bourgeana, Descurainea gilva, Echium auberianum, Echium gentianoides, Echium wildpretii, Erisymum scoparium, Genista benehoavensis (= Teline benehoavenensis), Micromeria lasiophylla ssp. Palmensis, Nepeta teydea, Pimpinella cumbrae, Plantago webbii, Pterocephalus lasiospermus, Pterocephalus porphyranthus, Scrophularia glabrata, Sideritis oriocephala, Silene nocteolens, Stemmacantha cynaroides, Viola cheiranthifolia, Viola palmensis.* |
| F8.1 Canarian xerophytic scrub | Open scrub formed by stem and leaf succulents, often belonging to the *Euphorbia* genus (*tabaibales* and *cardonales*), and woody sclerophyllous shrubs. It develops in the xerophytic to desertic lowland areas of the Canary Islands, covering practically the whole of the area in the eastern islands (Lanzarote and Fuerteventura) and the lower belts in the rest of the archipelago, particularly in the south facing slopes. The substrata are rocky, often with very poorly developed soils (lithosols).  The succulent scrub has elements of arid tropical origin, related to habitats existing in arid territories of tropical Africa. As in the other Canarian habitats, many geovicariant endemics for each of the islands or islands groups enrich the characteristic species list. This habitat type is divided into two main subtypes, one in the lower altitude on rocky soils and dryiest areas, in which the succulent scrub is dominant, and the second, in somewhat higher elevations, moister conditions and more structured soils, dominated by a xerophytic scrub of *Rhamnus* and *Olea*, much more related to Mediterranean ecosystems and containing more Mediterranean flora elements.  This habitat has been historically used by man and altered due to goat grazing, housing, and building of urban areas. As a result, it is easily invaded by nitrophilic species of the *Forsskaoleo-Rumicetalia lunariae*.  **Indicators of good quality:**   * Absence of nitrophilous and non-native species * Presence and abundance of endemic succulent shrubs     **Characteristic species:**  ***Flora***  Vascular plants: *Allagopappus dichotomus, Anagyris latifolia, Androcymbium hierrense, Argyranthemum callichryson, Argyranthemum coronopifolium, Argyranthemum escarrei, Argyranthemum gracile Argyranthemum sundingii, Asparagus arborescens, Asparagus nesiotes, Asparagus pastorianus, Asparagus ploclamoides, Asparagus scoparius, Asparagus umbellatus, Brachypodium arbuscula, Bupleurum handiense, Bupleurum salicifolium* subsp*. acidyphyllum, Bystropogon plumosus, Bystropogon odoratissimus, Campylanthus salsoloides, Caralluma burchardii, Ceropegia dichotoma, Ceropegia fusca, Cistus monspeliensis subsp. canariensis, Convolvulus floridus, Convolvulus lopezsocasi, Convolvulus scoparius, Dorycnium eriophtalmum, Dracaena draco, Echium aculeatum, Echium brevirame, Echium decaisnei,* subsp*. purpuriense, Echium giganteum, Echium strictum, Erysimum bicolor, Euphorbia aphylla, Euphorbia atropurpurea, Euphorbia balsamifera, Euphorbia berthelotii, Euphorbia canariensis, Euphorbia handiensis, Euphorbia lamarckii, Euphorbia regis-jubae, Globularia salicina, Helianthemum canarinse, Herniaria canariensis, Hypericum canariense, Jasminum odoratissimum, Juniperus turbinata* subsp*. canariensis, Justicia hyssopifolia, Kickxia sagittata, Kickxia scoparia, Kleinia neriifolia, Marcetella mocquiniana, Maytenus canariensis, Micromeria hyssopifolia* var*. hyssopifolia, Micromeria hyssopifolia* var*. kueglerii, Micromeria varia, Micromeria teneriffae* var*. cordifolia, Neochamaela pulverulenta, Olea europaea* subsp*. canariensis, Olea europaea subsp. cerasiformis, Pancratium canariense, Parolinia intermedia, Parolinia ornata, Paronychia canariensis, Periploca laevigata, Ploclama pendula, Reichardia famarae, Reseda scoparia, Retama raetam, Rhamnus crenulata, Rubia fruticosa* subsp*. melanocarpa, Rubia fruticosa* subsp*. fruticosa, Ruta pinnata, Rutheopsis herbanica, Scilla haemorrhiodalis, Seseli webbii, Sideritis brevicaulis, Sideritis dendrochahorra, Sideritis pumila, Spartocytisus filipes, Taeckholmia capillaries, Taeckholmia microcarpa, Taeckholmia pinnata, Tamus edulis, Teline osyrioides* subsp*. osyrioides, Teline osyrioides subsp. sericea, Teucrium heterophyllum, Vicia cirrhosa*. |
| F8.2 Madeirean xerophytic scrub | Xerophytic nano- to microphanerophytic communities, sclerophyllous, succulent (or having other kinds of morphological adaptations to drought) of the lower altitudes in Madeira island. These include: (1) communities dominated by paleomediterranean shrubs or small trees: *Olea, Maytenus, Chamaemeles*: with hard leathery leaves (*Mayteno-Oleion maderensis*) that stand for mature zonal vegetation of permanent character in thin cambisols of rocky steep cliffs in the infra to thermomediterranean (sometimes infra-thermotemperate in the north face) semi-arid to dry belts. In their upper altitude limit some of these communities (*Myrtus communis* with *Hypericum canariense*) may be the natural edge or first seral stage of the *Apollonias barbujana* thermomediterranean sub-humid forests (included in G2.3 type, *Visneo-Apollonion*); (2) Thick succulent stemmed *Euphorbia piscatoria* summer-deciduous communities that are seral stages of the former (*i.e.* i)), permanent communities or pioneer in rocky leptosols, for instance in low altitude abandoned fields; (3) inframediterranean/temperate sub-humid half-sclerophyllous tall shrub communities of the northern face, transitional from xerophytic to mesophytic heathlands (*Syderoxylon mirmulans* community: *Visneo-Apollonion barbujanae*); (4) chamaephytic communities of neomediterranean shrubs, having rolled, hairy, waxy or resinous leaves, or exhibiting leaflessness the most part of the year, that are seral stages of the zonal sclerophyllous types, pioneer or sometimes permanent in semiarid steep rocky cliffs (*Soncho-Artemision argenteae*); (5) xerophytic succulent low-scrub semi-halonitrophyllous under some influence of salt winds and nitrates from bird dropping deposition of *Calendula maderensis* (*Argyranthemo suculenti-Calendulion maderensis*).  The two later variants (iv) and v)) could be together separated as a subtype within the F8.2 type, but since they are found usually in mosaic with the other variants without regional or landscape separation, this is superfluous for habitat typology purposes. The main contacts of the F8.2 type are with *Grenovio-Aeonietea* succulent rock wall vegetation (*Sinapidendro-Aeonion glutinosi*, H3.3 Macaronesian inland cliffs). Where the semi-halonitrophyllous scrubs are not found in mosaic with other communities of H8.2, they can be considered as type H6.8a Mediterranean halo-nitrophilous scrubs.  Indicators of good quality:  In general, dominant plants and the bioindicator set should be identified at its maximum mumber as a measure of ecological integrity (see characteristic species, flora, vascular plants). As to the sclerophyllous or half-sclerophyllous variants (i and ii) that are successionaly replaced by the ii) or iv) variants by disturbance, the more elements of *Euphorbia piscatoria* community (*E. piscatoria, Echium nervosum* or *Globularia salicina*) or any of the iv) variant (*Carlina salicifolia, Artemisia argentea, Erysimum maderense, Genista tenera, Helichrysum monizii, Micromeria varia* subsp. *thymoides and Phagnalon lowei*), the more the sclerophyllous i) variant is formally close to collapse. Nevertheless, since this happens from natural or expected human-induced causes and the seral stages are themselves floristically valuable, some care should be taken in evaluating the whole of the mosaic of variants within the F8.2 type for conservation purposes. The same reasoning applies to the v) variant (indicators: *Argyranthemum pinnatifidum* subsp. *suculentum* and *Calendula maderensis*). Reliable indicators of degradation are the increase in dominance of tall-grass stages: *Hyparrhenia sinaica* (=*H. hirta* auct mad.), *Cenchrus ciliaris*, *Dactylis glomerata* subsp. *hylodes* or any kind of disturbance-prone or nitrophyllous vegetation.  Note on delimitation of habitat type  We restrict the habitat concept to the xerophytic hard-leaved/succulent in low-altitude (infra-thermomediterranean) semi-arid to dry nano-microphanerophytic shrub communities (*Rhamno-Oleetea cerasiformis*) and also including xerophytic low-scrub in high sea cliffs under the moderate influence of salt winds and nitrates from sea bird droppings (semi-halonitrophyllous communities: *Pegano-Salsoletea*). Due to its transitional character between xerophytic high scrub (*Mayteno-Oleion*) and driest /hottest laurel forest (*Visneo-Apollonion*), the *Sideroxylon mirmulans* tall-scrub is also included in the type. Chamaephytic communities of salt-rich soil in sea-cliffs under strong influence of salt spray close to wave breaks are not included (*Helichrysio obconico-devium*) and belong to habitat type B3.1-3c – Macaronesian rocky sea cliffs and shores. Also, chamaephytic vegetation dominated by succulent crassulaceae (*Aeonium* sp. pl.) is excluded and considered in H3.3.- Macaronesian inland cliffs.  Characteristic species:  Flora  Vascular plants: *Olea maderensis* (Lowe) Rivas Mart. & Del Arco (dom.), *Rubia fruticosa* subsp. *fruticosa*, *Asparagus* *scoparius, Bupleurum salicifolium* subsp. *salicifolium*, *Ephedra fragilis* var. *dissoluta, Erysimum bicolor, Globularia salicina* (dom.), *Hypericum canariense* var. *floribundum* (dom.), *Jasminum odoratissimum, Myrtus communis, Tamus edulis, Teucrium heterophyllum, Asparagus umbellatus* subsp. lowei, *Chamaemeles coriacea\**, *Convolvulus massoni, Crambe fruticosa, Echium nervosum* (dom.), *Echium portsanctensis, Euphorbia piscatoria* (dom.), *Sideroxylon mirmulans* (dom.), *Helichrysum melaleucum, Jasminum azoricum, Maytenus umbellata* (dom)., *Plantago maderensis, Prasium medium, Scilla madeirensis, Sideritis candicans* var. *multiflora, Carlina salicifolia, Artemisia argentea, Cheirolophus massonianus, Erysimum arbuscula, Erysimum maderense, Genista tenera, Helichrysum monizii, Lotus argyrodes, Lotus macranthus, Micromeria varia* subsp. *thymoides* var. *thymoides, Phagnalon lowei, Atriplex glauca* subsp. *ifnensis, Atriplex halimus, Chenoleoides tomentosa, Launea arborescens , Lycium intricatum, Lavandula pinnata, Schizogyne sericea, Argyranthemum pinnatifidum* subsp. *suculentum, Calendula maderensis*.  \* this genus is endemic to Madeira. |
| F9.1 Temperate and boreal riparian scrub | This habitat includes scrub vegetation developed more permanently on unsorted gravelly deposits on the banks and shoals of turbulent seasonally-flowing streams and flood-prone rivers through the uplands of nemoral, boreal and alpine zones, as well as temporary successional willow vegetation through the European lowlands. In higher European mountains, common woody pioneers in such situations are *Myricaria germanica, Salix purpurea,* *S. eleagnos,* *S. daphnoides* and *S. nigricans* with *S. phylicifolia* often the leading pioneer in the Boreal zone. This kind of vegetation also extends into the Mediterranean zone of Spain where permanent flow protects streamside sediments against the seasonal drying of sediments and salinization that favours F9.3 Mediterranean riparian scrub. Here *S. salvifolia, S. pedicillata* and *S. cantabrica* are important colonisers. These willows anchor firmly in the gravels and can tolerate further flooding, as well as browsing from wild herbivores and stock. Where accumulating gravels raise the ground surface higher above the flood, *Hippophaë rhamnoides* can also gain a hold, thriving in the lime-rich conditions that generally prevail here and coming to dominate in dense thickets. Such alluvial scrub, only incidentally flooded, is found both in temperate Europe and in the boreal regions. Where regular inundation ceases in the higher reaches of rivers, there can be a succession to G1.2 Riparian woodland dominated by *Alnus incana.* These assemblages do not extend unchanged in composition into the lowlands of Europe and, in fact, where *S. eleagnos* persists along more mature riversides, it can attain the stature of a tree which excludes its stands from this habitat. However, on the sediments which are deposited by flood waters at these lower altitudes, *S. purpurea* can colonise with *S. triandra* to form willow scrub with a similar structure to that of mountain streamsides. Here, however, where the sediments stabilise, this vegetation is often a prelude to the development of G1.1 Riparian and gallery woodland dominated by *S. alba* and *S. fragilis.* However, in lowland rivers prone to repeated flooding, repeated setback of such succession can leads to re-establishment of the willow scrub. In the boreal regions of Europe riparian scrub along rivers and mountains streams is dominated by a combination of *Salix lapponum*, *Salix glauca*, *Salix lanata* and *Salix phylicifolia*, and a herb layer of tall herbs, like *Filipendula ulmaria*, *Geum rivale, Calamagrostis purpurea, Rumex acetosa* and *Comarum palustre*.  Indicators of quality:   * Stands of this scrub may be impermanent along very turbulent streams and rivers, developing again in the same or other places in following seasons, so discontinuity in a particular locality is not necessarily a sign of threatened quality * the maintenance of seasonal flooding fed by snow-melt or upland rains. * continuing dominance of shrubs without invading trees. * low levels of browsing by wild herbivores and stock with no decline in shrub cover.   Characteristic species: Flora, vascular plants: *Myricaria germanica, Salix cantabrica, Salix daphnoides, Salix eleagnos,* *Salix glauca*, *Salix lanata,* *Salix lapponum, Salix myrsinifolia, Salix nigricans, Salix pedicillata, Salix phylicifolia, Salix purpurea,* *Salix salvifolia Salix starkeana, Hippophaë rhamnoides.* |
| F9.2 Salix fen scrub | Low to middle-high non-riverine *Salix* dominated scrub on permanent water-logged sites on organic or peaty soils in plains and low mountain valleys and plateaus. Dominant shrubs are *Salix cinerea*, *Salix aurita*, *Salix pentandra, Salix* *atrocinerea (= Salix cinerea ssp. atrocinerea)*, *Salix rosmarinifolia* as well as hybrids of these willow species (like *Salix x multinervis*), sometimes together with other *Salix* species, *Myrica gale*, and/or *Frangula alnus*. The scrub is on average between 2 and 4 meters high, except for scrub dominated solely by *Myrica gale* or by *Salix rosmarinifolia,* which are on average lower. Trees like *Alnus glutinosa*, *Fraxinus excelsior* and *Betula pubescens* may be present, indicating the first stages of succession towards forest. The understorey of this habitat depends on the nutrient-status and acidity of the soil. In relatively nutrient-rich sites, the optimum for *Salix cinerea*, it is composed of common helophytes and tall-herbs, like *Filipendula ulmaria*, *Phragmites australis, Iris pseudacorus*, *Geranium sylvaticum*, *Solanum dulcamara*, *Lythrum salicaria*, *Galium palustre*, *Scutellaria galericulata*, *Lycopus europaeus*, *Thelypteris palustris*, *Carex elata*, *Carex riparia, Carex gracilis* and *Carex remota*. Under acidic, nutrient-poor conditions, which is the optimum for *Salix aurita* and *Myrica gale*, *Sphagnum* species may dominate the moss layer, while in the herb layer *Carex diandra*, *Carex echinata, Carex limosa*, *Carex nigra*, *Carex rostrata*, *Agrostis canina, Comarum palustre, Eriophorum angustifolium,* *Menyanthes trifoliata* and *Calamagrostis canescens* are found. The (sub)boreal distributed *Salix rosmarinifolia* often grows together with *Betula humilis*, but in pre-Alpine relict communities with *Salix myrtilloides* and *Pedicularis sceptrum-carolinum*. In very wet situations, floating and submerging aquatic plants may be present. In the Carpathians and Rodopi mountains, several rare relict species are found in this habitat, like *Spiraea salicifolia*, *Evonymus nanus* and *Polemonium caeruleum*. In Scandinavia, *Salix myrsinifolia* may accompany *Salix pentandra, Salix aurita*, *Salix cinerea* and *Myrica gale* and in northern Scandinavia *Salix lapponum*, *Salix lanata* and *Salix glauca* are dominating the habitat together with among others *Salix myrsinifolia* and *Salix phyllicifolia*.  The habitat type is widespread in Atlantic, Boreal and Continental Europe, both in lowlands and mountains. It is found more sporadically in the Mediterranean, where it occurs mainly in mountains. It is absent from the Arctic and most northern Boreal regions. It is an azonal habitat, related to permanent wet soils, found in fens, mires, marshy floodplains, along brooks and on fringes of lakes, ponds and wet forest. It often forms relatively small stands and mosaics with other marsh habitats. It may develop in wet meadows when hay making ceases, indicating abandonment of traditional land-use. It also develops in drained mires and bogs. It is mainly a non-riverine type, as spring-fed and temporarily flooded *Salix* scrubs on the shores of brooks or rivers are included in habitat F9.1 Riverine scrub. In those situations other Salix species (*S. triandra*, *S. fragilis*) dominate in most cases, but, for example, *Salix cinerea* may also be present. It also excludes Salix scrub from well-drained sites in high mountains and subarctic regions (alliance *Salicion pentandrae*), which are considered under F2.3 Subalpine and subarctic deciduous scrub. *Myrica gale* dominated vegetation is included in this habitat, but in bogs and mires it may be considered part of the broader defined habitats of the main group D. In wet dune slacks similar *Salix cinerea* communities are found, but those are considered part of B1.6a.  Indicators of quality:   * Dominance of *Salix* species or *Myrica gale*. * Forming landscape mosaics with more open reedbeds, mires and grasslands. * Presence of relict species.   Characteristic species:  Flora: Vascular plants: *Alnus glutinosa*, *Betula pubescens, Betula humilis*, *Frangula alnus, Myrica gale*, *Salix atrocinerea, Salix aurita, Salix cinerea, Salix myrsinifolia, Salix myrtilloides, Salix pentandra, Salix repens, Salix rosmarinifolia, Salix lanata, Salix lapponum, Salix glauca, Salix phyllicifolia* |
| F9.3 Mediterranean riparian scrub | Alluvial Mediterranean tamarisk (*Tamarix spp*), oleander (*Nerium oleander*), and chaste tree (*Vitex agnus-castus* ) galleries and thickets, and similar low ligneous formations living in irregularly flooded environments. In climates with severe seasonal drought, such as the Mediterranean, streams can be intensely fluctuant and even temporary; often the flooding temporal pattern is extremely irregular. This can leave riverbeds (or large portions of them) completely dry for long periods, in which often salinity increases during the drought. The hydric requirements of the scrub in such river beds are much lower than those of the willow, poplar or alder riparian forests (habitat G1.3). Under even more extreme conditions pioneer communities of habitat C3.5e are found.  These scrub and thickets are frequent in the areas where summer drought is long and severe, i.e. the thermo- and meso-Mediterranean belts of southern Europe (central and southern Iberia, southern Italy and southern Greece) and the Canary Islands, expanding in North Africa and Middle East along the Saharo-Arabian and Irano-Turanian regions. They include formations of *Tamarix ramossissima* of stream sides and coastal localities of the Pontic and Steppic areas of the Black Sea shores in SE Europe.  This habitat is rarely forming a dense shrubland due to disturbance regime determined by the floods. The best examples are found in uncontrolled stretches of mature rivers, rivulets or depressions.  Indicators of good quality:   * periodically inundated with flood waters * bushes distributed scattered, sometimes closing in a more dense thicket * no signal of timber or firewood exploitation * no sign of eutrophication due to anthropogenically polluted or enriched flood-waters, with appearance of nitrophilic herbs * no sign of non-native invaders   Characteristic species:  Vascular plants: *Flueggea tinctoria (= Rhamnus tinctoria; Rhamnus saxatilis* subsp. *tinctorius), Lonicera biflora, Nerium oleander, Polygonum equisetiforme, Prunus lusitanica, Rubus bollei, Rubus ulmifolius, Tamarix africana, Tamarix arborea, Tamarix boveana, Tamarix canariensis, Tamarix gallica, Tamarix dalmatica, Tamarix hampeana, Tamarix mascatensis,* *Tamarix ramossisima, Tamarix tetrandra, Vitex agnus-castus*. |
| G1.1 Temperate and boreal softwood riparian woodland | This is riparian woodland occurring on periodically-inundated river terraces of active floodplains with deposition of nutrient-rich alluvium in the boreal, boreo-nemoral, nemoral, submediterranean and steppe zones. Typically, there is a tall canopy dominated by one or a few tree species, commonly *Salix alba,* sometimes *S. fragilis* (maybe favouring situations where there is lime-deficiency). Two other trees commonly found here are *Populus alba* which is really a submediterranean tree but widely planted and naturalised and *P. nigra*, native in a large part of Europe (from western to central south-eastern part), but also widely planted, though often outnumbered there by hybrids such as *P. x euramericana* and *x canadensis*. Typically, alder is absent from the canopy and riparian woodlands where *Alnus glutinosa* or A. incana form part or all of the tree cover are not included here but with land-upheaval woodlands in G1.2a Alnus woodland on alluvial and mineral soil. There is often a dense understorey of smaller *Salix* spp., *Sambucus nigra* and other shrubs beneath the trees, the composition of this layer depending on the local degree of wetness of the ground. Among these, tangles of lianes and sprawlers such as *Galium aparine* and *Solanum dulcamara* occur. The field layer is typically dominated by a luxuriant cover of shade-tolerant, nutrient-demanding tall herbs, notably *Urtica dioica*, in mountain areas also *Petastites hybridus*, with a carpet of smaller plants beneath. Characteristically, much of the taller herb cover dies back quickly in autumn to leave a patchy carpet of mat-forming bryophytes on exposed mud. After a flood, there can be much woody debris washed in from upstream. This type does not include scrubs dominated by narrow-leaved *willows S. eleagnos, S. purpurea* and *S. viminalis* which fall within F9.1 Temperate and boreal riparian scrub.  Indicators of quality:  â— Undisturbed hydrology with natural disturbance, at least periodically inundated with flood waters in uncontrolled stretches of mature rivers, though remnant stands can persist for some time around naturally isolated ox-bows.   * Survival of larger stands of forest continuously developed along the rivers without fragmentation and isolation * Few if any signs of exploitation for timber, fallen trees remaining in situ and ample deposition of natural organic debris from flooding. * No signs of eutrophication or pollution by anthropogenically enriched flood-waters, for example excessive spread of nutrient-demanding weeds. * Absence of non-native tree species (Alien Poplar, Robinia pseudoacacia, Acer negundo...) and absence of invasive aliens such as *Reynoutria japonica* or *Impatiens glandulifera*. * High diversity of epiphytic bryophytes (eg. *Orthotrichum* spp.)   Characteristic species:  Tree canopy: *Salix alba, Salix dasyclados, Salix eleagnos, Salix fragilis, Salix purpurea, S. viminalis, S. eleagnos* Understorey: *Crataegus monogyna, Rubus caesius, Salix triandra, Sambucus nigra*. Field layer: *Aegopodium podagraria, Athyrium filix-femina, Galium aparine, Solanum dulcamara, Glechoma hederaea, Geum urbanum, Poa trivialis, Urtica diocia, Heracleum sphondylium, Carduus personata, Petasites hybridus, Filipendula ulmaria Mosses: Brachythecium rutabulum, Eurhynchium praelongum, Plagiomnium undulatum* |
| G1.2a Alnus woodland on riparian and upland soils | These are riparian and land-upheaval woodlands dominated by *Alnus glutinosa* and/or *A. incana,* and sometimes *Fraxinus excelsior*, typically without many softwood willows in the canopy, such woodland being assessed separately as G1.1 Temp and boreal softwood riparian woodland).  This habitat also differs from riparian woodlands of the middle and lower reaches of major European rivers, which is assessed separately as G1.2b Temperate and boreal hardwood riparian forest. The non-riverine subtype of this present habitat (corresponding to the original G1.B Non-riverine alder woodland) is typical of the Baltic coast, a sea with a low level of salinity.  The stands show varying degrees of soil moisture according to the frequency of flooding in mature river valleys, depth of water table, or proximity to the coast. Moister forms can also have some *Salix fragilis, Betula pubescens* and *Prunus padus* in the canopy with *S. phylicifolia* beneath;  in more mesic situations, *Sorbus aucuparia* can appear among the trees with *Juniperus communis* beneath.  Other shrubs include *Crataegus monogyna, Ribes alpinum, R. spicatum, Rubus caesius, R. idaeus, S. triandra* and *Sambucus nigra.* The field layer can be quite species-rich, especially in moister situations, when more nutrient-demanding herbs such as *Urtica dioica* and *Filipendula ulmaria* may be abundant. Other herbs then include *Valeriana sambucifolia, Angelica sylvestris, Deschampsia cespitosa, Calamagrostis canescens* and *C. purpurea.*  More mesic stands have *Milium effusum, Silene dioica, Rubus saxatilis* and *Poa nemoralis*.In the driest situations, *Agrostis capillaris* and *Moehringia trinervia* occur and even some forest dwarf shrubs but at low frequency and cover.  In the northernmost Bothnian Bay, on slightly more calcareous substrate, *Geranium sylvaticum, Oxalis acetosella, Filipendula ulmaria, Geum rivale* and *Anthriscus sylvestris* are distinctive.  Indicators of quality:   * Undisturbed natural hydrology * Dominance of mature trees with shrubs forming a subordinate layer * Few if any signs of exploitation for timber, fallen trees remaining *in situ* with ample deposition of natural organic debris from flooding in riparian sites. * No signs of eutrophication or pollution by anthropogenically enriched flood or ground waters, for example excessive spread of nutrient-demanding weeds * Absence of non-native tree species and absence of invasive aliens such as *Reynoutria japonica* or *Impatiens glandulifera*   Characteristic species:  Tree layer: *Alnus glutinosa, A. incana, Betula pubescens, Prunus padus, Salix fragilis, Sorbus aucuparia.*  Shrub layer: *Crataegus monogyna, Juniperus communis, Ribes alpinum, R. spicatum, Rubus caesius, R. idaeus, Salix phylicifolia, S. triandra, Sambucus nigra.*  Field layer: *Aegopodium podagraria, Agrostis capillaris, Angelica sylvestris, Anthriscus sylvestris, Athyrium filix-femina, C. purpurea, Calamagrostis canescens, Deschampsia cespitosa, Filipendula ulmaria, Galium aparine, Glechoma hederaea, Geum urbanum,Geranium sylvaticum, Geum rivale, Milium effusum, Moehringia trinervia, Oxalis acetosella, Petasites hybridus, Poa nemoralis, P. trivialis, Rubus saxatilis, Silene dioica, Solanum dulcamara, Urtica diocia, Valeriana sambucifolia.*  Mosses*: Brachythecium rutabulum, Eurhynchium praelongum, Plagiomnium undulatum.* |
| G1.2b Temperate and boreal hardwood riparian woodland | These are mixed broadleaved woodlands typical of less-frequently flooded, well-aerated mineral soils in floodplains and around flushes on valley sides cut into shales and clay rocks or clayey superficial deposits throughout the nemoral and boreal zones with some extension into the sub-mediterranean.  The flooding regime can be by inundation of river water and/or by rising ground water in river valleys. They are especially characteristic of the middle and lower reaches of major European rivers such as the Rhine, Danube, Emst, Elbe, Saale, Weser, Loire-Allier and Rhone-Saône but also occur throughout Europe as smaller stands in younger river valleys. Occasional deposition of flood-borne silt or the concentration of nutrients and bases in flushes keep the soils fertile and, with the free drainage, there is a typically brisk turnover with mull humus. The high productivity of the soils has meant that these woodlands have been highly valued as sources of timber and the structure and composition have been much modified by exploitation.  The canopy in high-forest stands can be very tall and multi-layered and is typically dominated by various mixtures of *Fraxinus excelsior, F. angustifoliae, Alnus glutinosa* with *A. incana* towards the upperreaches of rivers outside the Atlantic zone, *Populus alba, P. tremula, P. nigra, P. canescens, Acer pseudoplatanus, Quercus robur, Prunus avium, Ulmus glabra, U. minor* and *U. laevis.* There is typically an abundant and varied understorey, again often structurally complex, with a range of small trees, shrubs and lianes that are more typical of mesic deciduous woodlands (such as G1.Aa *Carpinus* and *Quercus* woodland) than the wet woodlands of floodplains, swamps and fens. Among these species, *Crataegus monogyna, Malus sylvestris, Eunomyus europaeus, Prunus padus, Clematis vitalba, Humulus lupulus, Tamus communis* and *Vitis vinifera* are distinctive. Stands on spring-fed slopes with incompetent substrates often suffer landslips on the surface of which the trees and shrubs keel over at crazy angles.   The field layer also has much in common with that of mesic deciduous woodland though some of the typical vernal dominants there, such as *Hyacinthoides non-scripta,* are excluded by the wetness of the ground, so it is geophytes like *Anemone nemorosa, A. ranunculoides,* *Ranunculus ficaria, Ornithogalum umbellatum* or sometimes *Fritillaria meleagris* which provide the springtime colour here. Becoming prominent later in the year is a contingent of plants of moist to wet, fresh fertile soils including some tall fen herbs such as *Angelica sylvestris, Lysimachia vulgaris, Lythrum salicaria, Lycopus* *europaeus, Rumex sanguineus, Allium scorodoprasum* and *Filipendula ulmaria* together with a diversity of bulky plants, for example *Carex remota, C. pendula, C. strigosa, C. laevigata*, *Juncus effusus*, *Equisetum telmateia,* whose local abundance can lend different stands a strikingly distinctive appearance. Ground-carpeting plants such as *Aegopodium podagraria, Ranunculus repens* and *Poa trivialis* and particular assemblages of herbs along the fringes of trickling water can add further character and complexity. Bryophytes are often extensive and luxuriant, providing a continuing green ground cover as the herbaceous plants die back in autumn.  Indicators of quality:  Less modified stands are reckoned to preserve some of the richest of the original European forests of larger floodplains but the diverse structures related to sylvicultural exploitation need not necessarily reduce or impair the overall floristic quality of the habitat.  Indicators of good quality are:   * Signs of natural regeneration with an uneven-aged structure * Structural complexity, including old trees and the retention of fallen, dying and dead timber with a diversity of available niches for associated flora, fauna and fungi * Sufficient proportion of historically old (ancient) woodland with high species diversity * Intact natural hydrology: maintenance of the periodical to occasional flooding or flushing characteristic of the habitat * Survival of larger stands of forest without fragmentation and isolation * Absence of non-native tree species and of invasive aliens in all layers such as *Impatiens glandulifera*   Characteristic species:  Tree canopy: *Acer pseudoplatanus, Alnus glutinosa, A. incana, Fraxinus excelsior, Populus alba, Populus nigra, Prunus padus, Quercus robur, Ulmus glabra, U. laevis, U. minor, Carpinus betulus, Prunus avium.*  Understorey: *Cornus sanguinea,Corylus avellana, Crataegus monogyna, Euonymus europaeus, Rubus caesius, Sambucus nigra,*  Field layer: *Aegopodium podagraria, Anemone nemorosa, Angelica sylvestris, Brachypodium sylvaticum, Carex acutiformis, C. laevigata*, *C. pendula, C. remota, C. strigosa, Equisetum telmateia, Elymus caninus, Festuca gigantea, Filipendula ulmaria, Galium aparine, Geranium robertianum, Geum urbanum, Glechoma hederaea, Hedera helix, Lycopus* *europaeus, Lysimachia vulgaris, Lythrum salicaria, Ranunculus ficaria, Rumex sanguineus, Silene dioica, Stachys sylvatica, Urtica dioca.* |
| G1.3 Mediterranean and Macaronesian riparian woodland | These are broadleaved deciduous woodlands of periodically- or seasonally-flooded alluvial or gravelly deposits in river valleys and along streamsides within the Mediterranean and Macaronesian regions. Typical of humid localities within the thermo- and meso-Mediterranean belts, this habitat has been long exploited for being an easy source of firewood and widely lost from the middle and lower reaches of rivers, often surviving now as more fragmentary relict stands in deeper steep-sided valleys extending upstream into the submediterranean zone. Dominance can be of a single tree species, among which *Populus alba* and, in Sicily, the Balkans and Greece, *Platanus orientalis* are the most widespread and these fast-growing trees can attain a huge size in a very tall canopy. To the east also, *Populus canescens*, *P. nigra* and *P. tremula* can be prominent along with *P. alba* while, on Rhodes, *Liquidambar orientalis* dominates in gallery woodlands of this kind. Also included here are woodlands with *Rhododendron ponticum* ssp. *baeticum* and *Betula parvibracteata* (a synonym of *B. pendula* subsp. *fontqueri* var*. parvibracteata*) that occur in riparian situations in the Iberian peninsula. Generally, *Fraxinus angustifolia*, *F. ornus*, *Salix alba*, *S. eleagnos*, *Alnus glutinosa* are common associates and can be locally prominent and where *Salix* spp, dominate in riparian woodlands in the Mediterranean and Macaronesia, they are included here and not in G1.1 Riparian and gallery woodland. Other woody species, sub-shrubs and lianas associated with this habitat are *Frangula alnus*, *Salix atrocinerea*, *Juglans regia*, *Crataegus monogyna*, *Cornus sanguinea*, *Nerium oleander*, *Vitex agnus-castus*, *Vitis vinifera* ssp. *sylvestris*, *Rubus* subsp., *Rosa sempervirens*, *Hedera helix*, *Clematis vitalba*. The field layer shares some species with the equivalent habitat type, G1.2 hardwood riparian woodland in the temperate and boreal zone, but more distinctive here are Aristolochia grandiflora, *Cyclamen hederifolium, C. repandum, C. creticum, Galanthus nivalis* subsp. *reginae-olgae*, *Dracunculus vulgaris* and *Arum italicum*. The associated fern, bryophyte and lichen floras can be very species-rich and especially luxuriant in deep humid gorges.  Indicators of good quality:   * Intact natural hydrology * Natural composition of canopy * Structural diversity/ complexity with (semi)natural age structure or completeness of layers * Typical flora and fauna composition of the region * Presence of natural disturbance such as treefall openings with natural regeneration * Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests) * Absence of non-native species in all layers (flora & fauna) * No signs of pollution   Characteristic species:  Vascular plants: *Alnus glutinosa, Fraxinus angustifolia, Platanus orientalis, Populus nigra, P. alba, Salix alba, Ulmus minor*, *Arum italicum, Brachypodium sylvaticum, Bryonia cretica* subsp*. dioica, Carex pendula, Clematis vitalba, Crataegus monogyna, Galium aparine, Hedera helix, H. maroccana, Lonicera periclymenum, Oenanthe crocata, Rubus ulmifolius, Salix atrocinerea, Tamus communis, Urtica dioica, Athyrium filix-femina, Pteridium aquilinum*. |
| G1.4 Broadleaved swamp woodland on non-acid peat | These are true swamp woodlands on non-acid peat or hydromorphic soils with a high content of organic matter occurring mainly in lowland fens where the water-table is constantly at ground level or seasonally above it, for example where sites are inundated by spring snow-melt or rain-fed flooding. However, in contrast to the woodlands of mature floodplains included in G1.2 and G1.3, there is no regular deposition of allochthonous sediments, so enrichment and terrestrialisation typically do not occur here though intermediate habitats can be found in wetter river valleys. There is characteristically a well-developed tree canopy in which, throughout most of the nemoral zone, *Alnus glutinosa* is the usual dominant, often with a naturally multi-stemmed growth form, *Quercus robur* replacing it locally in the more Continental east and *Populus tremula* in the Boreal zone. On thin peats in Boreal swamps of the Finnish coast and archipelago and in regions in central Europe where *Alnus glutinosa* is missing, *Alnus incana* can replace *A. glutinosa* in this swamp woodland. Also the dense *Alnus barbata* forests on swamps on coastal alluvial plains around the Black Sea belong here. *Betula pubescens* is a common associate but never dominates. Shrubby willows such as *Salix aurita*, *Salix cinerea* and *Salix pentandra* can occur in an understorey, along with other smaller woody species listed below, but they do not dominate here. Shrubby vegetation (with or without occasional trees) developed in similar situations are placed in F9.2 and F9.3 Riparian scrubs. In the field layer, large *Carex* spp. are a consistent and sometimes prominent feature, with *C. elongata* typical through much of central Europe, *C. laevigata* and *C. paniculata* replacing it towards the Atlantic zone. The associated flora throughout can be rich with large graminoids, tall herbs and sprawlers, including many typical fen species, and a carpet of bryophytes tolerant of more shady wet habitats. In Boreal and Euxinic stands, the associated flora has some distinctive herbs. In other stands, alders and huge sedge tussocks can dominate in much more species-poor swamp with much bare peat and open water.  Indicators of quality:   * No forest exploitation or only very limited signs of forestry * Intact natural hydrology: maintenance of high groundwater table and no signs of drying of the peat or water-logged soil * Typical structure and composition of canopy: dominance must always ultimately lie with vigorously growing trees rather than the associated shrubs * Presence of old trees and a variety of dead wood (lying and standing) and the associated flora, fauna and fungi * Presence of natural disturbance such as treefall openings with natural regeneration * Structural diversity/complexity with (semi)natural age structure or completeness of layers * Regional variation in the associated flora of this essentially azonal habitat is low but such distinctive typical flora and fauna species as are characteristic should persist. * Absence of non-native tree species and absence of invasive aliens in all layers (fauna and flora), * Absence of species indicative of drying of the peat or the wet soil conditions or of excessive eutrophication and no signs of pollution   Charactersitic species:  Tree canopy: *Alnus glutinosa*, *Betula pubescens*, *Frangula alnus*, *Fraxinus excelsior*, *Sorbus aucuparia* and *Quercus robur*;  Understorey/field layer: *Viburnum opulus,* *Prunus padus*, *Salix cinerea*, *S. aurita*, *S. pentandra*, *Rubus fruticosus* agg., *Lysimachia vulgaris*, *Solanum dulcamara*, *Lycopus europaeus*, *Urtica dioica*, *Galium palustre*, *Iris pseudacorus*, *Calla palustris*, *Carex elongata*, *C. laevigata*, *C. paniculata*, *C. acutiformis*, *C. elata*, *Calamagrostis canescens*, *Lythrum salicaria*, *Deschampsia cespitosa*, *Peucedanum palustre*, *Filipendula ulmaria*, *Juncus effusus*, *Cirsium palustre*, *Caltha palustris*, *Crepis paludosa*, *Phragmites australis* and the ferns *Thelypteris palustris*, *Matteuccia struthiopteris*. |
| G1.5 Broadleaved bog woodland on acid peat | This habitat is broadleaved deciduous woodland on wet acid, oligotrophic peat on the surfaces of bogs or transition mires, around pools and along laggs throughout the Atlantic and into the Boreal zones; more locally, where ground water conditions permit, it occurs also in the Continental zone. The woodland is typically dominated by *Betula pubescens*, the canopy is often only a few metres tall and the trees sometimes have a naturally decrepit appearance, infected early with *Piptoporus*. *Alnus glutinosa* is generally excluded from the canopy because of nutrient shortage. There is never more than a minority component of conifers, though *Pinus sylvestris* increasingly replaces *Betula* as the dominant in similar situations in the colder Boreal zone and as a pioneer species in Massif central. Deciduous woody associates, such as shrubby *Salix* spp. and *Frangula alnus* can occur, though typically at low cover and never forming an extensive understorey. The field layer generally shows strong continuity with the adjacent bog vegetation and can be quite luxuriant but more shade-tolerant species gain the ascendancy under the birch canopy, sometimes producing a rather species-poor cover of, for example, tussocks of *Molinia caerulea*. The often extensive carpets of *Sphagnum* on lower wetter ground between the trees include some distinctive species such as *S. fimbriatum* and *S. russowii*. Only naturally developed stands should be included here (primary stands and secondary stands due to older/ former changes in hydrology) and drying or cut-over bogs onto which *Betula* and other tree species spread in the past should be considered as poorer-quality examples of bog forests. Young succession stages or stages without stabilized hydrology are not considered under this type.  Indicators of quality:   * Intact (semi)natural hydrology * Absence of forest exploitation * Typical structure and composition of canopy with an open or patchy cover with dying and keeling birch trees are natural * Typical flora and fauna composition of the region, especially a field layer typical of wet acid peat without any indication of drying, eutrophicaqtion or pollution, for example the overwhelming spread of *Molinia caerulea* * Absence of non-native tree species and absence of invasive aliens in all layers (fauna, flora), such as conifers or non-native *Rhododendron* such as happens where bogs have been drained.   Characteristic species:  Tree canopy: *Betula pubescens, Alnus glutinosa* (rare), *Frangula alnus, Pinus sylvestris.*  Understorey, field layer: *Sorbus aucuparia, Salix aurita, S. cinerea, Molinia caerulea, Erica tetralix, Carex laevigata, Vaccinium myrtillus, V. uliginosum, V. oxycoccos, Andromeda polifolia, Dryopteris dilatata, Eriophorum vaginatum, Juncus effusus, Deschampsia flexuosa*. Mosses: *Mnium hornum, Sphagnum palustre, S. fimbriatum, S. magellanicum, S. papillosum, S. fallax, S. flexuosum, S. angustifolium, Polytrichum commune, P. strictum, Aulacomnium palustre, Tomentypnum nitens*. |
| G1.6a Fagus woodland on non-acid soils | Within the climatic zone where *Fagus sylvatica* (including in south-eastern Europe ssp. *orientalis* and ssp. *moesiaca*) can out-compete other broadleaved trees, this habitat comprises all those beech woodlands on more base-rich and neutral soils including both nutrient-poor rendzinas and more fertile brown earths. They extend from the Atlantic zone, in Great Britain, northern France and the Pyrenees, through the Continental zone into the Alpine region of central Europe, the Carpathians, and the Balkans. Beech is the supreme dominant in the canopy, which, on more productive soils, is often very high, the majestic trees creating a cathedral like effect. However, there are more associates here than on base-poor soils even though they are sometimes in a subordinate canopy tier, with *Quercus petraea*, *Q. robur*, *Fraxinus excelsior*, *Acer pseudoplatanus*, *A. platanoides* and *Ulmus glabra*. *Carpinus betulus* and *Tilia cordata* are more common in the warmer lowlands while more strongly thermophilous types in periodically dry situations have *Sorbus aria*, *S. torminalis*, *Aesculus hippocastanum* and *Acer campestre*. To the Atlantic west, *Taxus baccata* is characteristic, though groves, where it becomes locally dominant, are included in G3.9a *Taxus* woodland. Towards higher altitudes, there can be some *Abies alba* and *Picea abies* but co-dominant canopies fall within the G3.1b and G3.1c mountain *Abies* woodland. The shrub layer is typically sparse and the most common species throughout are *Crataegus monogyna*, *C. laevigata*, *Corylus avellana*, *Viburnum opulus*, *V. lantana*, *Cornus sanguinea*, *Prunus spinosa*, *Ligustrum vulgare*, *Rosa arvensis* and *R. canina* agg., of which many are more typical of thermophilous oak woodland. *Ilex aquifolium* increases towards the Atlantic, *Daphne laureola* and *Buxus sempervirens* in the south-west while *Hedera helix* is the commonest liana overall with *Lonicera alpigena* and *L. nigra* in the Alps, Dinarides and Carpathians. The herb layer is here often species-rich with a predominance overall of shade-tolerant mesophytes, many of them shared with mixed broadleaved forests of the nemoral zone (G1Aa *Carpinus* & *Quercus* mesic deciduous woodland): *Galium odoratum*, *Milium effusum*, *Mycelis muralis*, *Lamiastrum galeobdolon*, *Pulmonaria obscura*, *Scrophularia nodosa*, *Viola reichenbachiana*, *Poa nemoralis*, *Athyrium filix-femina* and *Dryopteris filix-mas*. On more base-rich soils, *Mercurialis perennis*, *Hordelymus europaeus*, *Brachypodium sylvaticum*, *Bromus benekenii*, *Euphorbia amygdaloides*, *Asarum europaeum*, *Lathyrus vernus*, *Sanicula europaea*, *Actaea spicata*, *Paris quadrifolia*, *Melica uniflora* are frequent. Typical spring geophytes include *Anemone nemorosa*, *A. ranunculoides*, *Allium ursinum*, *Corydalis cava*, *C. solida* and *Ranunculus ficaria* with *Hyacinthoides non-scripta* in the Atlantic zone. In the more continental parts of central Europe, *Carex digitata*, *C. umbrosa*, *Galium sylvaticum,* *Melica nutans,* *Campanula trachelium*, *Neottia nidus-avis* and *Vicia sepium* are typical, while in montane stands, *Polygonatum verticillatum*, *Senecio ovatus*, *Prenanthes purpurea* and *Stellaria nemorum* are differential. At the upper altitudinal limit, *Ranunculus platanifolius*, *Cicerbita alpina*, *Petasites albus*, *Athyrium distentifolium*, *Geranium sylvaticum*, *Senecio nemorensis* and in the Alps and neighbouring mountains, *Adenostyles alliariae*, *Veratrum album*, *Saxifraga rotundifolia*, *Viola biflora*, *Luzula luzulina*, *Astrantia major* and *Polystichum lonchitis*. Thermophilous beech forests of this type, found in higher zonation belts in southern Europe or in locally warmer situations elsewhere, are especially species-rich and may have extensive thermophilous shrub layer, though the particular flora varies much according to the region and the altitude. Characteristic species include *Cephalanthera damasonium*, *C. rubra*, *Carex montana*, *C. flacca*, *C. alba*, *Campanula persicifolia*, *C. rapunculoides*, *Vincetoxicum hirundinaria*, *Tanacetum corymbosum*, *Polygonatum odoratum*, *Sesleria albicans*, *Anthericum ramosum*, *Primula veris*, *Brachypodium pinnatum* and *Epipactis atrorubens.* Regionally *Dentaria* species like *Dentaria eneaphyllos* (Karpathians to E-German mountains), *Dentaria heptaphyllus* (in beech forest on screes in the Swiss and French Jurassic mountain ranges) or *Dentaria bulbifera* can de abundant in the herb layer. In the northern Alps *Aposeris foetica* is a frequent species in the herb layer. In humid conditions species like *Circaea lutetiana* and *Stachys sylvatica*, or locally, also *Crepis paludosa* can be frequent. Characteristic species in the moss layer include *Atrichum undulatum*, *Ctenidium molluscum*, R*hytidiadelphus loreus* and *Eurhynchium striatum* and many more expecially in the drier thermophilous beech forests and in humid conditions and mountain beech forests. In addition to the above distinctions, the more species-rich beech forests have often been differentiated into geographical groups (see geographical classification in Bohn et al. 2004), some of which are recognised in the Annex 1 habitats.  Indicators of quality:  • Natural composition of canopy with dominant beech trees  • Structural diversity/complexity with (semi)natural age structure or completeness of layers  • Typical flora and fauna composition of the region  • Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi  • Presence of natural disturbance such as treefall openings with natural regeneration  • Long historical continuity (ancient woodland) with high species diversity  • Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which needs large undisturbed forests)  • Absence of non-native species in all layers (flora & fauna)  • No signs of eutrophication or pollution  • No man-induced very high population levels of ungulates  Characterstic species:  Flora (Vascular plants):  Tree canopy: dominant: *Fagus sylvatica ssp. sylvatica*, *Fagus sylvatica* ssp. *moesiaca*, *Fagus sylvatica* spp. *orientalis*; additional tree species: *Abies alba*, *Picea abies*, *Acer pseudoplatanus*, *Fraxinus excelsior,* *Sorbus aucuparia*, *Carpinus betulus*, *Quercus petraea*, *Quercus robur.*  Understorey/Field layer: *Galium odoratum*, *Oxalis acetosella*, *Mycelis* *muralis*, *Athyrium* *filix-femina*, *Hedera helix*, *Lamiastrum* *galeobdolon*, *Poa nemoralis*, *Mercurialis perennis*, *Anemone nemorosa*, *Euphorbia amygdaloides*, *Fragaria vesca* and *Milium* *effusum.* |
| G1.6b Fagus woodland on acid soils | Within the climatic zone where *Fagus sylvatica* is able to maintain dominance over other broadleaved trees, this habitat includes those beech woodlands which occur on impoverished, free-draining, base-poor rankers, acid brown earths and podzols developed from silicate bedrocks and sandy or gravelly superficial deposits. They extend from the Atlantic zone in Great Britain, France and Northern Spain, through Central Europe into the Continental zone and, in northern Italy and the Balkans into the Alpine region. Typically, *Fagus sylvatica* is overwhelmingly dominant (often ssp. *moesiaca* in the mid and eastern Balkans), when growing well forming a tall, cathedral-like canopy in which associates are few: *Quercus petraea* and less commonly *Q. robur* throughout the range, with *Q. pyrenaica* in the south-west and *Castanea sativa* in the west and south. In the Atlantic zone, *Ilex aquifolium* is a common understorey tree. *Pinus sylvestris* can be present at low altitudes, especially on shallow soils on siliceous rocks. At higher altitudes, *Acer pseudoplatanus* can occur, *A. heldreichii* in the Balkans and, towards the altitudinal limits of this woodland type, *Abies alba* and *Picea abies* in transitions to G3.1b and G3.1c mountain fir woodlands. The field layer is typically species-poor and often sparse, comprising shade-tolerant grasses and herbs and a few bryophytes. Commonest among these are *Deschampsia flexuosa*, *Agrostis capillaris*, *Carex pilulifera*, *Oxalis acetosella*, *Maianthemum bifolium*, *Luzula pilosa*, *Vaccinium myrtillus*, *Pteridium aquilinum*, *Polytrichum formosum*, *Dicranella heteromalla*, *Dicranum scoparium*, *Mnium hornum* and *Hypnum cupressiforme*. Generally, across the lowlands, *Melampyrum pratense* is characteristic with, towards the north-western Atlantic, *Ruscus aculeatus*, *Lonicera periclymenum*, *Teucrium scorodonia*, *Hypericum pulchrum*, *Blechnum spicant*, towards the south-west in the Massif Central, Pyrenees and Cantabrian Mountains, *Euphorbia angulata*, *E. hyberna*, *Saxifraga hirsuta*, *S. spathularis* and *Luzula sylvatica* spp. *henriquesii*. *L. nivea* and *L. pedemontana* occur in Insubria and Piedmont and *Festuca drymeja* in Illyria and the Carpathians. In the European lowlands, mixed Fagus-Quercus robur forests with this field layer should also be included under these *Fagus* woodlands. At higher altitudes, *Dryopteris dilatata*, *Festuca altissima*, *Prenanthes purpurea*, *Luzula luzuloides*, *L. sylvatica*, *Senecio ovatus* and *S. nemorensis* occur with, in mountain stands, *Polygonatum verticillatum*, *Calamagrostis villosa* and *Homogyne alpina*. Apart from the altitudinal variation from lowlands to higher altitudes, there is a broad range of different ecological situations in climatic and soil moisture conditions, ranging from relatively dry conditions with *Carex pilulifera*, *Hieracium glaucinum* or complete moss layers of *Leucrobryum glaucum* s.l. to humid conditions with ferns like *Dryopteris filix-mas* and *Athyrium filix-femina*. In relatively wet conditions species such as *Frangula alnus*, *Lysimachia vulgaris* occur, sometimes *Molinia caerulea* agg. can be dominant or if temporarily wet conditions prevail also *Carex brizoides*. Especially in subatlantic and atlantic conditions dominant species in the herb layer can be *Pteridium aquilinum*.  Indicators of quality:  Through the lowlands, this habitat has been widely converted to dwarf-shrub heaths for stock rearing and, later, partially re-afforestation with pine and spruce. At higher altitudes, there has been widespread replacement by conifer plantations (*Picea* spp., *Pseudotsuga menziesii*etc). High quality stands should show:  • Natural composition of canopy with dominant beech trees  • Structural diversity/ complexity with (semi)natural age structure or completeness of layers  • Typical flora and fauna composition of the region  • Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi  • Presence of natural disturbance such as treefall openings with natural regeneration  • Long historical continuity (ancient woodland) with high species diversity  • Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests) • Absence of non-native species in all layers (flora & fauna)  • No signs of eutrophication (e.g. with the spread of shade-tolerant nitrophiles) or pollution  • No signs of acidification  • No man-induced very high population levels of ungulates  Characteristic species:  Tree canopy: *Fagus moesiaca*, *Fagus sylvatica*, *Quercus petraea*, *Q. robur*, *Pinus sylvestris.*  Field layer: *Deschampsia flexuosa*, *Agrostis capillaris*, *Calamagrostis epigejos*, *Carex pilulifera*, *Convallaria majalis*, *Oxalis acetosella*, *Ilex aquilifolium*, *Maianthemum bifolium*, *Luzula pilosa*, *L. luzuloides*, *Vaccinium myrtillus*, *Melampyrum pratense*, *Hieracium murorum* agg., *Pteridium aquilinum*.  Moss layer: *Polytrichum formosum*, *Leucobryum glaucum*, and other mosses like *Dicranella heteromalla*, *Dicranum scoparium*, *Mnium hornum*, *Atrichum undulatum*, and *Hypnum cupressiforme*. |
| G1.7a Temperate and submediterranean thermophilous deciduous woodland | These thermophilous broadleaved deciduous woodlands form a wide, but interrupted, belt across the submediterranean zone of Europe, with milder winters and warmer drought-prone summers than sustain the broadleaved temperate woodlands, but colder, intermittently frosty and snowy winters than are typical for the evergreen broadleaved woodlands and scrub of the Mediterranean. To the north, they tend to occupy lower altitude, drier and warmer sites, to the south, rainier sites at higher altitudes, but the relief and parent materials differ widely across the range and the weakly base-rich to moderately acidic soils are of varied types. The canopy, rarely very tall, is dominated by thermophilous and drought-resistant deciduous (and some evergreen) trees, among which oaks are the commonest contributors to an upper tier. Quercus petraea and Q. robur remain important in the sub-Continental thermophilous woodlands of the Czech Republic, Poland, Slovakia, Romania, Ukraine and the northern Balkans but, across much of the range through France, northern Spain, Switzerland, northern Italy, the Pannonian Basin, around the Adriatic and in Greece, *Q*. *pubescens* is the leading oak, with *Q*. *cerris* and *Q*. *frainetto* becoming important from Italy eastwards. *Q*. *dalechampii*, *Q*. *polycarpa* and *Q*. *virgiliana* are common associates, with *Q*. *trojana* in the Balkans. In the Iberian Peninsula, *Q*. *pyrenaica*, *Q*. *faginea* ssp. *faginea*, *Q*. *faginea* ssp. *broteroi* and *Q*. *canariensis* replace these oaks as dominants. In less modified stands there is a second tier of trees with, across much of the range, *Sorbus torminalis*, *S*. *domestica*, *S*. *aria*, *Ulmus minor*, *Acer campestre*, *A*. *monspessulanum* and *Pyrus* *pyraster*, with *Fraxinus ornus*, *Ostrya* *carpinifolia* and *Carpinus* *orientalis* commoner in the south-eastern regions, *Acer* *tataricum* and *Tilia* *tomentosa* mainly in the more Continental east. The light shade cast by the oaks and thinning of the canopy characteristically permit a dense shrub layer among which *Cornus mas*, *Viburnum lantana*, *Ligustrum vulgare*, *Ruscus aculeatus*, *Crataegus monogyna*, *Prunus spinosa* and *Cotinus coggygria* are frequent along with more mesic shrubs like *Corylus avellana*, *Cornus sanguinea* and *Euonymus europaeus*. To the west, *Buxus sempervirens* and *Rubus* *ulmifolius* occur, to the southeast *Paliurus* *spina-christi*, *Hippocrepis* *emerus*, *Pistacia* *mutica* and *Juniperus* *excelsa* and, in the warmer south, evergreen Mediterranean species such as *Phillyrea* *latifolia*, *Arbutus unedo*, *Pistacia lentiscus*, *P*. *terebinthus*, *Viburnum* *tinus* and *Erica arborea*. Lianas are common with *Clematis vitalba*, *Lonicera* *caprifolium*, *L*. *etrusca*, *Tamus communis*, *Rubia* *peregrina* and *Hedera helix* the most consistent species throughout. The herb layer is rich with sub-Mediterranean species making a prominent contribution: *Lithospermum* *purpurocaeruleum*, *Lathyrus* *venetus*, *Melittis* *melissophyllum*, *Tanacetum* *corymbosum*, *Silene* *coronaria*, *Potentilla* *micrantha*, *Vincetoxicum* *hirundinaria*, *Physospermum* *cornubiense*, *Hellebrous* *odorus*, *H*. *foetidus*, *Mercurialis* *ovata* and *Viola* *hirta* are characteristic through much of the range, with many other species occurring in particular regional types.  Indicators of quality:  • Natural composition of canopy • Structural diversity/complexity with (semi)natural age structure or completeness of layers • Typical flora and fauna composition of the region • Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi • Presence of natural disturbance such as treefall openings with natural regeneration • Long historical continuity (ancient woodland) with high species diversity • Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which needs large undisturbed forests) • Absence of non-native species in all layers (flora & fauna) • No signs of eutrophication or pollution • No man-induced very high population levels of ungulates  Characteristic species:  Flora (vascular plants):  Canopy trees: *Quercus pubescens*, *Q*. *cerris*, *Q*. *frainetto*, *Q*. *dalechampii*, *Q*. *polycarpa*, *Q*. *virgiliana*, *Q*. *petraea*, *Q*. *robur*, *Q*. *pyrenaica*, *Q*. *faginea* ssp. *faginea*, *Q*. *faginea* ssp. *broteroi*, *Q*. *canariensis*, *Q*. *trojana*, *Sorbus torminalis*, *S*. *domestica*, *S*. *aria*, *Ulmus minor*, *Acer campestre*, *A*. *monspessulanum*, *Pyrus pyraster*, *Fraxinus ornus*, *Ostrya carpinifolia*, *Carpinus orientalis*, *Acer tataricum*, *Tilia tomentosa*. Shrub layer: *Cornus mas*, *Viburnum lantana*, *Ligustrum vulgare*, *Ruscus aculeatus*, *Crataegus monogyna*, *Prunus spinosa*, *Cotinus coggygria*, *Corylus avellana*, *Cornus sanguinea*, *Euonymus* *europaeus*, *Buxus sempervirens*, *Rubus ulmifolius*, *Paliurus spina-christi*, *Hippocrepis emerus*, *Pistacia* *mutica*, *Juniperus excelsa*, *Phillyrea latifolia*, *Arbutus unedo*, *Pistacia lentiscus*, *P*. *terebinthus*, *Viburnum tinus*, *Erica arborea*. Herb layer: *Lithospermum purpurocaeruleum*, *Lathyrus niger*, *L*. *venetus*, *Melittis melissophyllum*, *Tanacetum corymbosum*, *Silene coronaria*, *Potentilla micrantha*, *Vincetoxicum hirundinaria*, *Brachypodium pinnatum*, *Physospermum cornubiense*, *Hellebrous odorus*, *H*. *foetidus*, *Mercurialis ovata*, *Polygonatum odoratum*, *Viola hirta* plus additional species of the regional floras. |
| G1.7b Mediterranean thermophilous deciduous woodland | *Quercus ithaburensis* subsp*. macrolepis* (Kotschy) Hedge and Yaltirik (Valonia oak) is a subspecies of the broadly distributed East Mediterranean deciduous oak species *Quercus ithaburensis* Decne (mount Thabor’s oak), that is confined to continental Greece and some Greek islands (surviving as relict isolated trees or in scattered localities as the dominant species in open woodland), in Southeastern Italy, in Southern Albania (forming important pure and mixed forests up to 800-900 m a.s.l.) and in Turkey. The relict *Quercus macrolepis* stands in Salento (S Italy), appear to have been derived from planted stock, but are treated here as semi-natural woodlands. Most stands occur on shallow soils, perhaps because of the absence of competition from rival trees but also maybe because of preferential felling of the oak on deeper better soils. It can grow on a variety of terrain types and soils up to 700m and beyond, but growth is better where the local climate is semi-arid with warmer winters. Often the canopy is pure but there can be some other deciduous oaks such as *Q. frainetto, Q. coccifera* or *Q. pubescens, Pinus pinea*. In some cases the overall effect is of a phrygana, at higher altitudes a grassland with trees, but a common feature in many stands is the prominence of a variety of therophytes, maybe because of the long history of disturbance of the landscapes. Agroforestry and specifically silvopastoralism is a traditional land use system in parts of continental and insular Greece where livestock breeders use the valonia oak forests (*Quercus ithaburensis* subsp. *macrolepis*) for grazing and the collection of acorns. Valonia oak regeneration is affected by livestock grazing and tree canopy cover. Very low regeneration is observed in various distances from the sheep and goat sheds where livestock is intensively grazing in the surrounding area. On the other hand, tree regeneration is strongly related to the tree canopy cover, whereas new seedlings are observed under trees due to the favorable micro-environmental conditions.  Indicators of quality:   * No forest exploitations (if applicable, mainly azonal types with high nature value) * Natural composition of canopy * Structural diversity/ complexity with (semi)natural age structure or completeness of layers * Typical flora and fauna composition of the region * Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi * Presence of natural disturbance such as treefall openings with natural regeneration * Long historical continuity (ancient woodland) with high species diversity * Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests) * Absence of non-native species in all layers (flora & fauna) * No man-induced very high population levels of grazing animals (sheep, goats, cows)   Characteristic species:  Tree canopy: *Q. macrolepis, Q. frainetto, Q. coccifera,* *Q. pubescens,*  Understorey: *Pistacia terebinthus, Cistus creticus, Olea euopaea, Phillyrea latifolia, Prunus spinosa, Pyrus amygdaliformis* and *Ruscus aculeatus*  Field layer: *Chrysopogon gryllus*, *Dactylis glomerata*, *Asparagus acutifolius*, *Asphodelus aestivus*, *Urginea maritima, Cardamine hirsuta, Origanum vulgare, Phlomis frutciosa, Galium aparine.* |
| G1.8 Acidophilous Quercus woodland | These are oak-dominated woodlands typical of acidic, free draining soils with mor humus on sandstones, lime-poor metamorphic and igneous rocks and sandy and gravelly soils through the nemoral zone. Extending from the Atlantic fringe of northern Portugal and Spain, across north-west and central Europe into southern Scandinavia, the northern Balkans and on into Russia, the habitat occurs often very fragmentary and scattered now in the prevailingly agricultural semi-natural landscape. Variations in climate across this wide overall range, from extreme Atlantic on the western fringes of Ireland and the British Isles, Lusitanian in northern Iberia, through Continental to Boreal in the east and sub-Mediterranean in the south, have an effect on the associated flora, even though this is not in general very rich.   The characteristic oaks here are *Quercus robur* and *Q. petraea*, often occurring with a subordinate proportion of *Betula pendula* and/or *B. pubescens*, which can be pioneers in this habitat following fire or clear-felling, are relatively short-lived survivors in mature forest and which have been selected against in the coppice manage-ment or timber extraction often imposed on these woodlands. Through much of the range in central and north-western Europe, *Fagus sylvatica* is a potential competitor for canopy dominance even on mineral-poor, sandy soils. On acidic, mineral-rich soils with moder humus co-dominant Fagus-Quercus canopies are better classified under G1.6b *Fagus* woodland on acid soils. On highly acidic soils to the Boreal east of the range, *Pinus sylvestris* replaces the oaks as the dominant tree in woodlands with much the same field layer. In central European mountain ranges on shallow siliceous soils Pinus sylvestris can also be present in the canopy in lower proportions. Overall, other associated trees and shrubs are typically very few in this habitat: *Sorbus aucuparia* and *Frangula alnus* occur through much of the range, *Castanea sativa, Sorbus torminalis* and *Pyrus cordata* in the Sub-Atlantic heartland *a*nd, to the west, *Ilex aquifolium* can be abundant.   The field layer is generally rather species-poor with calcifuge sub-shrubs, herbs and cryptogams most characteristic and lending a heathy appearance, especially under lighter shade and where grazing is absent. Constant through much of the range are *Vaccinium myrtillus, Calluna vulgaris (in more open places), Deschampsia flexuosa, Agrostis capillaris, Anthoxanthum odoratum, Festuca ovina agg., Holcus mollis, Carex pilulifera, Potentilla erecta, Hieracium sabaudum,* this sometimes tall and denseon less shallow soils. The commonest bryophytes overall are *Polytrichum formosum, Hypnum jutlandicum, Pleurozium schreberi* and *Leucobryum glaucum.*   Regional variations in the flora in relation to climatic differences can be seen in each of the layers of the vegetation moving away from the Sub-Atlantic woodlands of central and western France, the lower Rhineland and north-east Italy/south-west Switzerland. In the more Atlantic climate of the north-west, there is a further contingent of herbs such as *Galium saxatile, Teucrium scorodonia, Hypericum pulchrum, Luzula sylvatica* and *Blechnum spicant* and to the western seaboard of Ireland and the UK an extraordinary additional richness in cryptogams and ferns which, with annual precipitation up to 3000 mm, lends this habitat a great luxuriance*.* It is this vegetation which forms the richer core of Annex 1 91A0 Sessile Oakwoods in the British Isles.   On the Atlantic fringe of Portugal and Spain, with annual precipitation up to 2000 mm but with warmer summers and milder winters, *Quercus petraea* tends to be less prominent than further north but there is often some *Q. pyrenaica* along with *Betula pubescens* spp. *celtiberica* and *Arbutus unedo. Cytisus scoparius, Ulex gallii* and *Erica arborea* enrich the sub-shrub layer, with the lianas *Rubia peregrina* and *Tamus communis.* Herbs such as *Pseudarrhenatherum longifolium, Potentilla montana, Daboecia cantabrica, Crepis lampsanoides, Luzula forsteri, Euphorbia dulcis, Melitis melissophyllum, Silene nutans, Polygonatum odoratum, Galium rotundifolium, Arenaria montana, Genista florida, Rumex papillaris* give a South Atlantic or more Mediterranean feel to the flora.  In northern Europe and southern Scandinavia, some Eurasian Temperate and Boreal species such as *Vaccinium vitis-idaea, Maianthemum bifolium* and *Luzula pilosa* begin to appear in these woodlands and examples on the Baltic-North Sea plain form the core of the Annex 1 9190 Old acidophilous oakwoods with *Quercus robur* on sandy plains.   Further east, through Germany, Poland, Belarus, Ukraine and into Russia, where *Pinus sylvestris* begins to challenge the dominance of *Quercus* spp. on impoverished acid soils, *Juniperus communis* and *Euonymus verrucosa* are additional woody species and, among the herbs, *Trientalis europaea, Rubus saxatilis, Pyrola rotundifolia, Orthilia secunda, Calamagrostis arundinacea*. At the extreme east of the range, where there is usually less than 800mm precipitation and winter temperatures down to -12°C, *Carex digitata, Galium schultesii* and *Chamaecytisus ruthenicus* are characteristic. Among the bryophytes *Dicranum polysetum, Eurhynchium angustirete* and *Rhodobryum roseum* are distinctive here.   Further south, at the eastern sub-Mediterranean limit of this habitat in Austria, the northern Balkans and Romania, the warmer climate is reflected in the appearance of *Quercus cerris, Q. dalechampii* and *Q. polycarpa* in the canopy, *Pyrus communis* and *Euonymus verrucosa* among the shrubs and *Genista tinctoria, G. germanica, Cytisus nigricans, Rubus hirtus* and *Vincetoxicum hirundinaria* in the herb layer. Castanea sativa woods are inlcuded in this forest type as well because of their  species-poor and calcifuge vegetation.  Indicators of good quality:   * Sufficient proportion of historically old (ancient) woodland with corresponding species diversity * Presence of old trees and a variety of dead wood (lying and standing) and the associated flora, fauna and fungi * Sufficient structural diversity/ complexity including (semi)natural age structure * Maintenance of humidity beneath an intact canopy where a rich fern and bryophyte component is typical (e.g. for Annex 1 91A0) * Typical flora and fauna composition of the region * Absence of non-native tree species (such as *Pseudotsuga menziesii*) and absence of invasive aliens in all layers (fauna, flora) * No signs of eutrophication or pollution with e.g. pronounced invasion on nutrient-demanding herbs * Presence of gradients or mosaics with heathland or acidic grassland at the landscape level (not isolated within plantation forests).   Characteristic species:  Tree layer: *Quercus robur, Quercus petraea* agg., *Sorbus aucuparia, Frangula alnus, Betula pendula, B. pubescens;* Shrub layer: *Ilex aquifolium, Frangula alnus;* Herb layer: *Deschampsia flexuosa, Hieracium sabaudum, H. lachenalii, Dryopteris carthusiana, Pteridium aquilinum, Rubus fruticosus agg., Vaccinium myrtillus, Holcus mollis, Molinia caerulea, Festuca ovina agg., Agrostis capillaris, Melampyrum pratense, Anthoxanthum odoratum;* Moss layer*: Dicranum scoparium, Hypnum jutlandicum, Leucobryum glaucum, Pleurozium schreberi, Polytrichum formosum, Rhytidiadelphus loreus.* |
| G1.9a Temperate and boreal mountain Betula and Populus tremula woodland on mineral soils | This habitat includes deciduous woodlands growing in mountains at the extreme cold climatic limit towards the arctic or, oroarctic zone, where the short growing season, the prevalence of frost, snow conditions and high exposure limit both the possible dominants and the structure of the woodland. Silicate soils predominate, strongly acidic, often podzolised, sometimes showing cryogenic microrelief. But, nutrient-rich and moist brown soils also exist. Birch is the typical dominant tree, in northern Fennoscandia *Betula pubescens* ssp. *czerepanovii* (= *B. tortuosa*), which typically forms a very open, sometimes krummholz, canopy usually only 3-10m tall, with occasional *Picea abies* ssp. *obovata* towards the east. Beneath this, there is a layer of dwarf-shrubs including *Vaccinium myrtillus, V. vitis-idaea, V. uliginosum, Empetrum hermaphroditum, Arctostaphylos uva-ursi, Betula nana, Rubus chamaemorus* and *Ledum palustre*, monocotyledons and herbs such as *Deschampsia flexuosa*, *Carex globularis*, *Cornus suecica* and *Trientalis europaea* and a carpet of mosses and lichens. Similar field layers occur beneath short canopies of *B. pubescens* ssp. *carpatica* in the higher parts of the Scottish Highlands, so such woodland qualify as part of this habitat.  Indicators of good quality:  • Typical flora and fauna composition of the region  • Presence of natural disturbance  • Long historical continuity (ancient woodland) with high species diversity  • Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests)  • Absence of non-native species in all layers (flora & fauna)  • No signs of eutrophication or pollution  • No man-induced very high population levels of ungulates  Characteristic species:  Tree canopy: *Betula pubescens* ssp. *czrepanovii* (Fennoscandia), or ssp. *carpatica* (UK).  Field layer: Dwarf shrubs: *Arctostaphylos alpina, Diphasiastrum* spp., *Empetrum nigrum, Linnaea borealis, Lycopodium* spp., *Phyllodoce coerulea, Vaccinium myrtillus, V. vitis-idaea.* Herbs: *Cornus suecica, Geranium sylvaticum, Melampyrum pratense, Pedicularis lapponica, Solidago virgaurea, Trientalis europaea, Viola biflora*. Graminoids: *Calamagrostis lapponica, Carex bigelowii, Deschampsia flexuosa, Festuca ovina, Juncus trifidus*.  Bryophytes: *Barbilophozia lycopodioides, Dicranum* spp., *Hylocomium splendens, Pleurozium schreberi*.  Lichens: *Cladina* spp., *Nephroma arcticum, Peltigera aphthosa*. |
| G1.9b Mediterranean mountain Betula and Populus tremula woodland on mineral soil | This habitat includes a variety of deciduous birch and aspen woodlands growing at the sub-alpine level in the high mountain ranges of southern Europe. In such situations, the short growing season, the prevalence of frost and high exposure limit both the possible dominants and the structure of the woodland. Silicate soils predominate, strongly acidic and often podzolised.   In the Pyrenees and the more humid Cantabrian mountains of Spain, there are woodlands in the subalpine belt with canopies of other birches of variously contested taxonomy: *B. pubescens* subsp. *pubescens* (= *B. carpatica*)*, B. pubescens* subsp*. celtberica* (*B. celtiberica*) and *B. pendula* subsp. *fontqueri* (*B. fontqueri*)*.* Here birch is often a secondary invader, colonising spontaneously after avalanches, fire and clear cutting, but it can form more permanent woodlands on boulder scree where there is much winter snow accumulation.  *Betula pendula* forms extensive belts of woodland on rapidly eroding soilsat the upper forest limit on the high mountains of Corsica  Between 1400 and 2000m on the north-eastern slopes of Etna in Sicily, an open canopy of *B. aetnensis* develops over volcanic cinders in a severe montane climate subject to frequent volcanic events such as ash rains. *Pinus nigra,* *Quercus dalechampii* and *Q. congesta* occur occasionally with a species-poor field layer of *Pteridium aquilinum, Festuca circummediterranea, Achillea ligustica, Genista aetnensis, Astragalus siculus, Tanacetum siculum* and *Carlina nebrodensis.*  This habitat also includes high mountain woodlands dominated by *Populus tremula.* On Etna, this tree dominates in small humid valley woodlands above 900m where there is a quite rich mesophytic flora including *Brachypodium sylvaticum, Lathyrus pratensis, Daphne laureola* and *Agropyron panormitanum.*  Relict aspen forests can also be found on deep colluvial soils in humid foothill and mountain gorges from 600-1500m in the central and southern Apennines. There distinctive associates are *Acer obtusatum, Laburnum anagyroides, Sorbus aria, Euonymus latifolius, Prunus avium, Lonicera etrusca, Rosa arvensis, R. agrestris, Rubus hirtus, Daphne laureola* and *Chamaecytisus hirsutus* with *Sanicula europaea, Primula vulgaris, Euphorbia amygdaloides, Fragaria vesca* and *Melica uniflora.*  Indicators of quality:   * Woodland permanent not a successional stage * Dominance by either birch or aspen * Presence of the distinctive woody associates and field layer   Characteristic species:  Trees: *B. pubescens* ssp. *pubescens* (= *B. carpatica*)*, B. pubescens ssp. celtiberica* (*B. celtiberica*) and *B. pendula* ssp. *fontqueri* (*B. fontqueri*)*.* |
| G1.Aa Carpinus and Quercus mesic deciduous woodland | These are deciduous broadleaved woodlands typical of free-draining to somewhat-strongly impeded brown earth soils and gleys of quite low, moderate to high base-status and moderate to high nutrient content across the lowlands and foothills of the temperate zone of western, central and southern Europe, with local extensions into regions of sub-Mediterranean, Pannonian and Boreal climate.  Partially this includes alluvial Quercus/ Carpinus-dominated forests in mountain valleys with infrequent indundation. The canopy is typically of mixed composition with oaks figuring prominently, notably *Quercus robur* and *Q. petraea* but with regional contributions from other oaks, along with *Carpinus betulus, Fraxinus excelsior, F. angustifolia, Acer pseudoplatanus, A. campestre, A. platanoides, Ulmus glabra, Tilia cordata* and *T. tomentosa.* Typically, *Fagus sylvatica* is at most a minor component here because it does not tolerate the stagnation in gley soils and is disadvantaged competitively, though transitions to more mesophilous and immature stands of free-draining G1.6a *Fagus* woodland on non-acid soils are quite common.  The tree canopy can have a complex multi-layered structure (often much affected by sylviculture) but it casts a relatively light shade, so there is often a rich and extensive understorey of saplings, small trees, shrubs and lianes. Among the latter, *Crataegus monogyna, C. laevigata, Corylus avellana*, *Euonymus europaeus*, *Viburnum opulus, Daphne mezereum, Lonicera xylosteum* and *Hedera helix* are frequent throughout with other associates figuring according to regional or local climatic and edaphic conditions.  The field layer too has a core of characteristic widely distributed hemicryptophytes and geophytes throughout the range with other contingents according to major climatic differences and local site conditions.  *Viola reichenbachiana, Polygonatum multiflorum, Lamiastrum galeobdolon, Milium effusum, Campanula trachelium, Carex sylvatica, Pulmonaria obscura, P. officinalis, Scrophularia nodosa, Brachypodium sylvaticum, Galium odoratum, Poa nemoralis, Paris quadrifolia, Sanicula europaea, Adoxa moschatellina, Ranunculus auricomus, Arum maculatum* are common throughout with *Deschampsia cespitosa, Festuca gigantea, Stachys sylvatica, Circaea lutetiana, Impatiens noli-tangere* and *Athyrium filix-femina* in moister situations.  There, too, especially where the soils are freshly aerated and more nutrient-rich, can be a striking vernal geophyte element with *Ranunculus ficaria, Allium ursinum, Anemone nemorosa, Leucojum vernum* and, in the Atlantic north-west, *Hyacinthoides non-scripta.*  Within this broad frame, the geographic and climatic extremes can present rather striking contrasts.  To the Atlantic west, through Great Britain, Ireland and the foothills of northern Spain, *Fraxinus excelsior* can often exceed the oaks in its cover, is often accompanied by *Ulmus glabra* and, among the smaller trees of the understorey, *Ilex aquifolium* with *Lonicera periclymenum* a common liana.Ferns such as *Polystichum setiferum, P. aculeatum, Dryopteris filix-mas, D. affinis, Asplenium scolopendrium* and *A. trichomanes* and a lush cover of bryophytes, especially bulky pleurocarpous mosses, reflect the humid atmosphere.  In northern Spain, *Quercus ilex, Q. pyrenaica,  Laurus nobilis* and *Rhamnus alaternus* in the canopy, *Smilax aspera* and *Euphorbia peregrina* as lianes and *Helleborus viridis, Pulmonaria affinis* and *P. longifola* among the herbs, reflect the warmer oceanic conditions adjacent to the sub-Mediterranean zone.  Towards the east of its range, this habitat grades into the lime-oak woodlands which extend far into the Russian lowlands.  In the transitional types, *Tilia cordata* becomes more important in the canopy, along with occasional *T. tomentosa*, and *Q. polycarpa* and *Q. dalechampii c*an figure among the oaks.  Further south, extending from the foothills of Austria, through Slovenia, into the Balkans, the flora has a distinct Illyrian aspect with *Quercus cerris, Q. frainetto, Carpinus orientalis, Fraxinus ornus* and a large contingent of herbs among which *Epimedium alpinum, Erythronium dens-canis, Hellebrous dumetorum ssp. atrorubens, Knautia drymeia, Cyclamen purpurescens, Staphyles pinnata* and *Helleborus odorus* are the most frequent.  Indicators of good quality:   * Typical structure and composition of canopy: High forest stands should have a complex composition with a mixed age structure, well-developed understorey and active regeneration but diverse patterns of exploitation mean that there are numerous other quality states for this habitat and this also affects the kinds of regeneration that can occur. * Typical flora and fauna composition of the region * Presence of old trees and a variety of dead wood (lying and standing) and the associated flora, fauna and fungi * Presence of mosaics of developmental stages including gaps * Sufficient proportion of historically old (ancient) woodland with high species diversity * Survival of larger stands of forest without fragmentation and isolation * Absnce of non-native tree species and absence of invasive aliens in all layers (fauna, flora). * No eutrophication and pronounced invasion of nutrient-demanding herbs due to eutrophication from atmospheric deposition or ground-water enrichment   Characteristic species:  Tree layer: *Quercus robur, Q. petraea, Carpinus betulus, Fraxinus excelsior, Acer pseudoplatanus, A. campestre, Ulmus glabra, Tilia cordata, Acer platanoides, Prunus avium;*  *Shrub layer: Corylus avellana, Crataegus laevigata, C. monogyna, Euonymus europaeus, E. verrucosus, Sambucus nigra, Prunus avium, Sorbus aucuparia, Cornus sanguinea, Rosa arvensis, Ligustrum vulgare, Sorbus torminalis;*  *Herb layer: Lamiastrum galeobdolon, Galium odoratum, Poa nemoralis, Mercurialis perennis, Hedera helix, Geranium robertianum, Geum urbanum, Dryopteris filix-mas, Polygonatum multiflorum, Viola reichanbachiana, Brachypodum sylvaticum, Oxalis acetosella, Stellaria holostea, Pulmonaria officinalis, Anemone nemorosa, Anemone ranuculoides, Ranunculus auricomus, Vinca minor, Galium sylvaticum, Carex montana, Primula veris, Mycelis muralis, Aegopodium podagraria, Fragaria vesca, Athyrium filix-femina, Melica uniflora, Campanula trachelium, Ajuga reptans, Carex sylvatica in the more subcontinental forests also Galium schultesii, Hepatica nobilis, Lathyrus vernus and Asarum europaeum.* |
| G1.Ab Ravine woodland | One striking situation in Europe where beech and oaks can be out-competed by such fast-growing trees as *Fraxinus excelsior*, *Acer pseudoplatanus*, *A. platanoides*, *Ulmus glabra* and, *Tilia platyphyllos* and *Tilia cordata* is on the nutrient-rich soils that accumulate in the humid micro-climate of shady slopes and ravines. Here, with downwash and percolation of ground water, the brown earth soils can be deep and moist, but usually they are free-draining and show a brisk turnover of nutrients and mull humus. Typically, such situations are associated with hard, base-rich, though not always calcareous, rocks and they occur widely throughout steep-sided immature river valleys of the foothills, sub-montane and high mountain belt right across Europe. The terrain is typically complex and rocky, with a heterogenous soil cover and the structure of these woodlands has been vividly described as ‘impetuous’. The distinctive kind of terrain necessary to sustain this habitat means that through Europe, these woodlands have a basic floristic and structural similarity, though variations in regional climate support distinctive contingents of associates with more Continental, Boreal, Alpine, Mediterranean or Atlantic affinities. There is also some floristic variation according to whether the habitat is on very moist colluvium, is humid primarily because of shade or gets some warmth at ravine tops or by virtue of being in more southerly latitudes. More generally across the range, *Quercus robur*, *Q. petraea* and *Fagus sylvatica* can make a minority contribution to the canopy along with *Carpinus betulus* and *Sorbus aucuparia*. Through France, Germany, Austria and Switzerland, there is a tendency for more montane stands to be dominated by *Acer platanoides, A. pseudoplatanus* or *A. opalus* while those at lower altitudes have abundant lime (*Tilia spp.*). More particularly, *Tilia platyphyllos* is the lime more confined to ravine forests while *T. cordata* is more widely characteristic of G1.Aa Mesic deciduous woodland. The difficult terrain which has protected against exploitation of these woodlands and the extraordinary longevity of both limes means that these ravines can harbour some of the most ancient and majestic trees of Europe.  In the shrub layer *Sambucus nigra* is characteristic along with *Corylus avellana*, while the field layer is dominated by luxuriant nitrophilous herbs such as *Urtica diocia*, *Aegopodium podagraria* and *Impatiens noli-tangere*, moisture-loving vernal plants like *Allium ursinum* and, on the typically base-rich soils, *Mercurialis perennis*, *Geranium robertiamum*, *Brachypodium sylvaticum* and *Circaea lutetiana*. More especially distinctive are *Lunaria rediviva*, *Helleborus viridis*, *Aruncus dioicus*, *Actaea spicata*, *Aconitum vulparia*, *Corydalis cava*, *Equisetum hiemale*, *Polygonatum verticillatum*, and *Aconitum paniculatum*. Sometimes *Allium ursinum* can dominate the herb layer. Then, reflecting the high humidity, there are often abundant ferns such as *Phyllitis scolopendrium*, *Polystichum aculeatum*. *P. setiferum* and *Gymnocarpium robertianum* and bulky mosses thrive on the bare ground exposed by the rapid breakdown of herbage and litter at the close of the growing season. Lichens can also be well developed with species such as *Lobaria pulmonaria* or *Gyalecta ulmi*.  In the Atlantic zone, where the climate is more generally cool and humid, woodlands of this kind are less confined to ravines, particularly where base-rich rocks are extensively exposed. Also, approaching or beyond the limits of *Acer pseudoplatanus*, *A. platanoides* and even the limes, as in north-west Great Britain, there is a tendency for stands to be dominated by *Fraxinus excelsior* and *Ulmus glabra*, or even *Corylus avellana* in situations exposed to humid oceanic winds. Similar vegetation reported from southern Scandinavia also falls within this habitat type. Northern montane plants such as *Prunus padus*, *Ribes saxatilis*, *Actaea spicata,* *Trollium europaeus*, *Crepis paludosa*, *Cirsium helenioides* and *Geranium sylvaticum* can here give this habitat a Boreal feel. Towards southern Europe and particularly in sunny ravines at lower altitudes in Czechia, Hungary, Romania and the Pyrenees, there is a thermophilous contingent in this habitat including *Cotoneaster integerrimus*, *Sesleria caerulea*, *Athericum ramosum*, *Vincetoxicum hirundinaria* and other species more typical of the G1.7a and G1.7b thermophilous woodlands. South of these latitudes, the habitat occurs locally in the Italian pre-Alps and reaches its southern limit in the humid north-facing ravines of the Appennines. In ravines among G3.1c Mediterranean mountain *Abies* woodland in such situations, there can be occasional *Abies alba* among the canopy trees.  Indicators of quality:  • No forest exploitation  • Maintenance of the complex ravine topography, micoclimatic conditions and woodland structure  • Sufficient structural diversity/ complexity (semi)natural age structure or completeness of layers  • Sufficient proportion of historically old (ancient) woodland with high species diversity  • Presence of old trees and a variety of dead wood (lying and standing) and the associated flora, fauna and fungi  • Rich and luxuriant field and ground layers protected by continuous canopy and locally high humidity with typical flora and fauna composition of the region  • Absence of non-native tree species and absence of invasive aliens in all layers (fauna, flora)  • No signs of eutrophication or pollution, absence of nitrophilous adventives  • No fragmentation and isolation (no major disruptions in the ravine forests with coniferous plantations).  Main Characteristic species:  Tree canopy: *Fraxinus excelsior*, *Acer pseudoplatanus*, *A. platanoides*,*A. opalus,* *Ulmus glabra*, *Tilia cordata*, *T. platyphyllos*;  Field layer: *Urtica diocia*, *Aegopodium podagraria*, *Impatiens noli-tangere*, *Allium ursinum*, *Mercurialis perennis*, *Geranium robertiamum*, *Brachypodium sylvaticum*, *Circaea lutetiana*, *Lunaria rediviva*, *Helleborus viridis*, *Aruncus dioicus*, *Actaea spicata*, *Aconitum vulparia*, *Corydalis cava*, *Equisetum hiemale*, *Aconitum paniculatum*, *Phyllitis scolopendrium*, *Polystichum aculeatum*,*P. setiferum*, *Gymnocarpium robertianum*. |
| G1.Ba Alnus cordata woodland | Broadleaved deciduous, non-riparian forests dominated by *Alnus cordata*, subendemic to Corsica (North-Eastern sectors of the island) and S-Italy (Campania, Basilicata and Calabria Regions). The dominant species is a relict from the Tertiary period and is also present in other areas, where it is considered not native. Biogeographically distributed on the Central-Mediterranean mountains, from the climatic point of view these forests develop preferentially between the hilly and the montane belts, occupying a transitional area between the deciduous oaks and the beech forests. From a geo-pedological point of view, they show a preference for siliceous substrata but can also be found on limestone. *Alnus cordata* tends to form forests, either pure or mixed with other deciduous species, such as *Quercus cerris*, *Castanea sativa* or, at higher altitudes, *Fagus sylvatica*. They tend to colonize steep slopes and sides of deep valleys. The Italian alder is a strong pioneer species with great affinity for mineral soils, and could largely expand after the drastic economic changes following the Second World War, when large agricultural areas were abandoned and left to natural evolution, especially at higher altitudes. These formations are characterized by very strong pace of growth in the juvenile stage, and quickly reach maturity (Bezzi et al. 1991). Unlike the other species of the genus *Alnus*, the Italian alder shuns soils where water stagnates for a long time, although it still shows a certain hygrophilous ecology. Regeneration occurs quickly and seedlings can grow fast after cutting or in clearings. Furthermore, *Alnus cordata* can play a prominent role in improving the soil, due to the presence of radical tubercles hosting microorganisms (*Frankia alni*) fixing the atmospheric nitrogen (Pirazzi 1984; Ducci & Tani, 2009).  These forest types often show a high environmental quality and host rare or endangered species.  Indicators of good quality:  â— Dominance of *Alnus cordata*  â— Presence of the distinctive woody associates and field layer  â— Presence of the field layer flora typical of the region  â— Uneven-aged canopy with signs of regeneration of woody dominants  â— Presence of a well-developed structure of the tree layer  â— Woodland permanent, not a successional stage; blocked dynamism due e.g. to the steep slope, where this forests represent the potential natural vegetation  Characteristic species:  *Alnus cordata, Fagus sylvatica, Quercus cerris, Castanea sativa, Acer opalus subsp. obtusatum, Acer campestre, Crataegus monogyna*, *Rubus hirtus*, *Rubus ulmifolius, Malus sylvestris*, *Pyrus pyraster, Prunus spinosa, Clematis vitalba, Hedera helix, Cytisus villosus, Asperula taurina*, *Geranium versicolor, Geranium nodosum, Anemone apennina, Melittis albida, Festuca exaltata, Arisarum proboscideum, Pteridium aquilinum, Aquilegia vulgaris, Lamium flexuosum, Polystichum setiferum, Carex sylvatica, Mycelis muralis,* *Sanicula europea, Helleborus lividus* subsp. *corsicus*, *Primula vulgaris, Poa sylvicola, Fragaria vesca, Geum urbanum, Symphytum tuberosum, Geranium robertianum, Chaerophyllum temulum, Brachypodium sylvaticum, Viola alba* subsp. *dehnhardtii, Digitalis lutea* subsp. *australis, Potentilla micrantha,* *Crepis leontodontoides, Teucrium siculum, Stachys sylvatica, Circaea lutetiana, Salvia glutinosa, Rumex sanguineus*. |
| G2.1 Mediterranean evergreen Quercus woodland | This woodland habitat is naturally dominated by evergreen oaks with associated broadleaved sclerophyllous and lauriphyllous evergreen trees and shrubs adapted to the summer drought of the thermo-mediterranean climate. Stands have been modified in various degrees due to long histories of exploitation, clearance and regrowth, as well as by natural disturbance from fires, disease and insect infestation, interventions which affect both the structure and species composition of stands. Transitional degraded stages  of these woodlands to maquis and garrigues, are widespread throughout the distribution area of the habitat; in some regions there are transitions to the savannah-like vegetation of dehesas (Spain) or montado (Portugal) (Annex I habitat type 6310: Dehesas with evergreen *Quercus*), where the underlying vegetation can be largely unshaded pasture quite different from the associated flora of this woodland. In representative stands of this habitat, the tree canopy can be up to 15m (or more) high,  although it is often lower; the layer beneath the oaks tree canopy typically consists of other sclerophyllous or lauriphyllous species, as well as few deciduous tree and shrub species. Different dominants and co-dominants and associates prevail in different regions and on different terrains; *Q. ilex* is the most widespread oak in these woodlands largely occurring on base-rich substrata throughout the meso-Mediterranean altitudinal belt. *Quercus ilex* subsp. *ilex* occurring from northern and western Iberia through France to the Adriatic region and Greece is the dominant species and the deciduous oak species *Q. pubescens* participant at the tree layer; *Pinus halepensis* is also a component of these woods in the Balkan peninsula localities. *Q. ilex* subsp. *rotundifolia* is extensive in Portugal and Spain in rather drier sites and more common in dehesas. *Quercus coccifera* is also widespread and often replaces *Q. ilex* around the Aegean, dominating in distinctive woodlands of Crete but elsewhere is less common in woodlands and mostly dominates maquis vegetation derived both from evergreen oak woodlands and thermophilous broadleaved woodlands. *Q. alnifolia* also dominates in some distinctive woodlands of Cyprus. *Q. suber* is primarily a western Mediterranean tree demanding moister climatic conditions than other evergreen oaks (500-1000mm annual precipitation) and can replace *Q. ilex* on more acidic and less fertile soils. *Quercus suber* is mainly distributed in Spain and Portugal and extends eastwards to a coastal belt in southern Italy; *Q. suber* has been of great commercial interest for its cork bark and acorns being a subsidiary crop used for feeding pigs. In cases that the evergreen oak woodlands occur on coastal dunes throughout the Mediterranean zone, these are considered part of the EUNIS habitat B1.7b: Mediterranean wooded dunes with *Quercus* spp.  Indicators of quality:   * No forest exploitations, especially in sub-type dominated by Q. suber no cork harvesting and forest management for ecological improvement purposes * Natural composition of canopy * Structural diversity/complexity with (semi)natural age structure or completeness of layers * Typical flora and fauna composition of the region * Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi * Presence of natural disturbance such as treefall openings with natural regeneration * Long historical continuity (ancient woodland) with high species diversity * Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests) * No man-induced very high population levels of ungulates   Characteristic species:  Vascular plants*: Quercus ilex ssp. ilex, Q. ilex ssp. rotundifolia, Q. coccifera, Q. suber, Arbutus unedo, Pistacia lentiscus, Rhamnus alaternus, Fraxinus ornus, Juniperus oxycedrus, Crataegus monogyna, Erica arborea, Phillyrea latifolia, P. angustifolia, Rubia peregrina, Smilax aspera, Hedera helix, Lonicera implexa, Tamus communis, Clematis flammula;* *Asparagus acutifolius, Ruscus aculeatus, Rubus ulmifolius, Teucrium chamaedrys, Brachypodium sylvaticum, Carex hallerana.* |
| G2.2 Mainland laurophyllous woodland | This habitat comprises micro-forest vegetation with a low canopy dominated by lauriphyllous evergreen shrubs or small trees growing in warm-temperate oceanic to hyper-oceanic environments along the Atlantic coasts of northern Iberian Peninsula, central and southern Italy, Sardinia and Sicily. Nowadays, they present small remnants in the most humid and oceanic areas of the Atlantic areas of the continent or isolated enclaves surviving where sheltered situations like ravines provide local protection against summer heat and dessication. Typically species-poor, the habitat is usually dominated by shrubs of the humid Mediterranean zone, such as *Arbutus unedo* and *Laurus nobilis* which have a broad Mediterranean and southern Atlantic distribution and has an associated liane and field flora with general affiliations to the evergreen oak forests of the Quercetea ilicis.  Indicators of good quality:   * When the stands are in optimal conditions they show the appearance of a closed deep shady bush or small forest. * Canopy is continuous and evergreen * Soil is covered by a thick layer of decomposing litter. * Ferns are common in the understory, sometimes as epiphytes, and bryophytes cover the stones and the trunks. * No signs of disturbance (logging, grazing, etc.) should be visible * Dead wood can be considered as a good indicator of maturity   Characteristic species:  *Arbutus unedo, Laurus nobilis, Ilex aquifolium, Phyllirea latifolia, Prunus lusitanica, Rhamnus alaternus, Rosa sempervirens, Rubia peregrina, Smilax aspera, Tamus communis, Viburnum tinus.* |
| G2.3 Macaronesian laurophyllous woodland | Evergreen lauriphyllous forests with a very rich and luxuriant associated flora and fauna typical of the humid to hyper-humid, frost-free, mist-bound cloud belt of the Macaronesian islands.  So-called ‘Atlantic rain forest’, this habitat forms the most complex and remarkable relict of the humid sub-tropical vegetation of the Miocene-Pliocene period in southern Europe.  Occurring at 500-1500m, it is typical of slopes with deep soils kept permanently moist by rain and fog-drip. Humidity tends to decline from north to south among these archipelagos but, particularly on Madeira and the more westerly Canary Islands, more dramatic topography has a strong influence on the local climatic conditions.  In contrast to the G2.7 Macaronesian heathy woodlands which are dominated by shrubby ericaceous plants, the canopy here is composed of laurel-leaved trees and shrubs, many of them ancient endemics to the islands.  The canopy of these highly productive woodlands can reach over 30m with some of the tree species suckering over and again to produce dense multi-stemmed individuals.  There can be up to 20 different tree species in a few hectares, prominent among them *Laurus azorica, L. novocanariensis, Myrica faya, Ocotea foetens, Persea indica, Apollonias barbujana, Clethra arborea, Erica arborea*, *E. azorica, Ilex canariensis, I. perado ssp. azorica, I. perado ssp. perado, Isoplexis canariensis, Ixanthus viscosus, Picconia azorica* and *P. excelsa.* In general, these laurel forests also have more climbing plants, ferns and epiphytic mosses than the Macaronesian heaths. The lush bryophyte cover, including some liverworts, is important in intercepting and retaining atmospheric moisture.  The woodlands show variation according to the local climatic conditions, sub-humid forms favouring southern slopes within areas of 500mm annual precipitation and little influence of the cloud-belt (eg. the Visneo-Apollonion and Canarian Ixantho-Laurion); humid types with precipitation of up to 1200mm, sunshine and temperature lessened by fogs (eg. Azorean Dryopterido-Laurion); and the hyper-humid with precipitation over 1500mm and permanent fogs, conditions typical of mountains of Madeira and the Azores (eg. the Sibthorpio-Clethrion).  Local endemism also means that particular islands can have a highly distinctive character and, in some places, degradation and invasion of introduced taxa like *Pittosporum undulatum* affects the floristic composition (as in the *Myrico-Pittosporion* of coastal slopes on the Azores).  Indicators of quality:  Particularly at lower altitudes and on less difficult terrain, areas of intact laurel forests have been drastically reduced by forest exploitation in clear-cutting for charcoal, tool-making and compost production, by planting of replacement forests of commercial timber trees; or by dairy-cattle grazing which hinders regeneration and causes eutrophication.  Road construction through forests also allows the spread of invading species. Signs of high quality in remaining stands are:   * the continuance of structural and floristic integrity of the forest vegetation without secondary regeneration after interventions or the dense growth that develops with abandonment of operations * survival of larger stands of forest without fragmentation and isolation * absence of damage from fires, particularly threatening in the sub-humid Canarian forests, with death of older hollow trees, consumption of deadwood and litter and development of combustible pioneer vegetation afterwards * absence of introduced invaders such as *Pittosporum undulatum, Hedychium gardnerianum, Clethra arborea* (an endemic but cultivated as an ornamental), particularly threatening on the Azores and Madeira*.*   Characteristic species:  Tree canopy: *Laurus azorica, L. novocanariensis, Myrica faya, Ocotea foetens, Persea indica, Apollonias barbujana, Clethra arborea, Erica arborea*, *E. azorica, Ilex canariensis, I. perado ssp. azorica, I. perado ssp. perado, Isoplexis canariensis, Ixanthus viscosus, Picconia azorica* and *P. excelsa, Viburnum tinus, Frangula azorica, Viburnum tinus ssp. subcordatum, Juniperus brevifolia, Prunus lusitanica, Sambucus lanceolata, S. palmensis, Ruscus streptophyllus, Phillis nobla, Ocotea foerens, Rubia peregrina, Tamus edulis, Rubus ulmifolius;* Field layer: *Asplenium onopteris, Dryopteris oligodonta, Pteridium aquilinum, Asparagus fallax, Galium scabrum. Diplazium caudatum, Woodwardia radicans, Brachypodium syklvaticun, Sibthorpia peregrine Eupatorium adenophorum, Ixanthus viscosus, Carex canariensis, C. peregrina.*  Some endemic bird species live almost entirely in the laurel forests: Madeiran laureal pigeon *Columba trocaz*, Canarian dark-tailed laurel pigeon *C. bollii* and white-tailed laurel pigeon *C. junoniae* and the Azores bullfinch *Pyrrhula murina.* |
| G2.4 Olea europaea - Ceratonia siliqua woodland | This habitat includes woodland dominated by arborescent *Olea europaea* var. sylvestris, *Ceratonia siliqua, Pistacia lentiscus, Myrtus communis* or, in the Canary Islands, by *Olea europaea* subsp. *cerasiformis* and *Pistacia atlantica*. It is closely related to the habitat type F5.1/2 Mediterranean maquis and arborescent matorral and, in fact, only a few stands have a sufficiently tall, closed canopy to qualify as this woodland type. All formations occur in the thermo-Mediterranean zone, or the thermo-Canarian for the *Olea europaea* subsp. *cerasiformis* type. The most typical example of the *Olea europaea* var. *sylvestris*-dominated formations with *Ceratonia* *siliqua* and *Pistacia lentiscus* are found in the northern Tunisia (Djebel Ichkeul) and in southern Andalusia (Tamo communis-Oleetum sylvestris, extinct?), in Menorca (Prasio majoris-Oleetum sylvestris), Sardinia, Sicily, Calabria and Crete. Some carob-dominated facies of the previous unit in Djebel Ichkeul (Tunisia) from the most typical example of the *Ceratonia siliqua*-dominated formations, often with *Olea europaea* var. *sylvestris* and *Pistacia lentiscus*. Carob-dominated formations are also found in Mallorca (Cneoro tricocci-Ceratonietum siliquae), in eastern Sardinia, in southeastern Sicily, in Puglia, in South Greece, Crete, in northeastern Algeria and in Cyrenaica. The use of these forests as agropastoral systems in some regions results in a physiognomy similar to the dehesas.  Indicators of quality:   * Natural composition and intact woodland canopy * Vigorous regeneration of typical woody species * Structural diversity/ complexity with (semi)natural age structure or completeness of layers with a considerable number of carob- and/or olive-tree individuals at the tree layer * Typical flora and fauna composition of the region * Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi * Presence of natural disturbance such as treefall openings with natural regeneration * Long historical continuity (ancient woodland) with high species diversity * Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests) * Absence of ruderal, invasive and planted non-native species in all layers (flora & fauna) * Absence of signs of disturbances (either rare or of low intensity) * Low levels of soil compactness, absence of trampling and erosion and well developed Ah horizon as good indicators for the lack of overgrazing.   Characteristic species:  *Ceratonia siliqua*, *Olea europaea* subsp. *cerasiformis, Olea europaea* var. *sylvestris*, *Pistacia atlantica*, *P. lentiscus,* Arbutus unedo, Arisarum vulgare, *Arum pictum* subsp. *sagittifolium*, *Asparagus acutifolius*, *Asphodelus ramosus*, *Brachypodium retusum*, *Bunium macuca* subsp. *balearicum*, *Calicotome infesta,* *C. villosa*, *Cistus incanus* subsp. *creticus*, *C. salvifolius*, *Clematis flammula*, *Dactylis glomerata* agg., *Dracunculus muscivorus*, *Euphorbia spinosa*, *Galium rubrum*, *Geranium purpureum*, *Genista majorica*, *Juniperus oxycedrus*, *J. phoenicea*, *Lonicera implexa*, *Myrtus communis*, *Phillyrea latifolia*, *Piptatherum coerulescens*, *P. miliaceum*, *Pistacia terebinthus*, *Prasium majus*, *Bituminaria bituminosa*, *Quercus coccifera*, *Rhamnus alaternus*, *Rosmarinus officinalis*, *Rubia peregrina*, *Smilax aspera*, *Teucrium flavum*, *Thymus vulgaris*, *Trifolium campestre* and *Urginea maritima.* |
| G2.5a South-Aegean Phoenix grove | This habitat includes woods, in contact with the underground water table, often riparian, formed by the palm tree *Phoenix theophrasti*, found on the island of Crete and south-western Anatolia. The majority of occurrences of *Phoenix theophrasti* in Crete, and all existing records made outside Crete and southwest Turkey, are represented only by scattered or isolated trees. Within the EU, Crete holds the only palm groves that are representative for the habitat type. Only two sites are known in Crete with several hundreds of trees: Vai and Preveli, the former is the most extensive (ca. 20 ha). The tertiary relict *Phoenix theophrasti* woods of Crete and south-western Anatolia (Datça peninsula) are restricted to damp, mostly sandy coastal valleys below 250 m; here are included: a) the most extensive grove in Crete, the forest of Vai in the east of the island, characterized by the luxuriant palm growth, accompanied by a thick shrubby undergrowth rich in *Nerium oleander*, and b) a few other smaller coastal groves, notably on the south coast of the prefecture of Rethimnon. The westernmost occurrence is in southwest Crete, on coastal plains south of the monastery of Chrisoskalitissa. *Phoenix theophrasti* trees are known also from some Greek islands (Crete, Karpathos, Kos, Rodhos, Thira, Nisyros, Amorgos) and from the Turkish southeast Aegean sites of Datça and Kumluca-Karaöz, with additional populations in Bodrum-Gölköy, all in southwest Anatolia. In the Aegean palm groves, *Phoenix theophrasti* is a rather rare constituent of the Aegean *Nerio-Tamaricetea* vegetation and is restricted to semiarid climate (generally with 400-600 mm annual precipitation). The habitat may be either riparian (with the palm forming temporarily inundated gallery forest along permanent fresh or brackish waters), or related to seasonally or episodically flooded coastal valleys. In the latter, the palm trees are generally more scattered, and they may be restricted to rocky low slopes. Underground water level is high and sufficiently permanent to control habitat ecology and species combination. The soils are frequently sandy but the habitat type does not include mobile dunes. The vegetation belongs to the alliance *Rubo sancti-Nerion oleandri* but more isolated trees or clusters are surrounded by *Pistacio-Rhamnetalia* or *Cisto-Micromerietalia* vegetation. Associated of *Phoenix theophrasti* are species of wet or semiwet habitats, as well as species with a wider ecological range (see the list of characteristic species below).  Indicators of quality:   * No forest exploitations in the majority of the area covered by the habitat * Intact natural hydrology * Natural composition of canopy * Structural diversity/ complexity with (semi)natural age structure or completeness of layers * Typical flora and fauna composition of the region * Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi * Presence of natural disturbance such as treefall openings with natural regeneration * Long historical continuity (ancient woodland) with high species diversity * Absence of non-native species in all layers (flora & fauna) * No signs of eutrophication or pollution   The indicators of good quality are primarily related to the maintenance of the natural structure of the *Phoenix theophrasti* woods. The presence of rejuvenation of *Phoenix theophrasti* in all sites of its occurrence, as well as the undisturbed soil (no significant trampling or erosion), the natural relief, the stratified stands (tree, shrub, herb layer present), the closed canopy of *Phoenix theophrasti* woods ≥25% and *Phoenix* individuals mostly higher than 3 m are indicators that the structure and functions of the habitat are in favourable conservation status to a significant part of its distribution. Its adjacency to, or its interdigitation with Mediterranean salt meadows of the *Juncetalia maritimi* (1410 - Annex I of the Dir. 92/43/EEC), and/or Mediterranean tall humid herb grasslands of the *Molinio-Holoschoenion* (6420 -Annex I of the Dir. 92/43/EEC) are also considered as indicators related to the long-term conservation of the habitat.  Characteristic species:  *Phoenix**theophrasti, Aristolochia cretica, Juncus heldreichianus, Myrtus communis, Erica manipuliflora, Nerium oleander, Narcissus tazetta, Rubia peregrina, Schoenus nigricans, Scirpoides holoschoenus, Pistacia lentiscus, Smilax aspera.* |
| G2.5b Canarian Phoenix grove | The habitat includes sparse *Phoenix canariensis* groves (palmares) on colluvial deposits, mostly on flat mid-slope sites or at the base of irregular temporary streams. Endemic only to the Canary Islands, they are dependent on brief, temporary water-tables present in sporadic torrential flows during winter. Thus, they are azonal in the dry to arid bioclimatic belts of the infra-thermomediterranean where the zonal vegetation consists of xerophytic scrub (F8.1: Canary Island xerophytic scrub). As the Canarian palms were probably much exploited by humans in historic times (and still are found as semi-anthropogenic formations for the extraction of ‘palm honey’ or *guarapo*, a syrup made of the palm sap), the palm groves are considered to be impoverished versions of a former microphanerophytic dense community that was probably co-dominated also by dragon trees (*Dracaena draco*) and had some characteristics of a dry edapho-hygrophilous forest with climbers and tall-shrubs. Usually, the groves are in contact with the xerophytic sclerophyllous or scale-leaf communities (Mayteno-Juniperion canariensis) or canarian-spurge communities (the cardonales and tabaibales of Aeonio-Euphorbion canariensis) included in the G3.9c Macaronesian Juniperus woodland or F8.1 Canary Island xerophytic scrub.  Indicators of quality:   * No forest exploitations in the majority of the area covered by the habitat * Intact natural hydrology * Natural composition of canopy * Structural diversity/ complexity with (semi)natural age structure or completeness of layers * Typical flora and fauna composition of the region * Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi * Presence of natural disturbance such as treefall openings with natural regeneration * Long historical continuity (ancient woodland) with high species diversity * Absence of non-native species (such as *Opuntia* spp. and *Agave* sp.) in all layers (flora & fauna) * Low cover of nitrophilous species of the *Forskaleo-Rumicetalia lunariae*   Characteristic species:  *Phoenix canariensis*, *Dracaena draco, Plocama pendula*, *Periploca laevigata*, *Dracaena tamaranae*. |
| G2.6 Ilex aquifolium woodland | This is a woodland habitat defined on the sole (and ecologically questionable) basis of dominance by arborescent individuals of *Ilex aquifolium* without other co-dominant trees*.* Originally recognised as occurring in the supra-Mediterranean belt where stands occur in Sardinia and Corsica and in Atlantic mountains of northwestern Spain,it was there considered as mostly a facies of relict G3.9 *Taxus baccata* woodland. Other scattered occurrences exist in the nemoral zone of western Europe, in the UK for example, where they are probably facies of G1.6 *Fagus* woodland or G1.8 acidophilous *Quercus* woodland. *Ilex* was long exploited as a winter fodder for stock and this may account for its local abundance in landscapes where pasturing was combined with silviculture. Global warming contributes to its current successful colonization of a variety of forest types, more northern and eastern (suboceanic) in distribution than before.  Indicators of good quality:  â— The dominance of *Ilex aquifolium* (whatever its origin) remains the key indicator of quality here  â— Survival of the associated flora is inherited from the original woodland from which this habitat was derived  Characteristic species:  Tree layer: *Ilex aquifolium* dominant*, Fagus sylvatica, Quercus petraea agg., Fraxinus excelsior; Shrub layer: Sorbus aucuparia, Carpinus betulus, Crataegus monogyna, Corylus avellana, Prunus spinosa, Hedera helix;* Herb layer: *Pteridium aquilinum, Lonicera periclymenum, Deschampsia flexuosa, Vaccinium myrtillus;* Moss layer*: Polytrichum formosum, Dicranum scoparium, Mnium hornum.* |
| G2.7 Macaronesian heathy woodland | The habitat type comprises successionally mature, zonal microforests of Madeira and the Canary Islands with a luxuriant canopy 3 to 12m tall, dominated by one or more of *Erica canariensis* Rivas Mart., M. Osório & Wildpret (=*E.* *arborea* sensu auct. mad & can. and not *E. arborea* L.), *E. platycodon* subsp. *platycodon* (Canarian) or *E.* *platycodon* subsp. *maderincola* (Madeiran) usually with some broadleafs, including Lauraceae. Heath scrub, even if arborescent, that is pioneer, seral or secondary to mature forest, is not included here but placed in F4.3 Macaronesian heath, vegetation typical of cambisols with mor humus. Four distinct subtypes of these primary woodlands can be recognized with notable stretches of types 2 and 4 on Tenerife (Anaga) , Gomera and La Palma.  1. Madeiran, upper mesotemperate to supratemperate, hyper-humid tree-heath forests above the  upper limit of laurel forest from *ca.* 1500 up to 1862m, on andosols or cambisols, with absolute dominance of heaths reaching up to 12m tall, either *E. canariensis* or *E. platycodon* subsp. *maderincola* (Polysticho falcinelli-Ericion canariensis). Intense cold probably excludes laurels but there can be some other broadleafs (*Vaccinium padifolium*, *Sorbus maderensis*) and endemics in the understorey and clearings (e.g. *Teucrium francoi, Odontites holliana, Polystichum falcinellum*). In pristine stands, *Juniperus cedrus* subsp. *maderensis* used to be much more abundant in the forest, having been subsequently cut for timber and charcoal and now surviving as sparse individuals.  2. Tree-heath/Canarian holly forests of the sub-humid to humid mesomediterranean zone on rocky outcrops, but under almost permanent heavy fogs such that the thin soils with low water-holding capacity are kept permanently wet. These forests are co-dominated by *Erica platycodon* subsp. *platycodon* and elements of the Canarian laurel forest (Ixantho-Laurion), e.g. *Laurus novocanariensis* Rivas Mart. et al. (=*Laurus azorica* sensu auct. can. non (Seub.) Franco), *Viburnum tinus* subsp. *rugosum* and *Ilex* *canariensis* var. *canariensis.*.  3. Madeiran equivalents of type 2 have *Erica platycodon* subsp. *maderincola,* madeiran blueberries *(Vaccinium padifolium*) and elements of the madeiran laurel forest *(*Sibthorpio-Clethrion) on deep cambisols.  4. On west Canaries with a dry to subhumid thermomediterranean climate, there are tree heath/ Canarian strawberry tree microforests dominated by *Arbutus canariensis*, *Erica canariensis*, *Ilex* *canariensis* var. *canariensi*s with *Visnea mocanera* and *Syderoxylon marmulano*. Madeiran strawberry tree forests have no large tree-heath individuals.  Indicators of quality:   * Closed canopy layer and richness of both dominant and understory characteristic taxa. * Large gaps in crown layer occurring naturally by death of individual trees or sometimes mass movements of soil in steep slopes. * No tendency to dominance by shrub thickets of *E. platycodon* subsp. pl., *Teline* sp. pl., *Cistus* *symphytifolius, C. monspeliensis*, *Globularia salicina, Carlina* sp. pl. or tall perennial grasses (*Hyparrhenia sinaica, H. podotricha).* * Absence of invasive aliens such as *Cytisus scoparius*, *Ulex europaeus* and *Leptospermum scoparius* or even Australian wattles (*Acacia* sp. pl.), taking advantage of gaps or wildfires. * Absence of trampling by humans.   Characteristic species:  Flora:  Vascular plants: *Erica canariensis* (*= E. arborea* sensu auct. mad & can.) (dom.)*, Erica platycodon subsp. platycodon* (dom.)*, E. platycodon subsp. maderincola* (dom.)*, Ilex canariensis* (dom.)*, Laurus novocanariensis (= L. azorica sensu auct. mad & can.)* (dom.)*, Morella faya (= Myrica faya)* (dom.)*, Rhamnus glandulosa, Semele androgyna, Smilax canariensis, S. pendulina, Apollonias barbujana, Arbutus canariensis* (dom.)*, Carex perraudieriana, Diplazium caudatum, Dryopteris oligodonta, Euphorbia mellifera, Heberdenia excelsa, Ilex perado, Pleiomeris canariensis, Prunus lusitanica* subsp. *hixa* (dom.)*, Pteris incompleta, Syderoxylon marmulano, Visnea mocanera, Viburnum tinus* subsp. *rugosum*(dom.) *, Hypericum inodorum, Phyllis nobla, Teline canariensis, Apollonias barbujana, Persea indica, Picconia excelsa, Cedronella canariensis, Hypericum glandulosum, Hypericum grandifolium, Arachnoides webbianum, Berberis maderensis, Carex lowei, Cirsium latifolium, Clethra arborea, Dryopteris aintoniana, Dryopteris x furadensis, Dryopteris maderensis, Festuca donax, Goodyera macrophylla, Hedera maderensis* subsp. *maderensis, Luzula seubertii, Pittosporum coriaceum* (extremely rare)*, Polystichum drepanum, Rosa mandonii, Rubus grandifolius, Ruscus streptophyllus, Sibthorpia peregrina, Teucrium betonicum, Teucrium abutiloides, Vaccinium padifolium* (dom.)*, Arum italicum* subsp. *canariensis, Dryopteris aemula, Bystropogon punctatus, Juniperus cedrus* subsp. *cedrus, J. cedrus* subsp. *maderensis, Polystichum falcinellum, Ranunculus cortusifolius* var. *minor, Sorbus maderensis.* The genera *Picconia, Semele, Gesnouinia, Lactucosonchus* and *Ixanthus* are entirely endemic to theseforests and others such as *Isoplexus, Visnea* and *Phyllis* reach their maximum development here.  Fauna:  Birds: *Columba bollet, C. junionae, C. trocaz, Fringilla coelebs* subsp. *ombriosa, F. teydea.* |
| G3.1a Temperate mountain Picea woodland | These are evergreen coniferous woodlands of the montane and sub-alpine belt in the nemoral zone of Europe, where increased winter coldness towards the more easterly Continental mountains favour *Picea abies* against its main competitors of more temperate ranges, *Fagus sylvatica* and *Abies alba*. Here, at altitudes usually between 1000 and 2000m in the Alps, on the borders of Czechia, Germany and Poland, through the Carpathians, and in the Balkan mountains, spruce dominates on a variety of soils, even those that are very nutrient-poor, wet and cold, or fragmentarily developed on scree or rock exposures. These woodlands can give way at lower altitudes to G3.1b *Abies* woodland (though the forester’s preference for spruce has often extended its lower limits) and above, where spruce thins to a more open patchy cover, to G3.2/3 Temperate subalpine *Larix*, *Pinus cembra* or *P. uncinata* woodland. Exceptional relict populations of *Picea* in the lowlands (natural occurrences) are also included. The relict *Picea omorika* woodland of the Dinaric mountains is also included here. Depending on the particular site conditions, other trees in the canopy include *Abies alba*, *Larix decidua* (particularly in the Alps where it is a pioneer for spruce establishment), *Pinus sylvestris, P. cembra, P. peuce* and rarely *Fagus*. There can be some *Sorbus aucuparia*, *Lonicera nigra*, *L. caerulea, L. xylosteum* and *Rosa pendulina* in a patchy understorey. On the more usual acid soils, the field layer characteristically has a rather generalised calcifuge flora with *Vaccinium myrtillus*, V*. vitis-idaea, Deschampsia flexuosa, Luzula luzulina, L. sylvatica, Calamagrostis villosa, Melampyrum sylvaticum, M. pratense, Lycopodium annotinum, Oxalis acetosella, Homogyne alpina, Moneses uniflora, Blechnum spicant, Dryopteris dilatata, D. expansa* and bulky mosses such as *Rhytidiadelphus triquetrus*, *Hylocomium splendens*, *Pleurozium schreberi*, *Polytrichum formosum* and *Sphagnum girgensohnii*. At higher altitudes, a tall herb contingent can be prominent with *Adenostyles alliariae, Chaerophyllum hirsutum* and *Rumex arifolius* while, on the more base-rich soils derived from limestones and dolomite, such more basiphilous plants as *Adenostyles glabra, Valeriana tripteris, Calamgrostis varia, Carex alba, Polystichum lonchitis, Sesleria albicans, Cirsium erisithales* are typical with some beech forest species like *Mercurialis perennis, Daphne mezereum, Veronica urticifolia, Primula elatior* and, in the eastern Alps and Dinarids, *Helleborus niger* and *Cardamine enneaphyllos.* Distinctive geographical floras are associated with the Picea woodlands of the Western Carpathians, the Eastern and Southern Carpathians, the central Balkan peninsula and in Bulgaria and north-east Greece where spruce reaches its southern limit in Europe. On the mountains of the Bosnia/Serbia border, *Picea omorika*, a rather uncompetitive tree but one able to thrive on limestone screes, in timber clearings or after fire, dominates in woodlands of this same general type with a well- developed understorey and numerous Illyrian and south-east European species including *Daphne blagayana, Hieracium rotundatum, Aremonia agrimonoides, Festuca drymeja, Epimedium alpinum, Cardamine trifolia* and the Balkan *Doronicum columnae, Dianthus petraeus, Athamantha turbith, Sesleria rigida* and *Edraianthus graminifolius*.  Indicators of quality:   * Natural dominance of *Picea abies* with modest canopy contributions from *Abies alba, Fagus sylvatica* and pines * Uneven-age canopy with signs of spruce regeneration, distinctively patchy where favourable microsites extend spruce cover into the sub-alpine * Presence of old trees and a variety of dead wood (lying and standing) and the associated flora, fauna and fungi * Presence of natural disturbance such as windfall openings with natural regeneration * Sufficient proportion of historically old (ancient) woodland with high species diversity * Presence of well-developed associated flora and fauna reflecting soil conditions and regional climate * Absence of non-native tree species and absence of invasive aliens in all layers (fauna, flora) * No signs of eutrophication or pollution with e.g. pronounced invasion on nutrient-demanding herbs * No fragmentation and isolation with enough stands to support species which need large undisturbed forest habitats (such as wildcat, lynx etc. )   Characteristic species:  Flora:  Vascular plants:  Tree layer: *Picea abies* (incl. *P. omorika), Abies alba*.  Understorey: *Sorbus aucuparia*.  Field layer: *Vaccinium myrtillus, V. vitis-idaea, Deschampsia flexuosa, Luzula luzulina, L. sylvatica, Calamagrostis villosa, Melampyrum sylvaticum, M. pratense, Lycopodium annotinum, Oxalis acetosella, Homogyne alpina, Moneses uniflora, Blechnum spicant, Dryopteris dilatata, D. expansa.*  Bryophytes:  *Hylocomium* *splendens, Pleurozium* *schreberi, Polytrichum* *formosum, Rhytidiadelphus* *triquetrus, Sphagnum* *girgensohnii.* |
| G3.1b Temperate mountain Abies woodland | *Abies alba* is a conifer of central and southern Europe where it occupies an intermediate position between *Fagus sylvatica* and *Picea abies*, both geographically favouring climates that are only moderately continental, and altitudinally. In areas where both fir and spruce are present, it rarely dominates in a belt between forests of beech and fir, but more often occurs intermixed with these two trees, here especially with beech towards the sub-montane limits of the occurrence of this woodland type. These fir and fir-beech forests are most extensive in the mountain ranges of western and central France, the Black Forest, the Swiss Alps, Austria and the Carpathians, with outliers in the Pyrenees, Czechia, Slovakia, Poland, the Balkans, occurring on usually base-poor soils but extending also on to more base-rich and mesotrophic profiles where distinctive contingents of associates occur, especially in the field layer. *Abies* temperate moutain woodlands can also be found in Corsica, Italy (mainland) and reaches the north of Greece. Though located in mountain near the mediteranean belt, those fir forests do not correspond to the Mediteranean *Abies* mountain (see G3.1c) type (with *A. Cephalonica*...). The dominant trees here are Fir or mixtures of Fir, Spruce and Beech. Except in the Pyrenees, Massif central and most parts of the Vosges (where it is alien), *Picea abies* can also occur, particularly where site conditions are harsher, and it has been very widely planted in preference to *Abies*. Other broadleaves can occur, notably *Acer pseudoplatanus, A, platanoides Betula pendula, Populus tremula, Sorbus aucuparia, Quercus robur* (towards the sub-montane zone), and, in more Atlantic regions like the Pyrenees, Massif central, the Vosges and the Black Forest, where this kind of woodland is most extensive, *Ilex aquifolium*. In the Balkans and northern Greece, *A. borisii-regis* and *Fagus moesiaca* replace *Abies alba*, and *Acer heldreichii* and *A. obtusatum* occur among the associates in this woodland at its southern limit among xerothermic oak forests. Towards the upper mountain or sub-alpine zone, *Abies alba* dominates, expecially where *Picea abies* is absent. On acidic soils, the flora resembles that of the heathy spruce forests and *Picea abies* can be quite abundant, along with *Pinus sylvestris*. Saplings of the canopy trees are often the most abundant element of the understorey with V*accinium myrtillus, V. vitis-idaea, Deschampsia flexuosa, Dryopteris carthusiana, D. dilatatae, Luzula luzuloides, L. nivea, L. sylvatica, Listera cordata, Maianthemum bifolium, Oxalis acetosella, Hieracium murorum* in the field layer, together with bulky mosses such as *Polytrichum formosum, Dicranum scoparium, Hylocomnium splendens* and *Pleurozium schreberi*. At the sub-alpine zone, the flora is very close to the flora of sub-alpine spruce forests, with *Homogyne alpina, Rhododendron ferrugineum, Sphagnum div. sp., Lycopodium annotinum, Bazzania trilobata, Rhytidiadelphus loreus…* On less impoverished and moister soils, *Abies alba* often dominates more substantially with *Fraxinus excelsior* and *Ulmus glabra* figuring among the canopy trees, *Rubus idaeus, R. fruticosus* and *Lonicera nigra* in the understorey. *Galium rotundifolium, Oxalis acetosella, Prenanthes purpurea, Sanicula europaea, Mercurialis perennis, Crepis paludosa, Chaerophyllum hirsutum, Adenostyles glabra, Valeriana tripteris, Carex alba, C. digitata, Cirsium erisithales* can occur in the field layer. Like Spruce mountain forest, fir forests can also be found at lower altitudes (among beech forests) on rocks or peat.  Indicators of quality:  Spruce forestry is very widely practiced in the zone where this kind of woodland is the natural dominant, so signs of quality are:   * Natural dominance of fir and/or mixed dominance of fir, spruce and beech with canopy and understorey associates appropriate to the soil conditions and region * Mixed age structure of canopy with natural regeneration of the dominant trees - * Presence of old trees, a variety of dead wood (lying and standing) and trees with microhabitats (hollows, cracks, broken tops...), and the associated flora, fauna and fungi * Presence of natural disturbance such as windfall openings with natural regeneration - * Sufficient proportion of historically old (ancient) woodland with high species diversity * Absence of anthropogenic invaders with disturbance of forestry operations * Absence of non-native tree species and absence of invasive aliens in all layers (fauna, flora) * No signs of eutrophication or pollution with e.g. pronounced invasion on nutrient-demanding herbs   Characteristic species:  Flora:  Vascular Plants:   Tree canopy: *Abies alba, Fagus sylvatica, Picea abies*.  Field layer: *Vaccinium myrtillus, V. vitis-idaea, Deschampsia flexuosa, Luzula luzuloides, L. nivea, L. sylvatica, Maianthemum bifolium, Oxalis acetosella, Hieracium murorum, Hieracium lachenalii.*  *Bryophytes:*  *Polytrichum formosum, Dicranum scoparium, Pleurozium schreberi, Hylocomnium splendens.* |
| G3.1c Mediterranean mountain Abies woodland | These are xerophytic coniferous woodlands of shallow, drought-prone soils within the lower to mid-altitudinal belts of the Mediterranean climatic zone, where firs of very limited, sometimes relictual, distribution are able to maintain a competitive advantage against other trees and dominate in woodlands of highly distinctive character.  *Abies pinsapo* persists in three small enclaves in southern Andalusia on relatively humid northerly slopes between 1000 and 1800 m, stands on limestone having *Quercus ilex* and *Q. faginea* in the canopy anda sparse shrub layer with *Berberis vulgaris* subsp*. australis, Rosa micrantha, Juniperus oxycedrus* and *Ulex baeticus.* Some stands on limestone have *Paeonia broteroi* and  *P. coriacea* as distinctive field layer elements*,* others on serpentine are distinguished by *Bunium alpinum* subsp. *macuca.*  On the southern Greek mainland and some Ionian and Aegean islands *A. cephalonica* dominates, often growing tall and dense, sometimes with *Pinus nigra* intermixed. Usually only in gullies away from dense shading does the field layer attain any richness with such distinctive species as *Geocaryum parnassicum, Lilium heldreichii, Cardamine graeca, Neotinea maculata, Helictotrichon convolutum, Iris unguicularis* and *Carex macrolepis.*  On a fog-bound slope in the Madonie mountains of Sicily a relict population of *Abies nebrodensis* survives on embryonic quartzite soils with an understorey of *Juniperus hemisphaerica*, occasional *Acer pseudoplatanus* and *Sorbus graeca* and a field layer with *Silene sicula, Plantago humilis, Galium venustum* and *Armeria nebrodensis*.  **Characteristic species**  As listed above for the different regional examples.  Indicators of quality:  ·    Distinctive relationship with extreme topography and associated Mediterranean flora.  ·    Absence of signs of exploitation by felling.  ·    Natural composition of canopy.  ·    Structural diversity/ complexity with (semi)natural age structure or completeness of layers.  ·    Typical flora and fauna composition of the region.  ·    Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi.  ·    Presence of natural disturbance such as treefall openings with natural regeneration.  ·    Long historical continuity (ancient woodland) with high species diversity.  ·    Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests).  ·    Absence of non-native species in all layers (flora & fauna).  ·    No man-induced very high population levels of ungulates.  Characteristic species:  *Abies alba* ssp. *apennina*, *Abies borisii-regis, Abies cephalonica, Abies nebrodensis, Abies pinsapo* |
| G3.2 Temperate subalpine Larix, Pinus cembra and Pinus uncinata woodland | This habitat consist of coniferous woodlands of the mid sub-alpine belt in high mountains of the temperate zone, forming the tree-line at 1,500 m Asl and above in the Carpathians and reaching 2,400 m Asl in the Alps and the Pyrenees. At these altitudes, the growing season is becoming so short and cold that the limit for tree growth is approached. Snow is long-lasting but not deep enough to favour willow shrub and tall-herb vegetation. *Pinus uncinata* can also be found in lower mountain ranges (such as Jura) on clifs or rocks exposed to harsh weather conditions. In the Pyrenees Mountains, only *Pinus uncinata* woodlands can be found. Depending on the habitat variant, the main dominant trees can be Larch (*Larix decidua*), Arolla pine (*P. Cembra*) and/or Mountain Pine (*Pinus uncinata*). Larch and Arolla pine only occur in the Alps and the Carpathians. Larch is often dominant in pastured wood, and Arolla Pine in more mature stands. In the Southern Alps and the Carpathians, Mountain dwarf pine (*P. mugo*) is often in the understorey. Where this dwarf pine dominates towards the upper sub-alpine belt, the vegetation is included in F 2.4 subalpine shrub. Included are also perialpine river valleys with *Pinus* forests of *Pinus mugo s.l.* (erect forms including *P. x rhaetica*) and/ or *Pinus uncinata* as rare relict forests reaching lower altitudes in the alpine river valleys. *Sorbus* spp. are characteristic associates in the canopy with *S. aucuparia*, *S. aria*, *S. mougeotii* and *S. chamaemespilus*, often along with some *Picea abies* and *Abies alba* (never dominant). The woodland structure is often rather clustered, open and lightly shading but the part- or wholly-evergreen dwarf-shrubs typical beneath often grow so dense that herbs can be sparse. Among these dwarf-shrubs, *Vaccinium myrtillus, V. vitis-idaea, V. uliginosum, Juniperus nana (= J. sibirica)* occur throughout the range. *Arctostaphylos uva-ursi* and *Cotoneaster integerrimus* can be found on warmer slopes. *Erica carnea* occurs outside the higher Alps on northern slopes. *Rhododendron spp.* is more restricted: *R. ferrugineum* and *R. hirsutum* in various parts of the Alps and the former in the Pyrenees, *R. myrtifolium* in the Carpathians, together with *Daphne oleoides.* Where the cover of these dwarf-shrubs exceeds the trees and the tree cover becomes rather open, the vegetation is included in F2.2a Alpine and sub-alpine ericoid heath. These woodlands occur on a variety of rock types with different soils which, along with the contrasts in climate across the range, sustain a diversity of field layers, the distinctiveness of the flora increasing to the south. Graminoids are common and, in moist hollows and seepages, a contingent of montane tall-herbs is characteristic (*Calamagrostis villosa, Luzula albida, L. sieberi, Festuca flavescens, F. drymaeia*...). Subalpine and alpine plants such as *Homogyne alpina* or *Dryas octopetala* are also characteristic.  Indicators of quality:   * Tree-line at its natural limit with intact woodland structure. * Sufficient structural diversity/ complexity (semi)natural age structure or completeness of layers. * Presence of old trees and a variety of dead wood (lying and standing) and the associated flora, fauna and fungi. * Typical flora and fauna composition of the region. * Sufficient proportion of historically old (ancient) woodland with high species diversity. * Survival of larger stands of forest without fragmentation and isolation. * Absence of non-native tree species and absence of invasive aliens in all layers (fauna, flora). * No signs of impacts of alpine pasturing. * Absence of damage from trampling, skiing lanes and avalanches around winter sports centre.   Characteristic species:  Tree canopy: *Larix decidua, Pinus uncinata var. uncinata, P. mugo s.l.* (erect forms), *P. cembra, Sorbus aucuparia, S. aria, S. chamaemespilus, Picea abies, Abies alba, Juniperus communis, Acer pseudoplatanus*; Understorey: *Rhododendron hirsutum, R. ferrugineum, Arctostaphylos uva-ursi, Cotoneaster integerrimus, Juniperus sibirica, Rosa pendula, Rubus idaeus, Vaccinium myrtillus, V. vitis-idaea, Daphne mezereum, Erica herbacea (= E. Carnea), Calluna vulgaris;*Field layer*: Deschampsia flexuosa, Sesleria caerulea, Rubus saxatilis, Hieracium murorum agg.*, *Oxalis acetosella, Geranium sylvaticum, Melampyrum sylvaticum, Solidago virgaurea, Calamgrostis varia, C. villosa, Polygala chamaebuxus, Potentilla erecta, Valeriana tripteris, Carex alba, C. flacca, Luzula albida, Festuca flavescens, F. drymaeia, Homogyne alpina.* |
| G3.4a Temperate and continental Pinus sylvestris woodland | These are *Pinus sylvestris* woodlands with patchy occurrence across the hemiboreal and northern temperate zone of Europe. This light-demanding tree has a competitive advantage on more nutrient-poor soils that are less favourable to *Picea abies* or broad-leaved deciduous trees, or are beyond their geographical range. The pine canopy is often rather open in southern Scandinavia, more closed to the west in Scotland and further south where the woodland occurs across north Germany, Poland, Latvia and Lithuania and into Ukraine and Russia. Unable to rejuvenate beneath denser canopies or in a thick moss and litter carpet, the pine is naturally dependent on fire or canopy clearance for regeneration, so even-aged groves are common. Common associates in the canopy are *Betula pendula*, *B. pubescens*, *Populus tremula*, *Juniperus communis* and *Sorbus aucuparia*. Other local *Sorbus* spp., *Quercus robur* and *Frangula alnus* are found more commonly further south. Beneath, there is a cover of *Vaccinium myrtillus*, *V. vitis-idaea*, *Arctostaphylos uva-ursi*, *Rubus saxatilis* and *Melampyrum pratense* together with more thermophilous nemoral plants such as *Hepatica nobilis*, *Melica nutans*, *Anemone nemorosa*, *Carex digitata* and *Epipactis atrorubens*. Contrasts in soils also exert an influence on the associated flora, a dry grassland and meadow contingent with basiphilous species characterizing the pine woodlands of limestones with rendzinas in southern Sweden, Öland and Gotland, while more calcifuge species appearing on the podzols of the outwash plains, periglacial deposits and river terraces of the northern European plain – *Luzula pilosa*, *Pyrola chlorantha*, *Carex digitata*, *Hylocomium splendens*, *Dicranum scoparium*, *D. polysetum* and *Pleurozium schreberi*. On the inland sands of Poland, psammophytic pine woodlands have *Peucedanum oreoselinum*, *Anthericum ramosum* and *Dianthus carthusianorum*. In some subtypes extensive cover of lichens can occur with mostly *Cetraria* and *Cladonia* species.  Indicators of quality:  • No forest exploitations (if applicable, mainly azonal types with high nature value). • Natural composition of canopy. • Structural diversity/ complexity with (semi)natural age structure or completeness of layers. • Typical flora and fauna composition of the region. • Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi. • Presence of natural disturbance such as treefall openings with natural regeneration. • Long historical continuity (ancient woodland) with high species diversity. • Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests). • Absence of non-native species in all layers (flora and fauna). • No signs of eutrophication or pollution. • No signs of acidification (relevant mainly for oligotrophic or acidic types). • No man-induced very high population levels of ungulates.  Characteristic species:  Canopy trees and shrubs: *Pinus sylvestris*, *Betula pendula*, *B. pubescens*, *Populus tremula*, *Juniperus communis*, *Sorbus aucuparia*, *Quercus robur*, *Frangula alnus*. Field layer: *Vaccinium myrtillus*, *V. vitis-idaea*, *Arctostaphylos uva-ursi*, *Rubus saxatilis*, *Melampyrum pratense*, *Agrostis coarctata*, *Avenella flexuosa*, *Pyrola chlorantha*. Mosses: *Hylocomium splendens*, *Pleurozium schreberi*, *Leucobryum glaucum*, *Dicranum polysetum*, *Polytrichum piliferum*, *P. juniperinum*. Lichens: *Cladonia arbuscula*, *Cladonia portentosa*, *C. furcata*, *C. rangiferina* and *Cetraria islandica.* |
| G3.4b Temperate and submediterranean montane Pinus sylvestris-Pinus nigra woodland | This habitat is formed by Scots and Black Pine forests (mostly xerophilous, but also some mesophilous), distributed in isolated and not very large stands on calcareous (limestone, dolomite) or ultramafic (serpentine) rocks, in the Alps, Jura, Bohemian-Moravian Highlands, Carpathian, Dinaride and Bulgarian mountains. The Black Pine forests of the Crimean Mountains which are rich in steppe and submediterranean species also belong to this habitat. These communities are mainly relic and limited to specific kinds of terrain. They occur in different vegetation belts, from the xerothermic oak belt, through the mesophilic hornbeam-beech forest belt up to the microthermic coniferous forest belt and hence fall into different climatic and geographical territorial subdivisions. The aspect of the slopes with Black Pine forest can vary but is mainly southern, sometimes eastern or western and the slopes can be very steep. The Scots Pine forests mainly occupy slopes with a northerly exposure and inhabit the low and middle part of mountains and valleys in the Alps, with altitudes between 500 and 1,400 m asl. The terrain is mostly steep or very steep slopes, with many rock outcrops. The soils are mostly shallow immature rendzic leptosols, often eroded. The humidity can vary throughout the growing season from low to moderate. These forests are mostly monodominant or, less commonly, have a mixed canopy with various other conifers, for example *Picea abies* and *Larix decidua*, and deciduous trees including *Sorbus aria*, depending on the neighbouring communities. The forests are open, the trees often not much taller than 10 m, with a rich shrub or herbaceous layer and the flora is characterized by a significant proportion of central and south-European (submediterranean) species; many species of the boreal/continental taiga are absent. On dry alluvial plains and fans, there are more mesophytic pine woodlands with *Salix purpurea*, *S. elaeagnos* and *S. daphnoides* and a grassy field layer with *Calamagrostis varia* and *Molinia arundinacea*. In the western Alps, herbs such as *Ononis rotundifolia*, *Astragalus monspessulanus* and *A. vesicarius* provide a floristic link with the open pine woodlands of the southern slopes of the Pyrenees where *Juniperus communis* subsp. *hermisphaerica*, *Buxus sempervirens* and *Cytisus oromediterraneus* occur in the shrub layer, accompanied on more siliceous rocks by *Vaccinium myrtillus*, *Arctostaphylos uva-ursi* and *Calluna vulgaris*. The Scots Pine forests of the Southern Alps have a dense understorey of *Erica carnea* (*Erico carneae-Pinion*) while distinctive Scots Pine forests occur locally in the Slovakian Carpathians with endemics such as *Pulsatilla slavica*, *Thymus carpathicus*, *Campanula carpatica*, *Festuca tatrae* (*Pulsatilo slavicae-Pinion*). The Scots Pine forests on amphibolites and limestone in the Southern Carpathians also have a diverse understorey with some relict and submediterranean species such as *Daphne blagayana*, *Arctostaphylos uva-ursi*, *Sesleria rigida*. The forests dominated by Black Pine (*Erico-Fraxinion orni*, *Fraxino orni-Pinion nigrae*, *Chamaecytiso hirsuti-Pinion pallasianae*) are more diverse and have endemic subspecies in the southern part of habitat’s range – Italian and Slovenian Alps, Dinarides, Bulgarian mountains and Romanian Carpathians. The dominant species there are represented by different subspecies – subsp*.* *nigra* to the north, subsp*. pallasiana* to the south, subsp*. dalmatica* as a local endemic in the Croatian Dinarides. The shrubs and herb layers are even more diverse than in Scots Pine forests and include many species from neighbouring deciduous and coniferous forests. On serpentine rocks, there are also some typical serpentinophytes. The age of forests can be 80-100 years, even up to 200 years in some stands. Throughout the range of this habitat, Black and Scots pines are widely cultivated and numerous coniferous plantations exist often alongside the natural forests. These plantations, if occurring at sites where Black or Scots pine forest is not natural vegetation, are not included in the habitat.  Indicators of quality:  • No forest exploitations (if applicable, mainly azonal types with high nature value). • Natural composition of canopy. • Structural diversity/ complexity with (semi)natural age structure or completeness of layers. • Typical flora and fauna composition of the region. • Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi. • Presence of natural disturbance such as treefall openings with natural regeneration. • Long historical continuity (ancient woodland) with high species diversity. • Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests). • Absence of non-native species in all layers (flora and fauna). • No signs of eutrophication or pollution. • No man-induced very high population levels of ungulates.  Characteristic species:  Vascular plants: *Abies alba*,*Amelanchier ovalis*,*Anthericum ramosum, Anthemis carpatica, Aquilegia einseleana, A. vulgaris, Arctostaphylos uva-ursi, Armeria elongata*subsp*. serpentini, Asperula capitata, Asplenium cuneifolium, Berberis vulgaris, Betula pendula, Biscutella laevigata, Brachypodium pinnatum, Bruckenthalia spiculifolia, Buphthalmum salicifolium, Campanula divergens, Calamagrostis varia, Calluna vulgaris, Campanula carpatica, C. cervicaria, C. kladniana, Carex alba, C. flacca, C. humilis, C. ornithopoda, Carpinus orientalis, Ceterach officinarum, Centaurea rhenana, C. scabiosa, Chamaecytisus supinus, Coronilla vaginalis, Corylus colurna, Cotoneaster integerrimus, C. nebrodensis, Cotinus coggygria, Crocus veluchensis, Cyclamen purpurascens, Daphne blagayana, D. cneorum, Deschampsia flexuosa, Dianthus carthusianorum, D. petraeus, D. spiculifolius, Epipactis atrorubens, Erica carnea, Erythronium dens-canis, Euphorbia amygdaloides, E. glabriflora, E. saxatilis, Festuca xanthina, F. tatrae, Galium lucidum, Genista januensis, G. radiata, Geranium sanguineum, Gymnadenia odoratissima, Globularia aphyllanthes, Goodyera repens, Fagus sylvatica, Festuca xanthina, Fraxinus ornus, Genista radiata, Helianthemum nummularium, Helleborus niger, Hepatica nobilis, Hieracium bifidum, Hippocrepis comosa, Hypericum rochelii, Iris ruthenica, Juniperus communis, Kernera saxatilis, Lembotropis nigricans, Laserpitium krapfii, Leontodon incanus, Linum flavum, Luzula sylvatica, Melampyrum angustissimum, M. pratense, M. sylvaticum, Molinia caerulea, Monotropa hypopitys, Neottia nidus-avis, Ostrya carpinifolia, Phyteuma orbiculare, Picea abies, Pimpinella saxifraga*,*Pinus nigra*,*P. sylvestris, Populus tremula, Potentilla heptaphylla, Primula auricula ssp. hungarica, Polygala chamaebuxus, Pteridium aquilinum, Pulsatilla slavica, Pyrola chlorantha, Seseli libanotis, Sesleria caerulea*(=*albicans*),*S. rigida, Sorbus aria, Rosa pendulina, Rubus saxatilis, Stachys scardica, Sorbus aria, Symphytum tuberosum, Teucrium chamaedrys, Thymus carpathicus, T. comosus, T. pulcherrimus, Tolpis staticifolia*,*Vaccinium myrtillus*,*Veronica chamaedrys, Vicia villosa.*  Mosses: *Bryum capillare, Dicranum polysetum, D. scoparium, Ditrichum flexicaule, Homalothecium philipeanum, Hypnum cupressiforme, Hylocomium splendens, Leucobryum glaucum, Pleurozium schreberi, Pseudoscleropodium purum, Rhytidiadelphus triquetrus, Rhytidium rugosum, Tortella tortuosa*  Lichens: *Cladonia fimbriata, C. furcata, C. rangiferina, Solorina saccata* |
| G3.4c Mediterranean montane Pinus sylvestris-Pinus nigra woodland | *Pinus nigra* has been widely planted through the Mediterranean, but it remains the natural dominant tree species that formsforests in more drought-prone situations, at scattered localities through the mountains of Spain, Corsica, southern Italy, and at higher elevations further south where altitude moderates the effects of the Mediterranean climate. *P. sylvestris* can be co-dominant in the canopy, except in the far south and on the Mediterranean islands.  Vicariant forms of the black and Scots pines are recognised in different localities. In Spain, for example, *P.* *nigra* ssp. *salzmannii* forms stands with so-called *P. sylvestris* ssp. *nevadensis,* and *P. sylvestris* var. *iberica.* OnCorsica, *P. nigra* ssp. *laricio* is a pioneer species occupying open ground or clear-felled areas within the zone of beech and fir, but it also dominates on rocky, south-facing slopes, which are too dry for beech and fir to compete black pine. In such sites, black pine can attain a magnificent height in closed canopy, with shorter *Betula pendula* and *Ilex aquifolium* individuals in the understory*,* and a field layer with *Avenella flexuosa, Brachypodium pinnatum, Sanicula europaea, Galium* *rotundifolium, Veronica officinalis* and endemic species such as *Helleborus lividus, Crocus corsicus, Carlina macrocephala, Galium corsicum* and *Stachys corsica.* More open stands can have a denserunderstory of *Synonym of Juniperus communis subsp. Nana, Genista lobelii* and *Berberis aetnensis.*  Indicators of quality:  ·     Maintenance of natural woodland structure and distinctive  ·     Absence of signs of exploitation by logging and grazing which leads to to the increase of grasses cover  ·     No fragmentation of cover by quarrying or gravel extraction.  ·    Structural diversity/ complexity with (semi)natural age structure or the existence of different vegetation layers  ·    Presence of old trees and a variety of dead wood (lying or standing) and of the associated flora, fauna and fungi  Characteristic species:  Tree canopy: *P. nigra, P. sylvestris;*  Understory: *Amelanchier ovalis, Juniperus communis* (including ssp. *hemisphaerica*), *Cotoneaster* *tomentosus, Berberis vulgaris, Buxus sempervirens* and many endemic species in the herb layer. |
| G3.4d Mediterranean montane Cedrus woodland | To describe the habitat, we refer at first to the native *Cedrus* species in the Mediterranean: *Cedrus atlantica*  and *Cedrus libani*. The latter species includes two subspecies: *libani* and *brevifolia*. *Cedrus atlantica* is distributed in Morocco (Rif, Middle Atlas and north-east of the High Atlas) and Algeria (Aurés, Belezma, Hodna, Djbel Babor, Djurdjura, Blida and Ouarsenis). *Cedrus libani* subsp. *libani* is distributed in Lebanon, Syria and Asiatic Turkey. In Turkey and especially on the Taurus Mountains it forms extensive forests, while in the other two countries it is represented by small populations.  *Within the geographical scope of the Red List project only the woodlands with Cedrus libani subsp. brevifolia are of relevance. Cedrus libani* subsp. *brevifolia* is endemic to Cyprus, growing in a restricted area of the Paphos forest. It is found in the meso-Mediterranean to the mid supra-Mediterranean zone (altitude 900–1.400 m a.s.l.) in areas with sub-humid climate. It forms pure forests or mixed ones with *Pinus brutia* or *Quercus alnifolia* and it grows mainly on serpentine (diabase) substrates and on shallow to deep soils.  Indicators of quality:   * No forest exploitations * Natural composition of canopy, canopy of woodland species not fragmented and competitive dominance of *Cedrus* species against other tree species; * Structural diversity/ complexity with (semi)natural age structure or completeness of layers * Typical flora and fauna composition of the region * Presence of old aged trees with spreading crown, large height and basal area and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi * Presence of natural disturbance such as treefall openings with natural regeneration * Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests) * Absence of non-native species in all layers (flora & fauna) * No signs of disturbance (e.g. grazing, unregulated logging) or regressive succession; * No man-induced very high population levels of ungulates   Characteristic species:  Trees: *Cedrus libani* subsp. *brevifolia, Quercus alnifolia*  Understorey: *Arrhenatherum album* subsp. *cypricola*, *Crepis fraasii*, *Cyclamen cyprium*, *Lactuca cyprica*, *Lecokia cretica*, *Pteridium aquilinum*, *Stellaria cilicica* |
| G3.6 Mediterranean and Balkan subalpine Pinus heldreichii-Pinus peuce woodland | This habitat comprises timberline coniferous woodland in southern Italy, the southern Balkans and Greece, dominated by the two pine species *Pinus peuce* and *P. heldreichii,* trees which survive better in the summer-drought conditions of southern Europe than *Picea abies* or *Fagus sylvatica*, which extend as dominants to the timberline further north. Both these pines are considered to be Tertiary relict species, but these woodlands are not relicts, as pines survived glaciations at lower altitude. *P. peuce* can be found on non-carbonate bedrock, whereas *P. heldreichii* occurs on carbonate deposits. *P. peuce* can be found above altitudes of 1500 m and forms canopies of even 30-40 m tall, often mixed with *Picea abies, Fagus sylvatica* or *Abies borisii-regis*, but it also extends to lower altitudes and can dominate on sites that were originally occupied by *Fagus sylvatica* and deforested.  The soil in the stands is poor in nutrients with a lot of bedrock on the surface, which suggests that the stands of *P. peuce* can be of secondary origin. *Pinus heldreichii* grows at altitudes above 1000m and is a heliophilous tree, surviving better then *P. peuce* in dry conditions, growing more slowly and forming canopies up to 20-30m high. Its stands are often monodominant, especially on rocky, sunny slopes, but it can occur mixed with *P. sylvestris* or *P. nigra*, on Monte Pollino (Italy) also with *Abies alba* and *Fagus sylvatica*. The populations of both endemic pine trees are occur scattered and fragmented, due to the specific soil conditions.  Indicators of good quality:   * Overwhelming dominance of the pines * Species richness * Absence of logging and intensive grazing and consequent erosion * Absence of intensive destructive fires   Characteristic species:  Vascular plants: *Abies alba, A. borisii-regis, Fagus sylvatica, Pinus heldreichii, P . peuce, Sorbus aucuparia, Sorbus graeca,* *Anemone nemorosa, Aremonia agrimonioides, Avenella flexuosa, Brachypodium pinnatum, Festuca penzesii, Calamagrostis arundinacea, Calamintha grandiflora, Cotoneaster nebrodensis , Daphne mezereum, Drypoteris filix-mas, Fragaria vesca, Galium rotundifolium, Gentiana asclepiadea, Geranium macrorhizum, Geranium sylvaticum, Homogyne alpina, Juniperus communis, Juniperus hemisphaerica, Luzula luzuloides, Luzula sylvatica, Mycelis muralis, Orthilia secunda, Oxalis acetosella, Polystichum lonchitis, Pteridium aquilinum, Rosa pendulina, Vaccinium myrtillus, Veratrum album, Veronica chamaedrys, Veronica officinalis, Viola reichenbachiana*, *Wulfenia carinthiaca*. |
| G3.7 Mediterranean lowland to submontane Pinus woodland | Mediterranean lowland to submontane *Pinus* woodlands include forests of *Pinus halepensis* Mill., *P. brutia* Ten., *P. pinaster* Aiton and *P. pinea* L. These forests occur mainly within the Mediterranean biogeographic region of Europe, in areas with Csa, Csb and BSk climate type according to Köppen’s classification and play a fundamental role in shaping the Mediterranean landscape. The three former pine species are fire resilient and produce a high number of serotinous cones.  • *P. halepensis* is distributed all over southern Europe (from Spain to European Turkey), as well as North Africa but is more widespread in the western part of its range. It grows on a variety of soils, and although it occurs more frequently on limestone and marl, it can grow also on very strong acidic soils, as those formed on gneiss (e.g. in Chalkidiki region; NE Greece). It forms stands with understory of evergreen broadleaved species (e.g. *Quercus coccifera, Phillyrea latifolia, Quercus ilex, Arbutus andrachne, Arbutus unedo, Pistacia lentiscus, Smilax aspera*) or phyganic species (e.g. *Erica manipuliflora, Cistus* sp.pl.). The plant communities of Aleppo pine may be considered in many cases as paraclimax vegetation, although in some arid or semi-arid sites they represent mature, stable forests.  • *P. brutia* forests are distributed in the eastern Mediterranean area. In Europe, the *P. brutia* forests are found at the northeastern part of the Greek mainland, at the Aegean islands (e.g. Thasos, Samos, Chios, Kos, Rhodes, Crete) and in Cyprus. They cover lowland to mountainous areas (in Cyprus they reach the altitude of 1600 m a.s.l). *P. brutia* forms open forests, with an understory occupied mainly by Mediterranean woody species, such as *Pistacia lentiscus, Arbutus unedo, Phillyrea latifolia, Olea europaea* subsp. *oleaster* and *Rhamnus lycioides* subsp. *oleoides*. It prefers calcareous and fissured soils, but it can be found also on siliceous ones. *P. brutia* often forms climax vegetation types more than its ecologically similar species, *P. halepensis*.  • *P. pinaster* grows on a variety of substrates and is distributed naturally at the western Mediterranean area of Europe (Iberian Peninsula, France and Italy), as well as at the northwest part of Africa. However, it is considered indigenous only in the Iberian Peninula. It has been widely used in reforestation and afforestation. It occupies sites with an unstable substrate, where soil conditions prevent the development of *Quercus* forests.  • *P. pinea* is distributed all over southern Europe (from Portugal to Greece and Cyprus), as well as in Syria and Lebanon. Its forests are more common in Spain, Portugal and Italy, while are rare in the other countries. Because of its edible seeds, much of its distribution is of artificial origin and it is difficult to determine its natural range. It grows mainly on acidic and sandy soils.  Indicators of quality:   * Natural composition of canopy * Structural diversity/ complexity with (semi) natural age structure or completeness of layers (diversity of *Pinus* species age classes and existence of at least two - dominant and dominated - tree layers) * High coverage of *Pinus* individuals in reproductive age (indicator of increased possibilities of successful post-fire recovery and low frequency of forest fires). * Typical flora and fauna composition of the region * Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi * Absence or low cover (<5%) of non-native, of ruderal and grassland plant species in all layers * Adequate regeneration of *Pinus* species in both the herb and shrub layers, although in some cases adequate regeneration is possible only after a forest fire. * Existence of a shrub layer with cover higher than 50% (indicates natural formed forests and not disturbed). * Low levels of soil compactness, absence of trampling and erosion (especially in the form of rills and gullies), high cover of litter and well developed Ah horizon (indicates low intense of disturbances and adequate nutrient cycle).   Characteristic species:  *Acer monspessulanum*, *Aetheorhiza bulbosa*, *Allium subhirsutum*, *Alyssum lesbiacum*, *Anthyllis hermanniae*, *Arbutus andrachne*, *Arbutus* *unedo*, *Arisarum vulgare*, *Asparagus acutifolius*, *Asparagus aphyllus*, *Carex distachya*, *Carex flacca*, *Carex hallerana*, *Ceratonia siliqua*, *Cistus albidus*, *Cistus creticus*, *Cistus monspeliensis*, *Cistus salviifolius*, *Clematis flammula*, *Coronilla minima*, *Crataegus monogyna*, *Crepis fraasii*, *Daphne gnidium*, *Erica arborea*, *Erica manipuliflora*, *Eryngium campestre*, *Euphorbia spinosa*, *Galium rubrum*, *Genista acanthoclada*, *Genista fasselata*, *Genista hispanica*, *Hedera helix*, *Hieracium pilosella*, *Hippocrepis emerus*, *Jasminum fruticans*, *Juniperus oxycedrus*, *Juniperus phoenicea*, *Lonicera implexa*, *Myrtus communis*, *Odontites luteus*, *Olea europaea*, *Ononis minutissima*, *Osyris alba*, *Phillyrea angustifolia*, *Phillyrea latifolia*, *Pinus brutia*, *Pinus halepensis*, *Pinus pinaster*, *Pinus pinea*, *Pistacia lentiscus*, *Pistacia terebinthus*, *Prasium majus*, *Psoralea bituminosa*, *Quercus coccifera*, *Quercus ilex*, *Rhamnus alaternus*, *Rhamnus lycioides*, *Rhamnus myrtifolius, Rhamnus velutinus, Rosa sempervirens*, *Rosmarinus officinalis*, *Rubia peregrina*, *Rubus ulmifolius*, *Ruscus aculeatus*, *Sanguisorba minor*, *Smilax aspera*, *Spartium junceum*, *Staehelina dubia*, *Stipa bromoides*, *Teucrium chamaedrys*, *Teucrium montanum*, *Thymus vulgaris.* |
| G3.8 Pinus canariensis woodland | This pine forest is dominated by the Canarian endemic *Pinus canariensis*, which constitutes the potential natural vegetation or dominant habitat type in the corresponding vegetation belts of the western Canary Islands, where volcanic mountains reach sufficient elevation. It occupies an altitudinal range between 1,250 and 2,000-2,300 m on northern slopes, above the cloud layer (*mar de nubes*) caused by the trade winds. There it occurs above the lauroid forest belt (*monteverde*), while on southern slopes it is in contact with the xerophytic lowland Canarian habitats with junipers. Locally, on rocky outcrops, it can extend down to 500 m and it is also a colonizer of lava depositions (*malpaíses*). These woodlands vary from open to dense depending on the soil and slope conditions, and consist of pine stands in most places, having an understory of woody legumes (*Adenocarpus viscosus, Chamaecytisus proliferus*), Lamiaceae (*Bystropogon origanifolius, Sideritis soluta*) and Cistaceae (*Cistus symphytifolius*). They are out of the mist influence of the cloud layer and subsist under dry sunny conditions.  This habitat is the remnant of an ancient forest which was widespread in the western Mediterranean basin in the late Tertiary period (remnants have also been found in southern France and mainland Spain), but it is now only restricted to the Canary Islands, hosting lineages of a genuine Mediterranean flora. Stands have been extensively logged in the past due to their timber value and they continue to be exploited as an important resource, particularly in artificial plantations located on deep soils and in the moister areas naturally occupied by the lauroid forest. The Canary Pine (*Pinus canariensis*) is a fire-adapted tree, with a thick bark that resists fire and the capacity to resprout.  **Characteristic species:**  Vascular plants: *Pinus canariensis, Adenocarpus viscosus, Bystropogon origanifolius s. l.,Chamaecytisus proliferus s. l., Cistus symphytifolius s. l., Juniperus cedrus, Lotus campylocladus, Lotus hillebrandii, Lotus spartioides, Micromeria benthamii, Micromeria lanata, Micromeria pineolens, Micromeria varia meridialis, Sideritis oroteneriffae, Sideritis soluta, Teline stenopetala spachiana, Tinguarra montana, Isoplexis isabelliana\**  Birds: *Fringilla teydea, Dendrocopos major canariensis\*, Dendrocopos major thanneri\**  **\***Priority species included in the Annexes of the Birds and Habitats Directive  **Indicators of quality:**   * Little or no signs of exploitation signs, such as logging. * No signs of heavy grazing. * No signs of invasive alien species (i.e. *Escholtzia californica*, *Pennisetum setaceum*, *Ailanthus altissima*, etc. start to be relatively abundant in certain areas). * Structural diversity/ complexity with (semi)natural age structure or completeness of layers. * Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi. |
| G3.9a Taxus baccata woodland | *Taxus baccata* is an evergreen tree which figures as a prominent associate in various woodland types on more base-rich substrates, a bird-sown species capable of establishing in rocky terrain or in grasslands, provided those herbivores to which its foliage is palatable are absent, and persisting under the shade, even dense shade, of other trees, notably *Fagus sylvatica*, sometimes also *Abies alba* and *Picea abies*, which can overtop it. Those situations are included elsewhere, as in G1.6a *Fagus* woodland on non-acid soils. This G3.9a habitat includes two distinct types of woodland united by the dominance of *Taxus baccata*: one occurs very locally in the Mediterranean, particularly in Corsica and Sardinia, Apennines, Spain and northern and central Portugal; the other occurs in Ireland and the British Isles, where the woodland type strongly favours those locally hot drought-prone south-facing slopes which provide an echo of conditions on limestones in warmer latitudes. In both situations, the stands are typically isolated and there is often a suggestion (particularly in the Mediterranean) that the dominance of the tree is an accident of succession where, for some reason, *Taxus* has excluded possible subsequent invaders or remains as a relict senescent phase of some kind of beech forest. For the British, the fact that *Taxus* provided the wood for the longbow, enabling some epic victories over its foes, has entered national mythology, but some stands may really have been encouraged for supplying this important medieval weapon. Widely through Europe, by virtue of its longevity, *Taxus* and its woodlands have also been endowed with spiritual value and protected. In the woodland included here, *Taxus* is the sole dominant, though often accompanied in the Mediterranean stands by *Ilex aquifolium* and *Buxus sempervirens* (in the UK the latter is questionably native). *Sorbus aria* is another typical associate in both regions. *Juniperus communis*, which is among the junipers associated with other kinds of G3.9 Cupressaceae woodlands, is the seral precursor and protective nurse to *Taxus* where this kind of habitat establishes in basiphilous grasslands in the UK, its skeletal remains then remaining beneath each maturing *Taxus*. Otherwise there is often no understorey, apart from occasional *Sambucus nigra*, favouring the latrines of local rabbit colonies. The extremely dense shade cast by the *Taxus* canopy can exclude all but the most tolerant herbs and bryophytes, among which sparse and puny individuals of *Mercurialis perennis* and other representatives of the local basiphilous woodland flora are typical.  Indicators of good quality:  • Dominance of *Taxus baccata* in the canopy  • Typical flora and fauna composition of the region  • Sufficient structural diversity/ complexity (semi)natural age structure or completeness of layers  • Presence of old trees and a variety of dead wood (lying and standing) and the associated flora, fauna and fungi  • Presence of natural disturbance such as windfall openings with natural regeneration  • Low game density to enable *Taxus* regeneration  • Absence of non-native tree species and absence of invasive aliens in all layers (fauna, flora)  Characteristic species:  *Taxus baccata, Ilex aquifolium, Sorbus aria, Buxus sempervirens, Mercurialis perennis*. |
| G3.9b Mediterranean Cupressaceae woodland | This habitat combines conifer woods dominated by *Cupressus sempervirens* and/or various juniper species, including *Juniperus excelsa, J. drupacea, J. foetidissima* and *J. thurifera*. The few stands of *Juniperus phoenicea* and *J. oxycedrus* that qualify as woodlands are also attributed in this unit. The following sub-types can be distinguished: • Natural *Cupressus* sempervirens-dominated woodlands are found in South Anatolia, Cyprus, Syria, Palestine, Lebanon, Cyrenaica and the islands of southeast Greece, while isolated occurrences are also reported in Iran, Tunisia and Morocco. They form moderately open (cover ca. 60%) to open canopies often with thermophillous coastal pines (*Pinus halepensis, P. brutia*) or forming mixed stands with *Acer sempervirens* and *Quercus coccifera*. The woodlands are found on mountainous rocky slopes, in a wide range of altitudes, slopes and expositions. *C. sempervirens* form stands from the thermo- to the upper levels of the supra-Mediterranean zones and exhibits no clear preference for geological substrate, growing on shallow and dry to deep and moist soils. • *Juniperus excelsa* woodlands are distributed throughout the eastern Mediterranean, from the southern and central Balkans (Greece, Albania, Bulgaria, FYROM), through Anatolia (regionally widespread and continuously distributed along the Taurus chain in southern Anatolia), to Ukraine and Crimea, central and southwest Asia (Turkmenistan, Cyprus, Iran, Lebanon, Syria), Caucasus (Armenia, Azerbaijan, Georgia) and east Africa (Quézel and Médail 2003). The species does not occur in regions with annual precipitation below 500 mm. In the Balkan peninsula, the altitudinal range of distribution is from 100 to 1300 m, yet in Turkey it goes up to 2200 m. It occurs in xerothermic sites, most frequently on limestone, diabase or serpentine, and often forms rather small, almost pure associations. • *Juniperus foetidissima* woodlands are found in mountainous areas of the eastern Mediterranean region, mainly in the central and south Balkans (Albania, FYROM, Greece), Cyprus, Lebanon, Syria, Asiatic Turkey (rare or absent on the interior plateau), SE Caucasus to the coast of the Caspian Sea in Azerbaijan, along the coast of the Black Sea near Novorossiysk and in the Crimea (Farjon 1992). The *Juniperus excelsa* and *J. foetididissima* woodlands exhibit growth plasticity and can adapt to the soil dryness of the mountainous rocky slopes, forming the human-induced tree limits. They mainly occur on limestones in the meso- to upper supra-Mediterannean zone. Their canopy is moderately open (cover ca 60%) to open (cover <50%). Deciduous elements in the canopy are not uncommon, as for example *Fraxinus ornus, Carpinus orientalis* and *Quercus pubescens*, while at the higher altitudes the junipers are often associated with *Astracantha cretica, Daphne oleoides* and *Stipa pennata*. • *Juniperus drupacea* woodlands are distributed in the Mediterranean, where they occur in Syria, Lebanon, Israel, Southern Turkey and two mountain locations in Greece (the species just reaches southeastern Europe). In the south Peloponnese mountains in Greece (Parnon and Taigetos), they occupy somewhat extended areas, but in general these woodlands are more widespread outside Europe in Turkey and the Middle East. Within this distribution range, *J. drupacea* forms mixed montane conifer forests with *Abies cilicica, A. cephalonica, Pinus brutia, P. nigra, Cedrus libani, Juniperus excelsa, J. foetidissima, J. oxycedrus, Quercus coccifera, Q. ilex* and sometimes with *Fagus orientalis*. Much of its habitat has been modified into maquis vegetation. It grows on shallow, rocky soils, usually on calcareous or granite rocks at altitudes of between 600-1800 m and occurs in small groups or as solitary trees mixed with other conifer species. • *Juniperus thurifera* woodlands are scattered throughout the western Mediterranean basin and are relicts from the Tertiary distribution of the species pattern, a now disjunct spread occurring from Algeria and Morocco over the Iberian Peninsula and the Pyrenees to the French and Italian Alps and to Corsica. In general, these woodlands occur in a wide ecological amplitude, forming open stands from an altitude of 140m in Spain to more than 3000m in Mt. Atlas, Morocco. More specifically, and in contrast to the situation in Europe and Algeria, where J. thurifera occurs from 200 to 1800m, the Moroccan stands are associated with sub-humid cold winter bioclimates at the tree line, mainly between elevations of 1800 and 3150m. In Algeria, thuriferous juniper is limited to the Aurès mountains with a number of scattered and often very large trees that are probably the remains of formerly more extensive stands. The *Juniperus thurifera* woodlands are found on various substrates, slopes and inclinations of the supra-Mediterranean zone. The juniper is often associated with *Pinus nigra* subsp. *nigra*, *Quercus pubescens*, *Q. ilex* and other Juniper species. • Woodlands of *Tetraclinis articulata* are restricted to the dry coastal region of Cartagena in south-east Spain (regarding Europe), where these occur as scattered stands with a typical maquis understorey; in North Africa these woodlands are widespread in lowland areas of Morocco and Algeria. Since the canopy of all *Cupressaceae* woodlands is open, the presence of typical woodland species in the ground-flora is expected to be relatively limited, while, on the other hand, perennial steppe species are expected to dominate  Indicators of quality:   * No forest exploitations (if applicable, mainly azonal types with high nature value) * Natural composition of canopy * Structural diversity/ complexity with (semi)natural age structure or completeness of layers * Typical flora and fauna composition * Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi * Presence of natural disturbance such as treefall openings with natural regeneration * Long historical continuity (ancient woodland) with high species diversity * Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests) * Absence of non-native species in all layers (flora & fauna) * No man-induced very high population levels of ungulates * Absence of i) soil trampling signs, ii)  deformation of woody species due to over-browsing, iii) logging, iv) fire signs, v) ruderal taxa.   Characteristic species:  *Juniperus* thurifera woodlands: Hormathophylla spinosa, Berberis hispanica, *B.  vulgaris ssp. cantabrica*, *Bupleurum fruticescens* subsp*. spinosum, Daphne laureola, Ephedra major, Juniperus communis* subsp*. hemisphaerica*, *J. Juniperus communis* subsp*. nana, J. sabina, Pinus sylvestris*, *P. nigra* subsp*. salzmannii*, *Prunus prostrata, Rhamnus alpinus, Viburnum lantana;*  Cupressus sempervirens woodlands: *Acer sempervirens, Asperula rigida, Centaurea raphanina, Crepis fraasii, Cupressus sempervirens, Cylcamen creticum, Erica arborea, Lamyropsis cynaroides, Luzula nodulosa, Pistacia lentiscus, Prasium majus, Quercus coccifera, Q. Ilex, Ruscus aculeatus, Teucrium microphyllum;*  *Juniperus drupacea* woodlands: *Abies cephalonica*, *Galium peloponnesiacum*, *Juniperus drupacea*, *Iris unguicularis*, *Phillyrea latifolia*, *Luzula nudulosa*, *Digitalis ferruginea ;*  *Juniperus excelsa* & *J*. *foetidissima* woodlands: *Juniperus excelsa*, *J*. *foetidissima*, *Astracantha cretica*, *Berteroa obliqua, Melica ciliata*, *Festuca jeanpertii, Juniperus oxycedrus, Malcolmia graeca* subsp*. bicolor, Teucrium chamaedrys* subsp*. chamaedrys*, *Pterocephalus perennis*, *Scutellaria rupestris* subsp*. parnassica*, *Ajuga orientalis*, *Stipa pulcherrima, Achillea fraasii, Morina persica, Minuartia* hamata, *Silene congesta*;  *Tetraclinis articulara* woodlands: *Peroploca angustifolia, Euphorbia dendroides, Juniperus phoenicea* subsp*. turbinata, Calicotome infesta, Ephedra fragilis, Retama raetam* subsp*. gussoniei, Pistacia lentiscus, Teucrium fruticans, Asparagus acutifolius, Phillyrea latifolia, Ruta chalapensis, Erica multiflora, Asphodelus ramosus, Hyparrhenia hirta.* |
| G3.9c Macaronesian Juniperus woodland | Micro-woodlands of small trees or tall shrubs up to 10 m tall, dominated or co-dominated by *taxa* of the genus *Juniperus* L., all endemic to Macaronesia’s archipelagos: Azores, Madeira and the Canaries. Four distinct *taxa* dominate several distinct subtypes of the habitat G3.9c, each with specific sinecological traits, biogeography and floristic character (no common shared characteristic infrageneric *taxa* among them); *Juniperus* *turbinata* subsp. *canariensis* (the Canaries and a single location in Madeira), *Juniperus cedrus* subsp. *cedrus* (the Canaries), *Juniperus cedrus* subsp. *maderensis* (Madeira) and *Juniperus brevifolia* (Azores). The five subtypes are:  1.       *Juniperus turbinata* subsp*. canariensis* habitats of the Canary Islands (*Mayteno canariensis-Juniperion canariensis*). Tall shrublands dominated by hard leathery leaves or scaly-leaved plants in low altitude infra-thermomediterranean semi-arid to dry localites, on thin mediterranean volcanic rock-derived soils (leptosols or thin cambisols). Dominated or co-dominated by *J. turbinata* subsp. *canariensis*, *Olea europaea* subsp. *cerasiformis*, *Rhamnus crenulata* and *Maytenus canariensis*; secondarily also by *Euphorbia bertholothii*, *Euphorbia  wildpretii*, *E. atropurpurea, Pistacia atlantica*, *P. lentiscus*, *Hypericum canariense* and other characteristic shrubs can be locally dominant (see Characteristic species). Most of the habitat occupies rocky hillslopes in valleys not higher than 300 m a.s.l, but reaching sporadic very rocky locations and volcano craters and hillsides, up to 1900 m a.s.l. It is found in the islands of Tenerife, La Gomera, La Palma, El Hierro and sporadically in Gran Canaria. Low-altitude versions are in contact, in general, with *Phoenix canariensis* palm-groves (G2.5b). Regional floristic combinations of dominants (and co-dominants) in the Canaries are: a) Tenerife: *J. turbinata* subsp. *canariensis, Olea europaea* subsp*. cerasiformis, Pistacia atlantica, Hypericum* *canariense*. Contacts with *Euphorbia atropurea* scrubland can include characteristic plants of the later community: *E. atropurpurea, E. lamarkii, Aeonium hahworthii, Retama rhodorhyzoides*; b) La Gomera: *J. turbinata* subsp. *canariensis*, *Brachypodium arbuscula*, *Jasminum odoratissimum*, *Euphorbia bertholothii*; c) La Palma: *J. turbinata* subsp*. canariensis, Olea europaea* subsp. *cerasiformis, Rubia fruticosa*; d) El Hierro: *J. turbinata* subsp. *canariensis*, *J. odoratissimum*, *Euphorbia wildepretii*, *Rubia fruticosa*; e) Gran Canaria: *Olea europaea* subsp. *cerasiformis* but with sporadic *J. turbinata* subsp. *canariensis, Pistacia lentiscus*, *Bupleurum aciphyllum*, *Asparagus plocamoides*.  2.       *Juniperus turbinata* subsp. c.f. *canariensis* habitats of Madeira (*Mayteno umbellatae-Oleion maderensis*). Very rare habitat of Madeira, in an inacessible single location with a few tens of individuals of juniper in a  NE slope of Madeira Island. The taxononomical status of this juniper is incertain at the subspecies level, but so far it seems to be included in subsp. *canariensis*. The floristic combination of the community is: *Maytenus umbellata, Globularia salicina, Erica arborea* subsp. *arborea* and *Helichrysum melaleucum*.  **3.** *Juniperus cedrus* subsp. *cedrus* in the Canaries (*Juniperion cedri*).  *Although J. cedrus* subsp*. cedrus* is found inside *Pinus canariensis* forests, and is thought to have been abundant there and historically eliminated by cutting, the greatest abundance is nowadays in the shrub communities (also with shrubby individuals of *Pinus canariensis*) just above the *Pinus canariensis* timberline, already outside (above) the cloud belt. Thus, we interpret the later ecological situation alone as the habitat G3.9c, being the presence in canarian pinewood secondary. These communities are found in Tenerife mostly from ca. 1900 to 2200 m a.s.l., reaching the Cañadas del Teide, and contacting with *Spartocytisus nubigenius* (*Spartocytision nubigeni*)  communities. It occurs also in the external fringe of Taburiente’s crater, in La Palma.  Very isolated occurrences are those in Gran Canaria y La Gomera. These are xerophytic communities in rocky outcrops (lithosols) under upper mesomediterranean to supramediterranean dry to humid bioclimate. Floristic dominants are, in Tenerife: J*. cedrus* subsp*. cedrus, Adenocarpus viscosus, Echium wildpretii* and *Pterocephalus lasiospermus*; in La Palma: *J. cedrus* subsp. *cedrus*, *Adenocarpus spartioides*, *Echium trichosyphon* and *Pterocephalus porphyranthus*.  4.       *Juniperus cedrus* subsp. *maderensis* habitats of Madeira(*Polysticho falcinelli-Ericion canariensis*). Rare habitats in the summits of Madeira´s mountains (Pico Ruivo, 1862 m a.s.l.). There is evidence that this small tree used to be much abundant and probably a co-dominant species in the actual tree-heath forest, *Polysticho falcinelli-Ericetum canariensis*, the community of *Erica arborea* subsp. *canariensis* of Madeira above 1.500 m a.s.l., but historically heavily cut for timber and charcoal. Probabily, less than ten individuals remain in the hillsides of Pico Ruivo in inaccessible locations. Dominant in the community are: *Juniperus cedrus* subsp. *maderensis*, *Erica arborea* subsp. *canariensis*, *Erica platycodon* subsp. *maderincola*, *Sorbus maderensis* (doubtful presence after wildfire in 2011), *Polystichum falcinellum, Teucrium francoi*.  5.       *Juniperus brevifolia* habitats of Azores (*Culcito macrocarpae-Juniperion brevifoliae*). Although *Juniperus brevifolia* spans the whole of the laurel forest in Azores, *Lauro azoricae-Juniperetea brevifoliae* vegetation class and associated vegetation (seral stages), its optimum is in the form of a needle-leaved micro- to nano-forest, in the meso- to supratemperate hyperhumid to ultra-hyperhumid bioclimate, on leptosols or deeper andosols with an iron pan layer (placic horizon) usually with a thick acid horizon of organic matter or a thick blanket *Sphagnum* sp. pl. bog in the ground layer. In this sense, the habitat G3.9c is restricted to the *Culcito macrocarpae-Juniperion brevifoliae* alliance. It is present in the whole of the Azores Islands. The common characteristics of habitat are (with dominance or co-dominance): *Juniperus brevifolia, Myrsine retusa, Viburnum treleasi, Vaccinium cylindraceum, Rubus hoschttetorum, Hypericum foliosum, Myrtus communis, Erica azorica* (the later is dominant in *Erica azorica*-dominated F4.3 habitat type, which is the main contact with G3.9c); other taxa:  *Grammitis marginella* subsp. *azorica*, *Corema azorica*.  Indicators of good quality:  In a general sense, the more coenotically satured, namely by characteristic *taxa* and the less plants of seral stages co-dominate, the greater integrity of habitat is. Some part of such habitats have been historically cut (many times selectively), grazed or under agriculture. Thus, secondary, or altered versions of it are always found. These are versions of the habitat with less dense woody plant stratum (sometimes a parkland instead of the typical dense community), and where the lower strata have been substituted by zoo-antropogenic vegetation (*Cisto monspeliensis- Micromerion hyssopifoliae* in the Canaries and Madeira) and neophyte-dominated vegetation (*Holcus* sp. pl. and *Agrostis* sp. pl., *A. azorica* excluded, in the Azores). These degraded versions of habitat have much less conservation value, but potential to ecological restauration.  Characteristic species:  Vascular plants  Subtype 1*: J. turbinata* subsp. canariensis (dom.), *Olea europaea* subsp*. cerasiformis* (dom.), *Rhamnus crenulata* (dom.) *, Maytenus canariensis* (dom.) *, Asparagus scoparius, Bupleurum salicifolium, Globularia salicina, Teucrium heterophyllum,  Euphorbia bertholothii*, *Euphorbia wildpretii*, *Euphorbia atropurpurea, Pistacia atlantica*, *P. lentiscus*, *Hypericum canariensis, Euphorbia lamarkii, Aeonium hahworthii, Retama rhodorhyzoides, Brachypodium arbuscula*, *Jasminum odoratissimum, Rubia fruticosa, Echium wildpretii, Bupleurum aciphyllum*, *Asparagus plocamoides, Erysimum bicolor, Anagyris latifolia, Androcybium hierrense, Argyranthemum calychryson, Argyranthemum escarrei, Asparagus umbellatus, Asteriscus sericeus, Bupleurum handiense, Bystropogon plumosus, Convolvulus lopezsocazi, Dorycnium eryophtalmum, Echium purpuriense, E, strictum, E. giganteum, Marcetella moquiniana, Ruta pinnata, Sideritis brevicaulis, Sideritis pumila, Spartocytisus filipes, Teline osyrioides* subsp. *sericea, Vicia cirrhosa.*  Subtype 2 : *Maytenus umbellata* (dom.), *Globularia salicina* (dom.), *Erica arborea* subsp. *arborea* (dom.), *Erica platycodon* subsp*. maderincola*, *Helichrysum melaleucum.*  Subtype 3: J*uniperus cedrus* subsp*. cedrus, Adenocarpus viscosus, Echium wildpretii*, *Pterocephalus lasiospermus, Adenocarpus spartioides*, *Echium trichosyphon*, *Pterocephalus porphyranthus, Pinus canariensis* (shrub), *Andryala teydensis, Bufonia paniculata, Carlina xeranthemoides, Erysimum scoparium, Nepeta teydea, Scrophularia glabrata, Sideritis oroteneriffae, Chamaecytisus calderae, Chamaecytisus proliferus* subsp*. hierrensis, Echium auberianum, Echium trichosyphon, Echium wildpretii.*  Subtype 4: *Juniperus cedrus* subsp. *maderensis*, *Erica arborea* subsp. *canariensis*, *Erica platycodon* subsp. *maderincola*, *Sorbus maderensis, Polystichum falcinellum, VacciniumTeucrium francoi, Polystichum x maderensis, Ranunculus cortusifolius* var. *minor.*  Subtype 5: *Juniperus brevifolia* (dom.) *, Myrsine retusa, Viburnum treleasi, Vaccinium cylindraceum, Rubus hoschttetorum, Hypericum foliosum, Erica azorica, Arceuthobium azoricum, Bellis azorica, Carex hochstetteriana, Cerastium vagans, Culcita macrocarp,  Dryopteris azorica, Dryopteris crispifolia, Elaphoglossum semicylindricum, Hedera azorica, Platanthera grex ‘micrantha’, Smilax divaricata, Euphrasia grandiflora, Euphorbia stygiana, Vaccinium cylindraceum, Rubia agostinhoi* (non *R. agostinhoi* *sensu auct. mad et iber*. = *R. occidens;* *Rubia agostinhoi* is a strict azorean endemism)*.* |
| G3.A Picea taiga woodland | This habitat comprises of mesic to herb-rich forest vegetation on mineral soils in the boreal and boreonemoral zones. The soils are often podzolic, but other soil types occur and the humus is raw or mull. The canopy is often dominated by *Picea abies* but, despite the name of the habitat, stands dominated by *Pinus sylvestris* or *Betula pendula* or mixtures of these trees are also common. Other tree species include *Alnus incana, Betula pubescens, Populus tremula, Salix caprea, Sorbus aucuparia*, and in the boreonemoral and southern boreal subzones also *Acer platanoides, Alnus glutinosa, Quercus robur, Tilia cordata, Ulmus glabra and Ulmus laevis*. Under natural conditions, forest succession will lead to the development of a *Picea abies* forest, but the proportions of tree species are nowadays largely regulated by forestry. The shrub layer is best developed in moist herb-rich stands, where *Frangula alnus, Lonicera xylosteum, Prunus padus, Ribes* spp., *Rubus idaeus* and other shrubs can form dense thickets. On mesic sites, by contrast, the only true shrubs are *Juniperus communis, Salix caprea* and other *Salix* spp. Understorey vegetation varies from the dwarf shrub and feather moss dominated vegetation in mesic situations to the most luxurious and species-rich herb dominated vegetation. In mesic situations, *Vaccinium myrtillus* usually dominates, followed by *Vaccinium vitis-idaea, Linnaea borealis* and, in the middle and northern boreal subzones, even *Empetrum nigrum, Ledum palustre and Vaccinium uliginosum*. The commonest herbs are *Convallaria majalis, Dryopteris carthusiana, Epilobium angustifolium, Maianthemum bifolium, Melampyrum pratense, Melampyrum sylvaticum, Pteridium aquilinum, Solidago virgaurea* and *Trientalis europaea*, while species like *Lathyrus vernus* and *Oxalis acetosella* grow on slightly more nutrient-rich soils. *Calamagrostis arundinacea* and *Deschampsia flexuosa* are the most abundant grasses on mesic sites. Common graminoids also include *Carex digitata, Carex globularis, Deschampsia cespitosa, Luzula pilosa* and *Melica nutans*. There is great compositional variation in the herb layer of the richer sites, depending on the geographic location, soil moisture, soil nutrient status and canopy composition. In general, the number of herb species is high, and there are also many graminoids, but dwarf shrubs are few or non-existent. However, the number of vascular species decreases towards the north of the range. In addition to species thriving on mesic sites, examples of typical herb species are *Aegopodium podagraria, Anemone nemorosa, Angelica sylvestris, Anthriscus sylvestris, Athyrium filix-femina, Cirsium helenioides, Cornus suecica, Corydalis solida, Dryopteris carthusiana, Dryopteris expansa, Filipendula ulmaria, Fragaria vesca, Galium boreale, Geranium sylvaticum, Geum rivale, Gymnocarpium dryopteris, Hepatica nobilis, Matteuccia struthiopteris, Paris quadrifolia, Pulmonaria obscura, Ranunculus auricomus, Ranunculus fallax, Stellaria nemorum*, and common grasses are *Agrostis capillaris, Calamagrostis purpurea, Melica nutans, Milium effusum* and *Poa nemoralis*. On mesic sites the moss layer is usually continuous and dominated by feather mosses like *Pleurozium schreberi and Hylocomium splendens*. Other common species are *Dicranum fuscescens, D. majus, D. polysetum, D. scoparium, Polytrichum commune, Ptilium crista-castrensis* and on slightly more nutrient-rich sites *Climacium dendroides, Rhodobryum roseum* and *Rhytidiadelphus triquetrus*. The abundance and number of liverwort species, like *Barbilophozia lycopodioides*, increases towards north. On mesic sites there may even be some terricolous lichens. On herb-rich sites, the cover of the moss layer is usually small, and feather mosses are scarce. Instead, there is a rich flora of nutrient-demanding mosses and liverworts like *Brachythecium spp., Cirriphyllum piliferum, Plagiochila asplenioides, Plagiomnium* spp., *Plagiothecium* spp., *Pseudobryum cinclidioides* and *Rhizomnium* spp. After a major disturbance such as windfall, forest fire or regeneration cutting, herbs and grasses increase, *Vaccinium myrtillus* declines and bryophytes decrease.  Indicators of good quality:  • Natural composition of canopy  • Structural diversity/ complexity with (semi)natural age structure or completeness of layers  • Typical flora and fauna composition of the region  • Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi  • Presence of natural disturbance such as treefall openings with natural regeneration  • Long historical continuity (ancient woodland) with high species diversity  • Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests)  • Absence of non-native species in all layers (flora & fauna)  • No signs of eutrophication or pollution  • No man-induced very high population levels of ungulates  Characteristic species:  Tree canopy: *Acer platanoides, Alnus glutinosa, A.incana, Betula pendula, B. pubescens, Picea abies, Pinus sylvestris, Populus tremula, Salix caprea, Sorbus aucuparia, Tilia cordata*.  Shrubs: Corylus avellana, Daphne mezereum, Frangula alnus, Juniperus communis, Lonicera xylosteum, Prunus padus, Ribes spp., Rosa majalis, Rubus idaeus, Salix spp.  Field layer: Dwarf shrubs: *Vaccinium myrtillus, V. vitis-idaea, Huperzia selago, Linnaea borealis, Lycopodium annotinum, L. clavatum.* Herbs: *Actaea erythrocarpa, Actaea spicata, Aegopodium podagraria, Anemone nemorosa, Angelica sylvestris, Anthriscus sylvestris, Athyrium filix-femina, Circaea alpina, Cirsium helenioides, Convallaria majalis, Cornus suecica, Corydalis solida, Dryopteris carthusiana, Dryopteris expansa, Epilobium angustifolium, Equisetum sylvestris, Filipendula ulmaria, Fragaria vesca, Gagea lutea, Geranium sylvaticum, Geum rivale, Gymnocarpium dryopteris, Hepatica nobilis, Lathyrus vernus, Maianthemum bifolium, Matteuccia struthiopteris, Melampyrum pratense, Melampyrum sylvaticum, Oxalis acetosella, Paris quadrifolia, Pteridium aquilinum, Pulmonaria obscura, Pyrola minor, Pyrola rotundifolia, Ranunculus auricomus, Ranunculus fallax, Rubus saxatilis, Solidago virgaurea, Stellaria nemorum, Trientalis europaea, Orthilia secunda, Viola riviniana.* Graminoids: *Agrostis capillaris, Calamagrostis arundinacea, Calamagrostis purpurea, Carex digitata, Carex globularis, Deschampsia cespitosa, Deschampsia flexuosa, Luzula pilosa, Melica nutans, Milium effusum, Poa nemoralis.*  Mosses and liverworts: *Aulacomnium palustre, Barbilophozia lycopodioides, Brachythecium spp., Cirriphyllum piliferum, Climacium dendroides, Dicranum fuscescens, D. polysetum, D. majus, D. scoparium, Hylocomium splendens, Polytrichum commune, Plagiochila asplenioides, Plagiomnium spp., Plagiothecium spp., Pleurozium schreberi, Pseudobryum cinclidioides, Ptilium crista-castrensis, Rhizomnium spp., Rhodobryum roseum, Rhytidiadelphus triquetrus, Spagnum centrale, Sphagnum russowii, Sphagnum girgensohnii, Sphagnum squarrosum.*  Birds: Forests dominated by *Picea abies: Carduelis spinus, Erithacus rubecula, Loxia curvirostris, Parus ater, Phylloscopus collybita, Regulus regulus, Turdus philomelos.* Deciduous forests*: Hippolais icterina, Oriolus oriolus, Parus caeruleus, Phylloscopus sibilatrix, Scolopax rusticola, Sylvia atricapilla, Sylvia borin, Troglodytes troglodytes, Turdus merula.* Old growth forests*: Certhia familiaris, Dryocopus martius, Parus cinctus, Perisoreus infaustus, Phylloscopus trochiloides, Pinicola enucleator, Picoides tridactylus, Tetrao urogallus, Turdus viscivorus* |
| G3.B Pinus sylvestris taiga woodland | This is forest vegetation of sub-xeric, xeric and barren sites on mineral soils in the boreal and boreonemoral zones. The soils are usually podzolic with a raw humus layer. The tree canopy is almost always dominated by *Pinus sylvestris*, but mixed forests and even stands dominated by *Betula pendula, B. pubescens* or *Picea abies* can be found. Canopy composition is nowadays usually regulated by forestry. *Alnus incana, Populus tremula, Salix caprea* and *Sorbus aucuparia* may occur as individual trees usually on sub-xeric sites. *Juniperus communis* is common, but other shrubs, like *Salix phylicifolia* and *S. starkeana*, rarely occur. The understorey vegetation is dominated by dwarf shrubs, the most abundant species being *Calluna vulgaris, Empetrum nigrum, Vaccinium myrtillus* and *V. vitis-idaea*. In the middle and northern boreal subzones *V. uliginosum, Diphasiastrum complanatum* and *Ledum palustre* are common. Towards the north, the abundance of *V. myrtillus* and *E. nigrum* increases and the abundance of *V. vitis-idaea* decreases. Herb and grass species are few, and they are usually entirely missing from barren sites. *Convallaria majalis, Epilobium angustifolium, Maianthemum bifolium , Pteridium aquilinum, Solidago virgaurea* and *Trientalis europaea* are the most common herbs, but their small and pale shoots are often sterile. *Antennaria dioica* thrives on xeric sites. Graminoids include *Calamagrostis epigejos, Deschampsia flexuosa, Festuca ovina* and *Luzula pilosa*, but they are seldom abundant. In stands of this forest type on eskers there is some specialist flora, e.g. *Oxytropis campestris* and *Thymys serpyllum*. The ground layer is continuous. On sub-xeric sites, it is dominated by feather mosses, on barren sites by lichens. The number of moss, liverwort and lichen species increases towards the northern boreal subzone. The most dominant moss species are *Hylocomium splendens and Pleurozium schreberi*, followed by *Dicranum polysetum, D. scoparium* and *Polytrichum juniperinum*. In the northern boreal subzone, *Dicranum drummondii* and *D. fuscescens* are also common. Dominant lichens include *Cladina arbuscula, C. mitis, C. rangiferina, C. stellaris, Cetraria islandica* and *Stereocaulon* spp. In addition, on xeric and barren sites there usually are numerous *Cladonia* species. After a major disturbance such as forest fire, windfall or regeneration cutting, grasses usually increase moderately, bryophytes decrease and lichens increase.  Indicators of good quality:  • Natural composition of canopy  • Structural diversity/ -complexity with (semi)natural age structure or completeness of layers  • Typical flora and fauna composition of the region  • Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi  • Presence of natural disturbance with natural regeneration  • Long historical continuity (ancient woodland) with high species diversity  • Survival of larger stands of forest without anthropogenic fragmentation and isolation (to support fauna which need large undisturbed forests)  • Absence of non-native species in all layers (flora & fauna)  • No signs of eutrophication or pollution  • No signs of acidification (relevant mainly for oligotrophic or acidic types)  • No man-induced very high population levels of ungulates  Characteristic species:  Tree canopy: *Alnus incana, Betula pendula, B. pubescens, Picea abies, Pinus sylvestris, Populus tremula, Sorbus aucuparia.*  Shrubs: *Juniperus communis, Salix phylicifolia, Salix starkeana.*  Field layer: Dwarf shrubs: *Arctostaphylos alpina, Arctostaphylos uva-ursi, Betula nana, Calluna vulgaris, Diphasiastrum complanatum, Empetrum nigrum, Ledum palustre, Linnaea borealis, Phyllodoce caerulea, Vaccinium myrtillus, V. uliginosum, V. vitis-idaea*. Herbs: *Antennaria dioica, Convallaria majalis, Epilobium angustifolium, Maianthemum bifolium, Melampyrum pratense, Pteridium aquilinum, Solidago virgaurea,Trientalis europaea.* Graminoids: *Calamagrostis epigejos, Calamagrostis lapponica, Deschampsia flexuosa, Festuca ovina, Luzula pilosa.*  Mosses and liverworts: *Dicranum drummondii, Dicranum fuscescens, Dicranum polysetum, Dicranum scoparium, Hylocomium splendens, Pleurozium schreberi, Polytrichum juniperinum, Polytrichum piliferum, Ptilidium ciliare, Ptilium crista-castrensis.*  Lichens: *Cetraria ericetorum, C. islandica, Cladina arbuscula, C. mitis, C. rangiferina, C. stellaris, Cladonia spp., Flavocetraria nivalis, Nephroma arcticum, Stereocaulon* spp*.*  Birds: *Caprimulgus europaeus, Falco columbarius, Loxia pytyopsittacus, Lullula arborea, Phoenicurus phoenicurus. Old growth forests: Certhia familiaris, Dryocopus martius, Parus cinctus, Perisoreus infaustus, Phylloscopus trochiloides, Pinicola enucleator, Picoides tridactylus, Tetrao urogallus, Turdus viscivorus.* |
| G3.Da Pinus mire woodland | These are coniferous woodlands of shallow to deep peats and peaty mineral soils sustained by high ground water in gentle depressions on plains, on river terraces and at the margins of treeless mires throughout the boreal and more locally in the nemoral zones. The Pinus mire woodland can develop on a clearly ombrotrophic active bog surface on deep peat, but it can also be minerotrophic, located on shallower peaty soils at mire margins, though it could be more extensive on the mire surface. Tree cover can be sparse with low-growing individuals when the associated flora is very similar to the open mire surface, while under more closed canopies, shade-tolerant species prevail. An uneven age structure among the trees is characteristic of natural sites. *Pinus* species are the canopy dominant, mostly *Pinus sylvestris* but there are distinct subtypes with *Pinus mugo s.l.* (including *Pinus uncinata* ssp. *uliginosa* = *P. rotundata, Pinus x rhaetica, Pinus mugo s.str., Pinus x ascendens*). *Pinus* growth forms vary from upright tree form to more compact low-growth forms. *Picea abies* ssp. *abies* and ssp. *obovata*, *Betula pubescens* and *Salix* spp. are common associates. The field layer has such dwarf shrubs as *Vaccinium myrtillus, V. uliginosum, V. oxycoccos, V. vitis-idaea, Ledum palustre, Chamaedaphne calyculata, Rubus chamaemorus* with *Eriophorum vaginatum, Carex globularis* and peat-forming *Sphagna* like *S. angustifolium, S. fuscum* and *S. magellanicum* with big pleurocarpous mosses on drier hummocks. Trickles of moving water can sustain more minerotrophic species such as *Menyanthes trifoliata, Equisetum fluviatile, E. palustre* and *Comarum palustre*.  Indicators of quality:  • No forest exploitation.  • Intact natural mire hydrology.  • Natural composition of canopy with dominant *Pinus* species.  • Structural diversity/complexity with (semi)natural age structure or completeness of layers.  • Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi.  • Long historical continuity (ancient woodland) with high species diversity.  • Absence of non-native species in all layers (flora and fauna).  • No signs of eutrophication or pollution  Characteristic species:  Tree canopy: *Pinus sylvestris, Pinus mugo, P. x rhaetica, P. x ascendens s.l., Pinus uncinata*ssp. *uliginosa, Betula pubescens, Frangula alnus.*  Field layer: *Vaccinium uliginosum, V. oxycoccos, Ledum palustre, Chamaedaphne calyculata, Calluna vulgaris, Empetrum nigrum, Eriophorum vaginatum, E. angustifolium, Carex globularis, Molinia caerulea, Andromeda polifolia, Drosera rotundifolia*.  Bryophytes: *Sphagnum russowii, S. fallax, S. flexuosum, S. fuscum, S.m capillifolium, S.magellanicum, Dicranum bergeri, Polytrichum commune, P. strictum, Mylia anomala, Aulacomnium palustre.* |
| G3.Db Picea mire woodland | These are coniferous woodlands of shallow to deep peats and peaty mineral soils sustained by high ground water in gentle depressions on plains, on river terraces and at the margins of treeless mires throughout the boreal and more locally in the nemoral zones. Picea mire woodland can occur on ombrotrophic active bog surface on deep peat, but is more often found on minerotrophic peats or on shallower peaty soils at mire margins, though in drier regions being more extensive on the mire surface. Tree cover can be sparse with low-growing individuals when the associated flora is very similar to the open bog or mire surface while, under more closed canopies, shade-tolerant species prevail. An uneven age structure among the trees is characteristic of natural sites. *Picea abies* tends to be the canopy dominant in extensive stands on a hummock-dominated peat surface, or sometimes a more pronounced hummock-hollow micro-topography on the peat surface. Sometimes *Abies alba* is (co-)dominant in more minerotrophic conditions. *Betula pubescens, Pinus sylvestris* and *Salix* spp. are common associates sometimes with *Alnus glutinosa* and *A. incana* admixed in somewhat less oligotrophic situations. *Picea abies* ssp.*obovata* is a dominant subspecies vicariating with *P. abies* ssp*. abies*  in northeastern parts of Europe. The field layer has such dwarf shrubs as *Vaccinium myrtillus, V. vitis-idaea, V. uliginosum, V. oxycoccos, Ledum palustre, Chamaedaphne calyculata*, with herbs and sedges like *Melampyrum pratense, Rubus chamaemorus, Eriophorum vaginatum, Carex globularis* as well as  peat-forming *Sphagna* like *S. angustifolium, S. centrale, S. girgensohnii,  S. palustre,  S. magellanicum and S. russowii* with big pleurocarpous mosses on drier hummocks. In more mesothrophic conditions, herbs like *Equisetum sylvaticum, Dryopteris carthusiana, Trientalis europaea,* and graminoids like *Calamagrostis purpurea, Carex canescens and Carex loliacea* are common. Trickles of moving water can even sustain species such as *Calla palustris, Menyanthes trifoliata, Equisetum fluviatile, E. palustre* and *Comarum palustre.*  Indicators of quality:  •       No forest exploitations.  •       Intact natural mire hydrology.  •       Natural composition of canopy with dominant Picea spp.  •       Structural diversity/ -complexity with (semi)natural age structure or completeness of layers.  •       Presence of old trees and a variety of dead wood (lying or standing) and the associated flora, fauna and fungi.  •       Presence of natural disturbance such as treefall openings with natural regeneration.  •       Long historical continuity (ancient woodland) with high species diversity.  •       Survival of larger stands of forest without anthropogenic fragmentation and isolation.  •       Absence of non-native species in all layers (flora and fauna).  •       No signs of eutrophication or pollution.  Characteristic species:  Tree canopy: *Picea abies, Abies alba, Betula pubescens, Alnus incana, A. glutinosa, Frangula alnus.*  Field layer: *Vaccinium myrtillus, V. vitis-idaea, Vaccinium uliginosum, V. oxycoccos, Ledum palustre, Chamaedaphne calyculata, Calluna vulgaris, Empetrum nigrum, Calamagrostis purpurea, Carex canescens, C. globularis, C. loliacea, C. nigra, Andromeda polifolia, Equisetum sylvaticum, Dryopteris carthusiana, Melampyrum pratense, Drosera rotundifolia, Rubus chamaemorus, Trientalis europaea.*  Bryophytes: *Sphagnum capillifolium, S. centrale, S. fallax, S. flexuosum, S. palustre, S, magellanicum, S. girgensohnii, S. russowii, S. squarrosum, Dicranum majus, Polytrichum commune, P. strictum, Mylia anomala, Aulacomnium palustre, Barbilophozia lycopodioides.* |
| H1.1 Cave | The habitat includes natural caves and cave systems with their associated cave water basins. Caves and their associated waters harbor various biotic communities (plants, animals, fungi and algae) that are restricted to them (troglobiont organisms), or are physiologically and ecologically capable of conducting their entire life cycle inside them (troglophile organisms), or are dependent on them for part of their life cycle (subtroglophile organisms). The habitat is very diverse, but is mainly formed by the karst processes at the calcareous rocks. The caves also vary in size and extent. Their exterior part (cave entrances) includes the twilight zone where light penetrating from the outer world is sufficient to permit human vision. The habitat is rarely vegetated, and in this case dominant plants are mostly algae and mosses, and sometimes also vascular plant species such as  *Cortusa matthioli* occur. At the interior part of the caves, light is completely lacking. This part is with or without troglobiont or troglophile organisms. The vertebrate fauna includes unique amphibians such as *Proteus anguinus* in the Adriatic karst systems and bats. Bats are not typical troglobionts because they use the caves only for breeding and wintering. Invertebrate species belong to a limited number of groups, and include remarkable relict species from *Gastropoda*, *Opiliones*, *Chilopoda* (Lithobiidae), *Collembola*, *Coleoptera* (Bathysciinae and Trechinae subfamilies) among the terrestrial fauna and *Turbellaria*, *Gastropoda* and *Urodela*, among the aquatic fauna. They form characteristic fauna communities, which are essentially restricted to caves in temperate regions. The majority of the rich in invertebrates’ caves are situated in Southern and South-Eastern Europe (Mediterranean and Balkan Peninsula). The caves may be of different types: dry caves or caves crossed by permanent or temporary watercourses (habitat C6.1),  warm caves and caves humidified by geothermal waters, relatively warm deoxygenated caves, rich in carbon dioxide and sulphur vapor or methane and hydrogen sulphide harboring relict thermophile invertebrate fauna. In the regions with active volcanic activities there are caves formed in lava flows by open-ended tubes or passages resulting from the cooling of the surface (whose molten interior continued to flow). Some large lava tubes on the Canary Islands harbor unique communities of invertebrates, in particular, decapod crustaceans. Caves near the coast, which may contain salt water and can be colonized by specialized (anchihaline) communities, whether or not connected to the sea, are included to the marine habitats.  Indicators of quality:  Caves in good condition are considered the ones that are without any anthropogenic structures and are impacted only by natural processes. These are dynamic systems due to water erosion and collapse of rocks. The main threat is from rehabilitation and lighting for tourist attraction, which would allow non-typical animal and plant species to invade the cave’s interior. Plants growing in caves are equipped with electric lights  known as “lampenflora”. They tend to be less vibrant in color and somewhat disfigured. Typically, lampenflora are mosses, ferns and algae. In caves that are lit constantly by lamps, these invasive plants can cause problems to the cave's natural structure or any prehistoric wall art present. It also may form a threat to troglophile and troglobiont fauna. Indicators of good quality are:   * Stable water regime and annual course of temperature * Absence of invasive organisms * No disturbance by humans   Characteristic species:  Vascular plants (only in the cave entrances): *Arabis nova*, *Chenopodium foliosum*, *Hackelia deflexa*, *Hymenolobus pauciflorus*, *Asperugo procumbens*, *Sisymbrium austriacum*, *Galium spurium*, *Saxifraga arachnoidea.* Mosses: *Eucladium verticillatum, Fissidens cristatus, F. pusillus, Isopterygium elegans, Pohlia nutans, Schistostega pennata.*  Fauna (Invertebrates): Worms (*Delaya buresch*i); Snails (*Lindbergia* spp.) Crustacean (*Muridopsis polymorpha*, *Diacyclops* spp., *Speocyclops* spp., *Niphargus* spp., *Hyloniscus* spp.), Arachnida (*Troglohyphantes* spp., *Lepthyphantes* spp., *Porrhomma* spp., *Paranemastoma* spp.), Myriapods (*Lithobius* spp., *Bacillidesmus* spp.), Insects (*Pheggomisetes* spp., *Duvalius* spp.)  Amphibians: *Proteus anguis*, *Speleomantes* spp.  Mammals: *Eptesicus serotinus, Hypsugo savii, Miniopterus schreibersii, Myotis* spp. *Plecotus* spp., *Rhinolophus* spp. |
| H2.1 Boreal and arctic siliceous scree and block field | This habitat type includes all kinds of boreal and arctic unvegetated accumulations of siliceous boulders, stones or gravel, except for the littoral habitats. They form a base-poor substrate that harbours acidophilous plant communities. The habitat type is heterogeneous in regard to its biota, as it extends from the small blockfields of the southern boreal taiga to the highlands of Iceland. Screes and blockfields are produced by various geological processes. Scree usually refers to a collection of broken rock fragments on slopes or under cliffs produced by slope processes (also called talus formations). Screes often show a sorting of rock fragments. The largest blocks falling off from cliff faces roll down the furthest, whereas the finest material accumulates in the uppermost part of the slope. Other boulder and gravel fields originate from glacial deposition, frost action breaking rock outcrops in situ, or e.g. frost heaving from moraine. Rock glaciers and ice-dominated moraines are distinguished as a separate habitat H4.3, however. Yet another type of boulder fields is related to ancient beach deposits constituted by former coastal constructional processes. Sparsely vegetated screes and block and gravel fields are distributed across the whole boreal and arctic region but with varying abundance. The largest screes are found in Iceland (incl. gravel fields) and along the Scandinavian Mountain range, where they reach mid- or high-alpine levels. Large stable blockfields cover mountaintops in northern Fennoscandia and some quite large ancient beach deposits encircle high hills along the ancient coasts of the Baltic Sea. The vegetation of scree slopes represents a complex that covers many vegetation types from forests at the foot of the slopes to scrubs and sparsely vegetated unstable screes in the upper parts of formations. The forest and scrub types are not included in the habitat described here, but included under G- and F-types, respectively. More or less flat boreal blockfields may be also covered by trees or sometimes by scrubs, but also in this case, the habitat type in question only refers to open areas that do not have a tree or scrub layer. In such screes, the most characteristic assemblages of vascular plants are found in unstable patches, where also weak competitors can persist. In other blockfields, the role of vascular plants is small. The vegetation typically consists of lichens and bryophytes with different growth forms dominating different microhabitats, e.g. crustose and foliose lichens and small cushion-forming bryophytes on the sides of boulders, and fruticose lichens and mat-forming bryophytes in the hollows between blocks. Where vascular plants find enough soil between blocks, they form sparse vegetation. Transitions may occur towards grasslands or heathlands while near mountain summits transitions towards fjell-fields (H5.1) may be found. Probably the most important steering factor in screes and blockfields is a natural or semi-natural disturbance regime, which maintains characteristic species assemblages. In the arctic, gravel and blockfields are kept open just by the harsh climate, but in the boreal zone slow overgrowth has been observed in some regions. In screes, the disturbance regime is characterized by the continuum of periodic rockfall, instability of the substrate, and in some regions also by the long tradition of grazing. In some cases, grazing or, e.g., hiking or mountaineering activities may cause additional erosion in the habitat to such an extent that it disturbs the formation of typical vegetation. In forested areas, especially small blockfields tend to become more and more vegetated, starting gradually from the margins. In these habitats, the characteristic scarce vegetation may be in the long run dependent on regular forest fires.  Indicators of good quality:   * natural or seminatural disturbance regime, with a continuum of periodic rockfall and instability of the substrate or (in some cases) forest fires * no or little succession towards scrub and forest * continuation of traditional grazing (where relevant) * no disturbance (for example by hiking, grazing, etc.) * diversity of lichen, moss, and vascular plant species   Characteristic species:  Flora: Majority of the listed species are relevant for the Scandinavian scree habitats, where they represent floral elements from the southern Boreal region to mid- or high alpine levels. Species relevant also or especially for boreal blockfields are indicated with\*, those relevant especially for Icelandic screes and gravel fields with (I) and those mainly for Svalbard with (S).  Vascular plants: *Alchemilla alpina* (I), *Arabis alpina* (I), *A. glabra*, *Arctostaphylos uva-ursi*\*, *Arenaria norvegica* (I, common and not restricted to particularly baserich screes in Iceland), *Armeria maritima* (I), *Calamagrostis epigejos*, *Campanula rotundifolia*, *Cardaminopsis petraea*, *Carex bigelowii* (I), *C. capillaris* (I), *C. rupestris, Cerastium alpinum* coll., *C. arcticum* (S), *C. regelii* (S), *Cryptogramma crispa*\*, *Cystopteris fragilis*\*, *Deschampsia alpina*, *D. flexuosa*, *Draba daurica, D. incana, D. norvegica, Dryas octopetala* (I, not restricted to particularly baserich screes in Iceland), *Dryopteris carthusiana\*, Empetrum nigrum\*, Epilobium angustifolium*, *E. collinum, E. latifolium* (I), *Equisetum variegatum* (I), *Erigeron acer* ssp. *politus*, *Erysimum strictum*,  *Festuca ovina, F. rubra, F. vivipara, Galium normanii* (I), *G. verum, Gentiana nivalis* (I), *Gymnocarpium dryopteris*\*, *Hieracium alpinum* (I), *Huperzia selago, Juncus trifidus, Juniperus communis*, *Lotus corniculatus, Luzula arcuata, L. spicata, Minuartia biflora, M. rubella* (I), *M. stricta* (I), *Oxyria digyna, Papaver radicatum* coll. (I, S), *Poa alpina, P. glauca, P. nemoralis, Polygonatum odoratum, Polypodium vulgare*\*, *Polystichum lonchitis, Potentilla crantzii*, *P. robbinsiana* ssp. *hypacrtica* (S), *P. nivea, Ranunculus glacialis, R. sulphureus* (S), *Rhodiola rosea, Rosa villosa, Rubus idaeus, R. saxatilis, Salix herbacea, S. starkeana, Saxifraga aizoides* (I), *S. cernua* (S), *S. groenlandica* (S), *S. nivalis, S. oppositifolia, Sedum annuum, S. telephium, Silene acaulis, S. uniflora* (I), *Solidago virgaurea, Thalictrum alpinum, Thymus praecox* ssp. *arcticus* (I), *Tofieldia pusilla* (I), *Trisetum spicatum, Vaccinium myrtillus\*, V. vitis-idaea\*, V. uliginosum\*, Verbascum nigrum, Verbascum thapsus, Veronica fruticans, Vicia sylvatica, Viola canina* ssp. *montana, V. tricolor, Viscaria alpina, V. vulgaris, Woodsia ilvensis*\*  Mosses: *Andraea rupestris, Dicranum scoparium, Pleurozium schreberi, Ptilidium ciliare, Polytrichum* spp., *Racomitrium lanuginosum, R. microcarpon, Tetralophozia setiformis*  Lichens: *Arctoparmelia* spp. (especially *A. centrifuga*), *Brodoa intestiniformis, Cetraria* spp., *Cetrariella commixta, Chrysothrix chlorina, Cladina* spp., *Cladonia* spp. *Diploschistes scriposus, Lecanora* spp., *Lecidea* sensu lato, *Melanelia* spp., *Ophioparma ventosa, Parmelia saxatilis, Porpidia* spp., *Protoparmelia badia*, *Rhizocarpon* spp., *Stereocaulon* spp., *Umbilicaria* spp. |
| H2.2 Boreal and arctic base-rich scree | This habitat type is connected to calcareous rock types, such as limestone, dolomite or calcareous siltstone. The habitat type extends from the southern boreal region to the arctic zone and harbours therefore large diversity of species and plant communities. Screes (or talus formations) are formed when rock fragments fall off from cliff faces as a result of physical and chemical weathering and erosion. Screes often show a sorting of rock fragments. The largest blocks roll down the furthest, whereas the finest material accumulates in the uppermost part of the slope. Most occurrences of this habitat type probably represent scree slopes but also flat baserich gravel or blockfields may have been formed by frost action breaking calcareous rock outcrops *in situ*.  Baserich or calcareous screes are distributed mainly in the Scandinavian Mountain range, Iceland and Svalbard. In Iceland the division between baserich and basepoor scree habitats is not as clear as elsewhere in northern Europe, but the species composition on more-or-less neutral screes fits best in the here described habitat type.  The sparsely vegetated flat, stony and sandy volcanic habitats of Central Island are included in type H5.1c.  Similar to siliceous screes, the vegetation of baserich screes varies in the boreal region from forests to scrubs and sparsely vegetated, unstable patches, if considered as a whole. However, the habitat type in question only refers to more or less open patches that do not have a tree or scrub layer. In screes, the most characteristic assemblages of vascular plants are found in the unstable patches, where also weak competitors or various pioneer communities can persist. On calcareous substrate, characteristic plants are *Arenaria humifusa, A. norvegica, A. pseudofrigida, Artemisia norvegica, Papaver* species of the *Papaver radicatum* group, *Papaver relictum, Papaver laestadianum* and *Braya linearis*.  The most important factor determining the species composition of screes is natural or seminatural disturbance regime, which maintains characteristic species assemblages. In screes, the disturbance regime is characterized by the continuum of periodic rockfall, unstability of the substrate, and in some regions also by the long tradition of grazing. In some cases, grazing or, e.g., hiking or mountaineering activities may cause additional erosion in the habitat to such an extent that it disturbs the formation of typical vegetation.  Indicators of good quality:  ·      natural or seminatural disturbance regime, with a continuum of periodic rockfall and unstability of the substrate or (in some cases) forest fires  ·      no or little succession towards scrub and forest  ·      continuation of traditional grazing (where relevant)  ·      no disturbance (for example by hiking, grazing, etc.)  ·      diversity of lichen, moss and vascular plant species  Characteristic species:  Majority of the listed species are relevant for the Scandinavian scree habitats, where they represent floral elements from southern boreal region to mid alpine levels. Species relevant also or especially for Svalbard are marked with (S).  Flora  Vascular plants: *Arabis alpina, Arenaria humifusa, A. norvegica, A. pseudofrigida* (S), *Artemisia norvegica, Braya linearis, B. purpurascens* (S), *Campanula rotundifolia, Cardaminopsis petraea, Carex capillaris, C. bigelowii, C. glacialis, C. misandra* (S), C. rupestris, Cerastium alpinum, Draba fladnizensis, D. nivalis, D. norvegica, Dryas octopetala, *Elymus macrourus* (*Roegneria borealis* subsp. *islandica*), *Equisetum scirpoides*, *E. variegatum, Gymnocarpium robertianum, Kobresia simpliuscula* (S), *Luzula arcuata* (S)*, Minuartia rubella. M. stricta, Oxytropis lapponica, Papaver laestadianum, P. radicatum* coll., *P. relictum, Pinguicula alpina, Poa alpina, P. glauca, Potentilla nivea* (S), *Salix reticulata, Saxifraga aizoides, S. nivalis, S. oppositifolia, Silene acaulis, Thalictrum alpinum, Tofieldia pusilla, Woodsia alpina.*  Lichens: *Caloplaca* ssp., *Polyblastia* ssp., *Protoblastenia rupestris, Thelidium* ssp., *Verrucaria* ssp.  Fauna  Insects: Spiders |
| H2.3 Temperate high-mountain siliceous scree | This habitat consists of siliceous, mostly acidic screes, moraines or stone rivers of high altitudes (mainly over 1000 m above sea level) and cool sites in mountain ranges of the nemoral zone of Europe, including the Alps, Pyrenees, Carpathians, central and eastern parts of Balkan Peninsula, Apennines, etc.. Scree habitats consist of rock fragments with different forms and sizes covering the frost-shattered summits of mountains or accumulating on slopes below siliceous cliffs. Siliceous screes are made up of siliceous rocks, such as quartzite, granite and sandstones.  The screes are colonised by a range of mostly perennial plant species. The vegetation consists of assemblages of mostly acidophilous or neutrophilous species. The composition is strongly influenced by altitude and geographical ranges. Siliceous screes are habitats which contain many relic and local endemic species, but less than calcareous screes. The diversity of vegetation units is also smaller compared to calcareous screes. A widespread alliance in the Alpine and Carpathian mountain systems is the *Androsacion alpinae*. In the Pyrenees, where the habitat is more common, two specific alliances occur: *Senecionion leucophylli* and *Dryopteridion oreadis*. The plants grow tufted between the scree stones, in places with a little soil. Typical species include *Androsace alpina*, *A. wulfeiana, Saxifraga bryoides*, *Silene acaulis* and *Festuca picta*. Another widespread species of this habitat in most European mountains is *Oxyria digina*.  The siliceous screes are more humid than the calcareous ones, because they have larger water-retention characteristics. The humid, humus-rich siliceous screes of the Alps, on slopes long-covered with snow, are carpeted by *Luzula alpinopilosa*, and accompanied by species that constitute an ecological variant of the snow patch communities. There are also communities of ferns and low semi-shrubs, including *Gymnocarpium dryopteris*, *Cryptogramma crispa*, *Athyrium distentifolium*, *Dryopteris dilatata*, *Cystopteris fragilis*, *Vaccinium* spp. colonizing non-stabilized screes on shady places, often with a high proportion of large blocks. The scree vegetation in the Caucasus Mountains., outside the range of the EU 28+, is represented by the endemic alliances *Scrophulario minimae-Symphyolomion graveolens* and *Chaerophyllion humilis*. Those screes are outside this habitat type’s definition.  Indicators of quality:  •    Occurrence of natural erosion processes.  •    Presence of rare, relict or endemic species.  •    Absence of human activities, including grazing.  •    Absence of alien species.  Characteristic species:  Vascular plants: *Adenostyles leucophylla, Achillea erba-rotta, A. nana, Androsace alpina, A. hedraeantha, Athyrium distentifolium, Arenaria biflora, Armeria alpina,  Cardamine glauca, C. resedifolia, Cerastium pedunculatus, C. pyrenaicum, C. uniflorum, Cochlearia tatrae, Cryptogramma crispa, Deschampsia alpina, Doronicum clusii, D. grandiflorum, Dryopteris dilatata, D. expansa, D. oreades, Festuca picta, Gentiana frigida, Geum reptans, Gymnocarpium dryopteris, Lerchenfeldia flexuosa, Linaria alpina, Luzula alpino-pilosa, Minuartia sedoides, Murbeckiella pinnatifida, Oreochloa disticha, Oxyria digyna, Pleuropteropyrum undulatum, Poa contracta, P. laxa, Polygonum alpinum, Ranunculus glacialis, Saxifraga adscendens, S. androcasea, S. bryoides, S.carpathica, S. cernua, S. oppositifolia, S. pedemontana subsp. cymosa, Senecio glaberrimus, S. leucophyllus, S. transylvanicus, S. rochelianus, S. rupestris, Silene acaulis, Poa cenisia, Vaccinium spp., Veronica baumgartenii.*  Mosses: *Dicranoweisia crispula, Polytrichum alpinum, Racomitrium lanuginosum, Sanionia uncinata*  Lichens: *Polyblastia alpina, Solorina crucea*  Reptiles: *Podarcis muralis*  Birds: *Alectoris graeca, Tichodroma muraria, Prunella collaris, Monticola saxatilis Mammals: Chionomys nivalis* |
| H2.4 Temperate high-mountain base-rich scree | Calcareous and calcschist screes of high altitudes (mainly over 1000 m alt.) and cool sites in mountain ranges of the nemoral zone of Europe, including the Alps, Pyrenees, Carpathians, central and eastern parts of Balkan Peninsula, Apennines, etc. Scree habitat consists of rock fragments with different forms and sizes covering the frost-shattered summits of mountains or accumulating on slopes below calcareous cliffs. Calcareous and calcschist screes consist of base-rich rocks including limestone, dolomites, calcareous-schists, and marbles.  The screes are colonised by a set of mostly perennial species. The vegetation consists of assemblages of calcicole and basiphilous species, the composition of which depends on altitude and geographical ranges. Geographical isolation and limited size of high-altitudinal screes are explanations for the high level of specification found in the flora of calcareous screes, resulting in many relic and local endemic species. Also many vegetation alliances have limited ranges on the slopes of European mountains, for example in the Carpathians (*Papverion tatrtici* and *Papavero-Thymion pulcherrimi*), the Dinarides (*Bunion alpini* and *Saxifragion prenjae*), the Pirin Mountain in Bulgaria (*Veronico-Papaverion degenii*), the Pyrenees *(Iberidion spathulatae*, *Iberido apertae-Linarion propinquae,* *Saxifragion praetemirsae Androsacion ciliatae*), and the Apennines (*Linario-Festucion dimorphae, Thlaspion stylosi)*. Some vegetation alliances, like the *Thlaspion rotundifolii* and *Drabion hoppeanae* (on slates), are more widespread in the Alps and Carpathians. The vegetation of high-mountain and subalpine, relatively humid, fine limestone and marl screes belongs to the alliance *Petasition paradoxi.* Here many fern species (*Polystichum lonchitis, Dryopteris submontana, D. villarii, Asplenium fissum)* are found as well as large number of calcicolous mosses.  Indicators of quality:   * Occurrence of natural erosion processes. * High species richness of the cliffs. * Presence of rare, relict or endemic species. * Absence of human activities, including grazing. * Absence of alien species.   Characteristic species:  Vascular plants: *Achillea atrata, A. clusiana, A. oxyloba, Adenostlyles alpina, Adonis distorta, Alchemilla decumbens, Alhtamanta cretensis, Alyssum cuneifolium, A. ovirense, A. repens, Anthemis carpaica, Aquilegia pyrenaica, Arabis alpina, A. caerulea, A. ferdinandi-coburgii, Arenaria bertolonii, A. ciliata, Aplenium fissum, Borderea pyrenaica, Bunium alpinum, Campanula cochlearifolia, C. pulla, C. velebitica, Cardaminopsis neglecta, Centaurea parlatoris, C. rupestris, Cerastiusm carinthiacum, C. tomentosum, C. transsilvanicum, Clorocrepis staticifolia, Cochlearia tatrae, Crepis pygmea, Cystopteris montana, Degenia velebitica, Delphinium oxysepalum, Doronicum carpaticum, Draba fladnizensis, Dryopteris submontana, D. villarii, Hypocharis robertia, Iberis spathulata, Festuca dimorpha, F. glacialis, F. pyrenaica, F. pulchella, Galium baldense, G. megalospermum, G. noricum, G. pyrenaicum, G. stojanovii, Gypsophila repens, Leucanthemum atratum, Ligusticum ferulaceum, Linaria purpurea, Minuartia certastifolia, Moerrihngia ciliata, M. muscosa, Myosotis ambigens, Omalotheca hoppeana, O. pichleri, Papver alpinum, P. pyrenaicum, P. suaveloens, Petasites paradoxus, Phyllitis scolopendrium, Poa minor, P. pirinica, Rumex scutatus, Polystichum lonchitis, Pritzelago alpina, Ranunculus carinthiacus, R. oreophilus, R. parnassifolius, Reseda glauca, Rhodiola rosea, Salix retusa, Saxifraga aizoides, S. bryoides, S. carpatica, S. glabella, S. moschata, S. oppositifolia, S. pedemontana, S. sedoides, S. wahlenbergi, Sedum atratum, Seseli malyi, Thlaspi bellidifolium, T. kerneri, T. rodtundifolium, T. stylosum, Thymus pulcherrimus, Trisetum distichophyllum, T. spicatum, Valeriana bertiscea, V. elongata, Veronica aragonensis, V. baumgartenii, V. nummularia, V. satureoides, Viola grisebachiana, V. magelensis, Xatardia scabra*  Mosses: *Blepharostoma trichophyllum, Conocephalum conicum, Homalothecium lutescens, Pohlia cruda, Polytrichum alpinum, Sanionia uncinata*  Reptiles: *Podarcis muralis*  Birds: *Alectoris graeca, Tichodroma muraria, Prunella collaris, Monticola saxatilis Mammals: Chionomys nivalis* |
| H2.5 Temperate, lowland to montane siliceous scree | Siliceous (acidic) screes and moraines of warm exposures on the lower slopes of mountain ranges of the nemoral zone, including the Alps, Pyrenees and Hercynian ranges, also on hills and lowlands and, locally, of middle European upland or lowland sites. They consist of various volcanic, crystalline, metamorphic or sedimentary rocks with acidic to neutral reaction. Often the screes are mixed with fine soil. The vegetation can completely lack, but in other sites is represented by forb- or fern-dominated, sometimes by moss- or lichen-dominated, species-poor communities. Siliceous screes in general have a lower species richness than calcareous screes. But the diversity of fern species is higher than in calcareous screes. Examples of characteristic ferns are *Cryptogramma crispa*, *Dryopteris oreades* and *Dryopteris expansa*. The screes on warm slopes of the subalpine level of the Alps and the Pyrenees, usually composed largely of big stones or boulders, are occupied by communities of *Senecio leucophyllus*, *Taraxacum pyrenaicum*, *Galeopsis pyrenaica*, *Xatardia scabra*, *Armeria alpina*. In central Europe and the Carpathian’s periphery screes are often dominated by *Achnatherum calamagrostis*, *Melica ciliata* and *Galeopsis ladanum*. Similar communities can also occur on secondary substrates, like in quarries, but they must not be treated as the habitat. Screes have a very special cold microclimate and are often inhabited by invertebrate glacial relict species.  Indicators of quality: •    occurrence of natural erosion processes, •    presence of rare, relict or endemic species, •    absence of human activities, incl. grazing, •    absence of alien species (e.g. *Robinia pseudacacia* may support the processes of stabilisation of screes and extinction of the typical flora).  Characteristic species:  Flora, Vascular plants: *Achnatherum calamagrostis, Anarrhinum bellidifolium, Asplenium adiantum-nigrum subsp. onopteris, Biscutella flexuosa, Cryptogramma crispa, Conopodium bunioides, Digitalis purpurea, D. tjiapsi, Dryopteris affinis, D. expansa, D. oreades, D. tyrrhena, Epilobium collinum, Erysimum humile, Holcus setosus, Hylotelephium telephinum, Galeopsis ladanum, G. pyrenaica, Galeopsis segetum, G. tetrahit, Geranium robertianum, L. repens, L. saxatilis, Melica ciliata, Poa nemoralis, Reseda gredensis, Rumex suffruticosus, Santolina oblongifolia, Scrophularia schousboei, S. scorodonia, S. oxyrhyncha, Senecio leucophyllus, S. pyrenaicus, S. viscosus, Taraxacum pyrenaicum, Trisetum hispidum, Xatardia scabra*  Mosses: *Ceratodon purpureus, Rhacomitrium* spp.  Lichens: *Cladonia arbuscula*, *C. cariosa*, *C. conoicrocea*, *C. fimbriata*, *Stereocaulon incrustatum*, *S. paschale, Umbilicaria* spp. |
| H2.6a Temperate, lowland to montane base-rich scree | Mostly coarse, unstabilized, dry, sunny, calcareous and marble screes of the colline and montane levels of the low- to mid-altitude levels of the temperate European reliefs, including the piedmonts of the Alps, Jura, Pyrenees, Carpathians and Hercynian ranges. They are located on the slopes of mountains, hills, but also in gorges. The vegetation can completely lack, but in other cases is represented by forb- or fern- dominated communities. The main plant species are *Achnatherum calamagrostis, Melica ciliata, Galeopsis angustifolia, Rumex scutatus, Vincetoxicum hirundinaria* and the ferns *Gymnocarpium dryopteris*. The fern swards colonize often slightly damp parts of screes. Other species in these more mesophilous screes are *Eupatorium cannabinum*, *Valeriana officinalis*, *Galeopsis ladanum*. The vegetation mostly belongs to the alliances *Stipion calamagrostis* and *Arabidion alpinae*. The plant communities of calcareous screes of the Paris basin and its periphery (*Leontodontion hyoseroidis*) have many rare or endemic plants, like the endangered endemic *Viola hispida*. The screes of the Eastern Carpathians are characterized by the presence of numerous sub-Mediterranean thermophilous species and some Balkan-Carpathian subendemics, which penetrate northwards from the south to the sunny and warm habitats. Carpathian endemics on screes in Romania are amongst others *Silene nutans* subsp. *dubia* and *Thymus comosus*. Similar communities can occur on secondary substrates, like quarries.  Indicators of quality:  The following characteristics may be considered as indicators of good quality: •    natural erosion processes •    absence of non-native species (e.g. *Robinia pseudacacia* may support the processes of stabilisation of screes and extinction of the typical flora) •    presence of habitat rare, endemic and relict species •    absence of human activities, like grazing.  Characteristic species:  Flora  Vascular plants: *Achnatherum calamagrostis, Aethionema saxatile, Anthericum ramosum, Arabis alpina, Biscutella neustriaca,  Calamagrostis varia, Campanula rapunculoides, Cardaminopsis arenosa, Cystopteris fragilis, Eupatorium cannabinum, Euphorbia waldsteinii, Galeopsis angustifolia, Galeopsis ladanum, Galium timeroyi* subsp*. fleurotii, Gymnocarpium robertianum, Festuca xanthina, Hieracium bifidum, Iberis durandii, I. violetii, Lamium garganicum* subsp*. laevigatum, Leontodon hyoseroides, Linaria supina, Melica ciliata, Microrhinum minus, Moehringia muscosa, Parietaria officinalis, Poa nemoralis, Rumex scutatus, Senecio rupestris, Sesleria albicans, Scrophularia juratensis, Silene hayekiana, Silene nutans* subsp*. dubia, S. vulgaris* subsp*. glareosa, Sisymbrium supinum, Silene nutans subsp. dubia, Thymus comosus, Vincetoxicum hirundinaria, Valeriana officinalis, Viola hispida. Mosses: Ceratodon purpureus, Conocephalum conicum, Eurhynchium schleicheri, Homalothecium sericeum, Mnium stellare, Plagiomnium affine, Tortella tortuosa*. |
| H2.6b Western Mediterranean base-rich scree | This is a calcareous and ultrabasic scree, constituted by boulders, rock debris and riverine gravel of the western Mediterranean, from lowlands through to the high mountains. It is composed by rock types that are sedimentary and metamorphic limestones and dolomites, further serpentinite and other ultramafic as well as silica-poor igneous volcanic rock such as basalt. Epilithic lichens and bryophytes may be very diverse, particularly in the mountains, where they are mostly found in crevices and other shady and humid microsites of immobile boulders. The vascular plant vegetation of western Mediterranean base-rich screes consists mainly of hemicryptophytes and chamaephytes adapted to the mechanical disturbance caused by mobile screes, shortages in water supply and lack of fine-grained soil. Many plants are disturbance-resilient and capable of regeneration even after being buried by moving stones. Prostrate stems, stolons, radicants, extensive root systems, storage tubers and rhizomes are common traits in the plants that are present in this habitat. Scree creeping, passive moving with mobile screes, and accumulation of scree through resilient tussocks and root stocks, thereby controlling erosion, are characteristic growth form functional strategies in Mediterranean screes. Species-rich genera of vascular plants are, among others, *Campanula*, *Iberis*, *Linaria* and *Scrophularia*. The species composition in the high mountains is particularly variable and includes many regional endemic taxa. Several phytosociological alliances restricted to subalpine and alpine levels of mountain ranges in the Iberian and Apennine Peninsulas or to the larger islands have been described. They reflect phytogeographical patterns of isolation and centers of speciation. Lowland scree and gravel vegetation is in comparison more uniform in the western Mediterranean. Most plant communities belong to the extremely variable class of *Thlaspietea rotundifolii*. Local habitat variation reflects differences in slope and substrate mobility, rock size and mineral composition, microclimate, aspect and solar radiation, humidity and precipitation.  Mediterranean base-rich screes cover extensive areas in the high mountains. In the lowlands and foothills, by contrast, they may be rare. Gravel banks occur along permanent or temporary streams. Western Mediterranean base-rich scree habitats occur from the Iberian Peninsula through southern France to the Apennines (Italy), on the Balearic Islands, Corsica, Sardinia, Sicily, and on many of the smaller islands and archipelagos of the Tyrrhenian Sea, such as the Tuscan, the Aegadian and the Aeolian, and further in the Mediterranean domain of northwest Africa (Morocco, Algeria and Tunisia).  Indicators of quality:  The dynamics of scree and gravel habitats depend on the natural constant supply of rock debris and riverine materials. When there is no supply from rock source areas above, the habitat and its vegetation will be subject to succession and gradually change in character towards grasslands, shrublands or woodlands. High-mountain screes in the western Mediterranean, underlying natural dynamics, are normally little or not affected by human impact. In contrast, riverine gravel fills in the lowlands, with their rivers, have commonly been subjected to quarrying, hydrological control or other drastic changes of the river regime. Human-made screes such as mining heaps may provide important and valuable secondary habitats, especially after long periods of abandonment. They should be considered and preserved when their quality is good, especially when primary scree habitats are absent in a wider area. The habitat quality must be assessed by taking into account the regional species pool. Scree and boulder specialists, with many endemics and relict plants among them, are useful indicators of good habitat quality.  The following characteristics may be used as indicators of favorable habitat quality:   * Occurrence of rare and phyto-geographically significant plants * Presence of sizable areas of scree and gravel with adequate and ongoing supply of rock material through cliff, stream and river dynamics, and with local differences in slope, moisture, aspect, substrate mobility, and grain size * Contact with natural habitats such as cliffs, high-mountain pioneer grasslands and plant cushion vegetation, or riverine scrubs and woodlands * Absence of gravel quarrying and mining * Absence of hydrological and traffic constructions affecting the river regime   Characteristic species:  Vascular plants: *Achillea barrelieri subsp. mucronulata, Achnatherum calamagrostis, Adonis distorta, Allium palentinum, Alyssum gadorense, Androsace ciliata, Andryala ragusina, Aquilegia pyrenaica (subsp. cazorlensis, subsp. discolor), Arabis alpina subsp. alpina, Arenaria bertolonii, Arrhenatherum (album, elatius subsp. sardoum), Biscutella valentina, Bunium (alpinum subsp. corydalinum, alpinum subsp. petraeum, macuca), Bupleurum ranunculoides subsp. ranunculoides, Calamagrostis pseudophragmites, Campanula (arvatica, cochleariifolia, jaubertiana), Carduus carlinoides, Centaurea (ceratophylla, delucae, prolongoi), Centranthus (lecoqii, ruber), Cerastium (soleirolii, thomasii, tomentosum), Cirsium acaulon subsp. gregarium, Cochlearia aragonensis subsp. navarrana, Coincya monensis subsp. cheiranthos, Conopodium thalictrifolium, Crambe filiformis, Crepis (granatensis, oporinoides, pygmaea), Cystopteris montana, Doronicum grandiflorum subsp. braunblanquetii, Dryopteris (oreades, submontana), Echium albicans, Erucastrum nasturtiifolium subsp. sudrei, Eryngium glaciale, Erysimum (duriaei, gorbeanum), Euphorbia nevadensis (subsp. aragonensis, subsp. bolosii), Festuca glacialis, Galeopsis angustifolia, Galium (cespitosum, cometerhizon, corsicum,  pyrenaicum, rosellum), Gouffeia arenarioides, Gymnocarpium robertianum, Hypochaeris robertia, Iberis (carnosa subsp. granatensis, carnosa subsp. hegelmaieri, carnosa subsp. nafarroana, ciliata, spathulata), Jurinea fontqueri, Lactuca (singularis, tenerrima, viminea subsp. chondrilliflora), Laserpitium gallicum, Leontodon hyoseroides, Leucanthemum (coronopifolium subsp. ceratophylloides, laciniatum), Leucopoa dimorpha, Linaria (aeruginea, badalii, faucicola, filicaulis, glacialis, propinqua, purpurea, supina), Minuartia cerastiifolia, Myosotis alpestris var. ambigens, Nepeta (amethystina subsp. amethystina, nepetella subsp. aragonensis), Noccaea stilosa, Papaver (ernesti-mayeri, lapeyrousianum), Plantago monosperma, Platycapnos saxicola, Poa balbisii, Polystichum lonchitis, Pritzelago alpina (subsp. auerswaldii, subsp. brevicaulis), Ptilostemon niveus, Ptychotis saxifraga, Ranunculus (alpestris ssp. leroyi, parnassifolius ssp. Favargeri), Reseda valentina, Rumex scutatus, Salix breviserrata, Saxifraga (oppositifolia subsp. murithiana, oppositifolia subsp. paradoxa, oppositifolia subsp. speciosa, pedemontana subsp. cervicornis, praetermissa), Scrophularia canina (subsp. canina, subsp. crithmifolia), Scrophularia sciophila, Secale strictum subsp. strictum, Sedum (annuum brevifolium, monregalense), Senecio pyrenaicus, Silene (boryi, inaperta subsp. inaperta, secundiflora), Spergula viscosa, Taraxacum sect. Alpina, Tolpis staticifolia, Trisetum distichophyllum, Verbascum conocarpum, Veronica (alpina, mampodrensis, nummularia) Vicia glauca subsp. giennensis, Vincetoxicum hirundinaria subsp. lusitanicum, Viola (crassiuscula, lapeyrousiana, magellensis.* |
| H2.6c Eastern Mediterranean base-rich scree | This is a calcareous and ultrabasic scree, constituted by talus, boulder fields, glacier forefields, rock debris and riverine gravel banks, from lowlands upwards to subnival levels in the eastern Mediterranean. Apart from epilithic bryophytes and lichens on rock outcrops and stable boulders, the vegetation consists mainly of specialist vascular plants adapted to the mobility of scree materials, the scarcity of fine-grained soil, mechanical disturbance, shortage of water and other physiological stresses. Most plants show storage organs and considerable regeneration capacity of roots and shoots. Characteristic plant adaptive syndromes include prostrate stems, stolons, tubers, rhizomes, and radicants. Clonal reproduction is common among them. The most common plant life forms in eastern Mediterranean screes are hemicryptophytes, some of which may turn to being facultative rhizome geophytes, and chamaephytes. In contrast to temperate high-mountain screes, bulbous geophytes may play a prominent role in East Mediterranean screes. Characteristic plant growth form strategies are scree creeping, scree moving (passively), and scree accumulating. Characteristic plant genera in eastern Mediterranean screes, each with several species represented are the following: *Aethionema, Alyssum, Euphorbia, Heldreichia, Nepeta, Ranunculus, Ricotia, Scrophularia, Silene* and *Viola.*  While the plant composition in lowland screes consists mostly of widespread plant generalists and ruderal specialists but only few narrow-range endemics, there is considerable regional variation in the high mountains, as reflected by the high number of phytosociological alliances. Some alliances are restricted to oro-mediterranean levels of single mountain ranges such as Pindos or the Taurus Mountains. Characteristic plants are often narrow endemics. Most plant communities belong to three geographically vicariant vegetation classes, i.e. *Thlaspietea rotundifolii* in the northwest (and further in nemoral Europe), *Drypidetea spinosae* in the southwest (Greece and South Aegean), and *Heldreichietea* in the east (Anatolia to Israel). Local habitat variation is the result of mobility and stability of the scree and gravel, to the supply of debris by rivers or through downslope transport by gravity, to substrate grain size and chemistry.  The habitat type, as defined here, occurs from the eastern Adriatic region, (i.e. Dalmatia) and the southern part of the Dinarides, through Albania, the Balkans, western and south-central mainland Greece, the Ionian Islands, the Peloponnese and Aegean Greece, western and southern Turkey (Anatolia) and further into Syria, Lebanon, and Israel.  Indicators of quality:  Scree habitats depend on the natural, adequate and constant supply of rock debris and gravel by rivers, cliff weathering or landslides. While high-mountain screes in the eastern Mediterranean are not normally affected by human impact, talus fans and riverine gravel fills in the lowlands have often been cut off from fresh material supplies by hydrological constructions and through transforming the river regime. Habitat quality must be assessed in view of the regional variation in species composition, using endemic scree specialists as indicators. The following characteristics may be used as indicators of favorable habitat quality:  • Occurrence of rare and phytogeographically significant plants  • Presence of sizable areas of scree and gravel with adequate material supply, and with differences in slope, moisture, mobility of materials, and grain size  • Contact with natural habitats such as cliffs, high-mountain thorny cushion vegetation or riverine scrub and woodland  • Absence of gravel quarrying and mining  • Absence of hydrological and traffic constructions influencing the river regime  Characteristic species:â€¨  Vascular plants: *Acantholimon androsaceum, Achillea (abrotanoides, ambrosiaca), Achnatherum calamagrostis, Aethionema (cordatum, oppositifolium, saxatile, speciosum, stylosum), Ajuga chamaepitys subsp. glareosa, Allium tauricola, Alopecurus textilis, Alyssum (akamasicum, argyrophyllum, bertolonii, chondrogynum, cypricum, fragillimum, handelii, scardicum, sphacioticum, troodi), Androsace (multiscapa, villosa), Anthemis plutonia, Anthriscus (kotschyi, sylvestris subsp. fumarioides), Arabis alpina (subsp. brevifolia, subsp. caucasica), Arenaria (balansae, conferta subsp. conferta, conferta subsp. serpentini, kotschyana subsp. kotschyana), Asperula (idaea, muscosa, stricta subsp. grandiflora), Astragalus (haussknechtii, oxytropifolius, pelliger), Aurinia rupestris subsp. cyclocarpa, Bornmuellera baldaccii (subsp. baldaccii, subsp. markgrafii, subsp. rechingeri), Bubon albanicum, Bunium microcarpum, Campanula hawkinsiana, Cardamine (carnosa, glauca), Centaurea (cyprensis, idaea), Centranthus calcitrapae, Cerastium (cerastoides, gnaphalodes), Cicer incisum, Clinopodium troodi, Corydalis (blanda subsp. parnassica, rutifolia, solida subsp. incisa, uniflora), Crepis (frigida, sibthorpiana, willdenowii), Cyanus bourgaei, Cyclotrichium origanifolium, Cynoglossum troodii, Dianthus (petraeus, sphacioticus, strictus subsp. strictus, strictus subsp. multipunctatus, strictus subsp. troodi), Draba cretica, Drypis spinosa (subsp. spinosa, subsp. jacquiniana), Elytrigia (lazica subsp. divaricata, tauri), Euphorbia (cassia subsp. cassia, cassia subsp. rigoi, deflexa, herniariifolia, pestalozzae), Festuca (adanensis, anatolica), Fritillaria crassifolia subsp. crassifolia, Fumana paphlagonica subsp. alpina, Galium (cilicicum, corrudifolium, incanum subsp. incanum, incanum subsp. centrale, incanum subsp. creticum, incanum subsp. elatius), Geocaryum parnassicum, Geranium (macrorrhizum, purpureum, subcaulescens), Grafia golaka, Hedysarum (cyprium, erythroleucum), Heldreichia (bourgaei, bupleurifolia, rotundifolia), Helianthemum hymettium, Heracleum (humile, sphondylium subsp. orsinii), Hyacinthella millingenii, Hypericum (confertum subsp. stenobotrys, crenulatum), Iberis simplex, Jurinea moschus subsp. moschus, Lactuca (glareosa, intricata), Lamium (cymbalariifolium, eriocephalum, garganicum subsp. striatum), Laserpitium petrophilum, Leucopoa spectabilis subsp. affinis, Linaria (corifolia, microsepala), Lindbergella sintenisii, Lomelosia (crenata subsp. crenata, sphaciotica subsp. sphaciotica), Malcolmia orsiniana subsp. angulifolia, Mattiastrum lithospermifolium, Melica ciliata subsp. magnolii, Minuartia (attica, juniperina, pichleri, rimarum), Myosotis suaveolens, Nepeta (cilicica, concolor, sphaciotica), Noccaea (sintenisii, zaffranii), Onosma troodi, Ormosolenia alpina (=Peucedanum alpinum), Oxyria digyna, Peltaria alliacea, Phagnalon pygmaeum, Poa cenisia, Podospermum radicosum, Pseudofumaria alba subsp. acaulis, Ptilostemon afer, Ranunculus (brevifolius, cadmicus, cyprius, radinotrichus), Ricotia (cretica, davisiana, varians), Rumex scutatus, Salvia veneris, Scrophularia (canina, depauperata, myriophylla, rimarum), Scutellaria (hirta, orientalis subsp. orientalis, orientalis subsp. pinnatifida), Senecio (fruticulosus, squalidus subsp. rupestris, thapsoides), Sesleria (phleoides, robusta), Silene (caesia, fabaria subsp. domokina, fabarioides, haussknechtii, multicaulis subsp. multicaulis, nuncupanda, pentelica, supina subsp. pruinosa, variegata, vulgaris subsp. prostrata, vulgaris subsp. vourinensis), Thamnosciadium junceum, Theligonum cynocrambe, Thymus (integer, leucotrichus), Valantia aprica, Valeriana bertiscea, Vavilovia formosa, Veronica (caespitosa, cuneifolia, tauricola, thessalica), Vicia (alpestris subsp. hypoleuca, canescens subsp. gregaria), Viola (albanica, calcarata subsp.zoysii, crassifolia, dukadjinica, fragrans, striis-notata).* |
| H3.1a Boreal and arctic siliceous inland cliff | Siliceous (rich in quartz and silicate minerals such as mica or feldspar) rock walls and cliffs in the boreal and arctic biogeographical regions, excluding supralittoral cliffs adjacent to the sea with salt spray influence (habitat B3.1) as well as very wet, dripping vertical rocks (habitat H3.4). These siliceous cliffs in the North chiefly consist of granite, gneiss and other kinds of hard crystalline acid rock. Soft mica schist is also common. Volcanic rocks occur locally.  The vegetation consists of a limited number of vascular plants in rock crevices and on ledges, while epilithic bryophytes, lichens as well as micro-algae occur on dry or wet rock faces, overhangs and in all kinds of sheltered microsites. Although these rock types are all base-poor, they show marked variation in their chemical composition and can harbor hundreds of different lichens and bryophytes and a range of plant communities. For example, lichen communities on quartzite and diorite are composed largely of different species. The most base-poor rocks include sandstone and quartzite, followed by granites, gneisses, and granulites. Rocks with reduced acidity include phyllite, mica schist, gabbro, and diorite; they host species that are slightly more nutrient demanding. In the boreal zone, diabase and amphibolite represent more base-rich rock types that form transitions between base-poor and base-rich habitats (this type and H3.2a). However, in most cases these cliffs do not host remarkable calciphilous communities, like on limestone cliffs.  Usually, the highest diversity of species is found in cliffs with the highest geomorphological diversity. Especially lichen and bryophyte communities vary according to microhabitats like rock slopes, vertical and overhanging rock faces, cavities, shelves, and ledges, as well as crevices of different size or fissures on walls. For example, the most bare and sunny walls are dominated by crustose and foliose lichens and small cushion-forming bryophytes, whereas shady vertical surfaces are covered by mat- or cushion-forming bryophytes. The gloomiest cavities may harbor fan-like bryophytes (e.g. *Neckera* spp.), powdery lichens or algae. Crustose and foliose lichens are well represented with numerous genera; particularly species-rich are, e.g., *Lecanora*, *Parmelia* s.l., *Rhizocarpon*, *Stereocaulon,* and *Umbilicaria*. Among the mosses, numerous species of *Grimmia*, *Racomitrium*, *Schistidium*, *Andreaea* and many other genera occur. The vegetation of vascular plants is rather poor but small ferns (*Asplenium* spp.) may occur, except in the far north.  Specific plant communities can be recognized on Fe and Cu sulphide-rich rocks, where the specialized flora includes copper moss *Mielichhoferia elongata* and lichens that favour iron-containing rocks (e.g. *Acarospora sinopica, Lecanora epanora, Lecidea silacea, Miriquidica atrofulva, Tremolecia atrata*). Bird nesting cliffs (excl. coastal bird cliffs) have also a special species composition, as they gain extra nutrients from guano and host so-called ornithocoprophilous plants.  Boreal and arctic siliceous cliffs occur in Iceland, northern Scotland, the Shetland, Orkney and Faroe Island groups, Svalbard, Fennoscandia and the northern Baltic region, moreover in Greenland, northern Russia and circumpolar in North Siberia and North America. In the boreal lowlands, cliffs are usually small and low and located in forest environments, whereas in the Scandinavian Mountain range and in the arctic zone the most massive cliffs occur on open mountain slopes and may be hundreds of meters high and kilometers long.  Indicators of good quality:  Boreal and arctic siliceous cliffs are of particular importance for cryptogams, in particular for lichen and bryophyte diversity. The biodiversity varies between regions, phytogeographic zones and altitudinal belts. The species diversity varies enormously also in entirely natural communities in cliff habitats. Usually, the smallest rock formations with monotonous microtopography and little variation in rock types show low diversity, whereas larger cliff complexes with heterogeneous geomorphology and varying rock types may represent local biodiversity hotspots. Therefore, low species diversity or absence of rare species should not as such be interpreted as an indicator of low habitat quality, unless it is caused by anthropogenic influence.  The following characteristics may be used as indicators for assessing trends in quality: •    Occurrence of rare species of lichens, bryophytes and phytogeographically significant vascular plant taxa,  •    Presence of sizable open exposed rock with species-rich bryophyte carpets and lichen crusts, and of different aspects of rock walls, different exposure to insolation, moisture and rock structures such as overhangs, cavities, rock shelters, ledges •    Presence of indicators of good air quality, e.g. usneoid lichens or Lobaria spp. •    Contact with natural habitats such as screes, boulder fields, and pioneer grasslands  •    Absence of quarrying and control structures  •    Absence of garbage dumping and anthropogenic nutrient input from above the cliff •    Absence of rock climbing facilities •    Absence of alien species  Characteristic species:  Flora:  Vascular plants: *Alchemilla alpina, Arabidopsis thaliana, Arenaria norvegica (common in Iceland), Asplenium septentrionale, A. trichomanes, Astragalus alpinus, Campanula rotundifolia, Cardaminopsis petraea (Iceland), Cerastium alpinum, Cystopteris fragilis, Draba incana, D. norvegica, Epilobium collinum, Festuca ovina, Geranium robertianum, Gymnocarpium drypteris, Hieracium schmidtii, Hylotelephium maximum, Moehringia trinervia, Phegopteris connectilis, Poa glauca, P. nemoralis, Polygonatum odoratum, Polypodium vulgare, Potentilla argentea, Rumex acetosella, Saxifraga cotyledon, Sedum* spp.*, Silene rupestris, Solidago virgaurea* subsp. *minuta, Stellaria graminea, Veronica fruticans, Viola tricolor, Viscaria alpina, Viscaria vulgaris, Woodsia alpina, Woodsia ilvensis*  Bryophytes: *Amphidium* spp.*, Anastrophyllum* spp.*, Andreaea rothii, Andreaea rupestris, Barbilophozia* spp.*, Bartramia* spp.*, Brachythecium* spp.*, Cnestrum schisti, Cynodontium* spp.*, Dicranum scoparium, Ditrichum zonatum, Dryptodon patens, Grimmia affinis, Grimmia alpestris, Grimmia apiculata, Grimmia arenaria, Grimmia caespiticia, Grimmia curvata, Grimmia donniana, Grimmia elatior, Grimmia elongata, Grimmia funalis, Grimmia incurva, Grimmia muehlenbeckii, Grimmia ovalis, Grimmia torquata), Gymnomitrion concinnatum, Hedwigia ciliata, Homalia trichomanoides, Homalothecium sericeum, Hylocomium splendens, Hypnum* spp.*, Isopterygium* spp.*, Lophozia* spp.*, Neckera* spp.*, Orthodicranum montanum, Orthrotrichum* spp.*, Paraleucobryum longifolium, Plagiomnium cuspidatum, Plagiothecium* spp.*, Pleurozium schreberi, Pohlia* spp.*, Polytrichum* spp.*, Pterigynandrum filiforme, Ptilidium ciliare, Racomitrium fasciculare, Racomitrium heterostichum, Racomitrium lanuginosum, Racomitrium microcarpon, Racomitrium sudeticum, Rhabdoweisia fugax, Sanionia uncinata, Schistidium* spp.*, Ulota curvifolia, Tetralophozia setiformis*  Lichens: *Arctoparmelia* spp.*, Aspicilia leucophyma, Aspicilia moroides, Aspicilia caesiocinerea, Catolechia wahlenbergii, Cornicularia normoerica, Ephebe lanata, Haematomma ochroleucum, Lecanora bicincta, Lecanora cenisia, Lecanora frustulosa, Lecanora intricata, Lecanora nephaea, Lecanora polytropa, Lecanora reagens, Lecanora rupicola, Lecanora subcarnea, Lecanora swartzii, Lecidea* spp.*, Lepraria latebrarum, Lepraria membranacea, Lepraria neglecta, Lithographa tesserata, Melanelia* spp.*, Micarea intrusa, Ophioparma ventosa, Parmelia disjuncta, Parmelia incurva, Parmelia omphalodes, Parmelia panniformis, Parmelia saxatilis, Parmelia stygia, Phylliscum demangeonii, Placopsis gelida, Polychidium muscicola, Porpidia pseudomelinoides, Porpidia speirea, Porpidia superba, Porpidia tuberculosa, Protoparmelia badia, Pseudephebe minuscula, Pseudephebe pubescens, Ramalina capitata, Rhizocarpon alpicola, Rhizocarpon atroflavescens, Rhizocarpon badioatrum, Rhizocarpon caeruleoalbum, Rhizocarpon copelandii, Rhizocarpon distinctum, Rhizocarpon eupetraeum, Rhizocarpon geographicum, Rhizocarpon hochstetteri, Rhizocarpon obscuratum, Rhizocarpon oederi, Rhizocarpon polycarpum, Rhizocarpon umbilicatum, Stereocaulon dactylophyllum, Stereocaulon leucophaeopsis, Stereocaulon pileatum, Thelidium aeneovinosum, Trapelia coarctata, Trapelia involuta, Tremolecia atrata, Umbilicaria cinereorufescens, Umbilicaria cylindrica, Umbilicaria crustulosa, Umbilicaria hirsuta, Umbilicaria leiocarpa, Umbilicaria nylanderiana, Umbilicaria polyphylla, Umbilicaria polyrrhiza, Umbilicaria torrefacta, Umbilicaria vellea* |
| H3.1b Temperate high mountain siliceous inland cliff | Siliceous (rich in quartz and silicate minerals such as mica, feldspar, biotite and hornblende) cliffs and walls of acid rock in the high mountains of the nemoral biogeographical zone. The most common kinds of siliceous rock are granite, gneiss and crystal schist, mostly of Palaeozoic age. Younger igneous-volcanic acid rocks such as quartz-porphyry also occur, for instance in the western central Alps. As gneiss and granitic rocks weather more slowly than calcareous rock, the vegetation of vascular plants in crevices and on ledges in the high mountains is less species-rich. Siliceous rock-faces, on the other hand, are richer in epilithic lichens. Lichens of crustose (*Acarospora*, *Haematomma*, *Lecanora*, *Lecidea* s.l., *Rhizocarpon*, *Sarcogyna*, *Schaereria*, *Sporastatia*) and foliose (*Parmelia* s.l., *Physcia*, *Umbilicaria*) growth form prevail. Endolithic lichens and micro-algae are other important components of siliceous rock biota. Siliceous rock-dwelling bryophytes of the temperate high mountains include chiefly acrocarpic mosses and hepatics, among others many species of *Grimmia*, *Racomitrium*, *Schistidium*, *Andreaea* and *Marsupella*. Bryophyte diversity and abundance is highest in fissures of wet rocks and on ledges with a thin humus layer. Among the vascular plants tufted or matted perennial herbs prevail; plants of rosulate or succulent growth form may be prominent. Species-rich genera of silicolous chasmophytes are *Saxifraga*, *Sempervivum*, *Primula*, *Phyteuma* and *Artemisia*. Alpine siliceous cliffs are generally less species-rich than calcareous cliffs of the high mountains. Nevertheless, several range-restricted taxa are confined to siliceous inland cliffs.  The habitat type occurs in the high mountains of nemoral Europe, chiefly in the Pyrenees, the Alps, the Carpathians and the Balkanic mountain ranges of Stara Planina (Balkan range), Rila and Rhodopes, and further east in the Caucasus.  Indicators of good quality:  High-mountain siliceous cliffs of the temperate zone are particularly rich in lichens and bryophytes, less so in vascular plants. It is therefore advisable to take cryptogram diversity into consideration when assessing the habitat quality of siliceous cliffs. Relict arcto-alpine and range-restricted taxa among both phanerogams and cryptogams are the most significant biological quality indicators.  The following characteristics may be used as indicators of favourable quality:   * Occurrence of rare species of lichens, bryophytes and phytogeographically significant vascular plant taxa, * Presence of sizable cliffs and large boulders with species-rich lichen crusts and bryophyte assemblages, with different aspects of rock-faces, different exposure, moisture and rock structures such as vertical rock faces, overhangs, cavities, rock shelters, and ledges * Contact with natural habitats such as screes, boulder fields and alpine grasslands * Absence of rock climbing facilities   Characteristic species*:*  Vascular plants: *Agrostis* *(rupestris*, *schraderiana*), *Alyssum repens*, *Androsace* (*alpina*, *vandellii*, *wulfeniana*), *Anthemis pindicola*, *Artemisia* (*genipi*, *glacialis*, *umbelliformis* subsp. *eriantha*, *umbelliformis* subsp. *umbelliformis*), *Asplenium septentrionale*, *Bupleurum stellatum*, *Campanula wanneri*, *Centaurea deustiformis*, *Dianthus* (*sylvestris*, *tristis*), *Draba dubia*, *Erigeron schleicheri*, *Eritrichium nanum*, *Erysimum rhaeticum*, *Hylotelephium anacampseros*, *Jacobaea incana* subsp. *carniolica*, *Minuartia cherlerioides* subsp. *rionii*, *Phyteuma* (*hemisphaericum*, *humile*, *scheuchzeri* subsp. *scheuchzeri*), *Poa laxa*, *Potentilla* (*doerfleri*, *haynaldiana*), *Primula* (*hirsuta*, *minima*)*,* *Saxifraga* (*aspera*, *bryoides*, *cotyledon*, *exarata*, *florulenta*, *juniperifolia*, *muscoides*, *pedemontana* subsp. *cymosa*, *pedemontana* subsp. *pedemontana*)*, Sempervivum* (*arachnoideum*, *grandiflorum*, *marmoreum*, *montanum*, *wulfenii*), *Silene* (*acaulis,* *dinarica*, *lerchenfeldiana*), *Veronica baumgartenii*, *Woodsia alpina*  Bryophytes: *Andreaea* (*rothii*, *rupestris*), *Diplophyllum taxifolium*, *Ditrichum zonatum*, *Dryptodon patens*, *Grimmia* (*affinis*, *alpestris*, *anomala*, *arenaria*, *caespiticia*, *curvata*, *donniana*, *elatior*, *elongata*, *funalis*, *incurva*, *muehlenbeckii*, *torquata*, *unicolor*), *Gymnomitrion concinnatum*, *Lophozia sudetica*, *Racomitrium* (*aquaticum*, *fasciculare*, *heterostichum*, *microcarpon*, *sudeticum*)  Lichens: *Acarospora* (*chlorophana*, *peliscypha*), *Catolechia wahlenbergii*, *Cornicularia normoerica*, *Dimelaena oreina*, *Ephebe lanata*, *Haematomma* (*ochroleucum*, *ventosum*), *Lecanora* (*bicincta*, *cenisia*, *frustulosa*, *intricata*, *lojkaeana*, *orosthea*, polytropa, *reagens*, *subcarnea*, *subplanata*, *swartzii*), *Lecidea* s.l. (*confluens*, *distans*, *garovaglii*, *griseoatra*, *leucophaea*, *mosigii*, *nigroleprosa*, *silacea*, *speirodes*, *umbonella*, *umbonata*), *Lepraria* (*latebrarum*, *membranacea*, *neglecta*), *Massalongia carnosa*, *Ophioparma ventosa*, *Orphiniospora moriopsis*, *Parmelia* s.l. (*conspersa*, *disjuncta*, *incurva*, *loxodes*, *mougeotii,* *omphalodes*, *panniformis*, *pulla*, *somloensis*, *sorediosa*, *stygia*, *verrucilifera*), *Placopsis* (*gelida*, *lambii*), *Pseudephebe* (*minuscula*, *pubescens*), *Ramalina capitata*, *Rhizocarpon* (*alpicola*, *atroflavescens*, *badioatrum*, *caeruleoalbum*, *carpaticum*, *distinctum*, *eupetraeum*, *geographicum*, *leptolepis*, *obscuratum*, *oederi*, *polycarpum*), *Sarcogyne clavus*, *Schaereria* (*cinereorufa*, *tenebrosa*), *Sphaeroporus fragilis*, *Sporastatia* (*polyspora*, *testudinea*), *Tremolecia atrata*, *Umbilicaria* (*cylindrica*, *crustulosa*, *hirsuta*, *polyphylla*, *polyrrhiza*, *subglabra*, *torrefacta*, *vellea*) |
| H3.1c Temperate, lowland to montane siliceous inland cliff | Siliceous (rich in quartz and silicate minerals such as mica or feldspar) rock walls and cliffs in the nemoral biogeographic domain except those in the high mountains and in the sea spray coastal zone. Siliceous cliffs consist chiefly of metamorphic more or less acid rocks such as slate, schist, gneiss and quartzite, sedimentary rock such as sandstone, or of igneous rocks such as granite, porphyry and diorite. Non-calcareous but more or less base-rich igneous volcanic rocks such as andesite, trachyte and basalt are also included. The vegetation in the rock fissures and crevices consists of vascular plants such as small ferns, succulents and rosulate herbs, on the rock surface also mosses and hepatics, crustose (e.g. *Aspicilia*, *Lecanora*, *Lecidea* s.l., *Lepraria*, *Pertusaria*, *Rhizocarpon*, *Rinodina*, *Trapelia*) and foliose lichens (e.g. *Parmelia* s.l. *Umbilicaria*), further epi- and endolithic micro-algae and other micro-organisms. *Asplenium*, *Dianthus*, *Saxifraga*, *Sedum* and *Silene* are important vascular plant genera in extra-alpine temperate siliceous cliffs. Among the mosses the genera *Hedwigia*, *Grimmia*, *Racomitrium* and *Schistidium* are particularly common on siliceous rocks, the latter three are species-rich.  Temperate lowland to montane siliceous cliffs are generally rather poor in plant species (but may be rich in lichens). The species composition depends on the biogeographic (thermic and oceanic) position, on rock type, humidity and water availability. Several species are considered glacial relicts.  The habitat type occurs throughout nemoral Europe from the British Isles and Northwest Spain to the Caucasus and the Ural Mountains and probably much further into Central Asia. It is particularly well-known in Galicia (Spain), the Massif Central, the slate-dominated suboceanic Rhenish Massif and generally in the Central European Uplands, where it is represented by gneiss and granitic rocks of the Rheno-Hercynian zone. The slate-dominated parts of the Carpathian Mountains are another main area of temperate montane siliceous cliffs.  Indicators of good quality:  Temperate lowland to montane siliceous cliffs is a habitat of high phytogeographical significance. Although not species-rich it harbours rare species and disjunct populations including many relict cryptogams of nordic-alpine distribution. There are also a few narrow endemics such as in the northwest Iberian Peninsula and in the Carpathians.  Habitat quality must be assessed at regional level and in view of the ecoregional variation. It is crucial to consider bryophytes and lichens. The occurrence of rare and relict species is a main criterion.  The following characteristics may be used as indicators of favourable quality:   * Occurrence of rare species of lichens, bryophytes, ferns and phytogeographically significant vascular plant taxa, * Presence of sizable open exposed rock and of different aspects of rock walls, different exposure to insolation, moisture and rock structures such as vertical rock faces, overhangs, cavities, rock shelters, and ledges * Contact with natural habitats such as screes, boulder fields, rock shrubs and pioneer grasslands * Absence of quarrying and control structures * Absence of garbage dumping and nutrient input from above the cliff * Absence of rock climbing facilities   Characteristic species*:*  Vascular plants: *Achillea chamaemelifolia, Asarina procumbens, Asplenium (adiantum-nigrum subsp. adiantum-nigrum, marinum, obovatum subsp. billotii, septentrionale, trichomanes subsp. trichomanes, x alternifolium), Aurinia saxatilis subsp. saxatilis, Coincya monensis subsp. cheiranthos, Centaurea (pectinata, prolongoi), Dianthus (graniticus, henteri, pyrenaicus subsp. attenuatus), Epilobium collinum, Hieracium schmidtii, Jovibarba heuffelii, Leucanthemum monspeliense, Minuartia recurva subsp. recurva, Polypodium vulgare, Primula minima, Saxifraga (hypnoides, paradoxa, rosacea subsp. steinmannii, rosacea subsp. sternbergii), Sedum (hirsutum subsp. hirsutum, stefco), Sempervivum calcareum, Sesamoides purpurascens subsp. suffruticosa, Silene (nutans subsp. dubia, rupestris), Veronica bachofenii, Woodsia ilvensis*  Bryophytes: *Bartramia halleriana, Bartramia pomiformis, Coscinodon cribrosus, Dicranum scoparium, Grimmia (affinis, arenaria, decipiens, donniana, hartmannii, laevigata, montana, muehlenbeckii, ovalis, trichophylla), Hedwigia (ciliata, integrifolia), Hypnum cupressiforme, Isopterygiopsis muelleriana, Isothecium alopecuroides, Metzgeria conjugata, Polytrichum piliferum, Ptychomitrium incurvum, Ptychomitrium polyphyllum, Racomitrium (affine, fasciculare, heterostichum, sudeticum), Rhabdoweisia (crenulata, crispata, fugax), Schistidium spp.*  Lichens: *Acarospora (paupera, tongletii), Aspicilia (cinerea, gibbosa, morioides, recedens, simoensis), Caloplaca (atroflava, crenularia, saxicola, subpallida), Calycium corynillum, Catillaria (atomarioides, chalybeia), Chrysothrix chlorina, Cornicularia normoerica, Diploschistes scruposus, Ephebe lanata, Fuscidia (austeri, kochiana), Haematomma ochroleucum, Lasallia pustulata, Lecanactis dilleniana, Lecanora (bicincta, cenisia, demissa, intricata, lojkaeana, orosthea, polytropa, rupicola, subcarnea, subplanata, swartzii), Lecidea (atomaria, erratica, fuliginosa, fuscoatra, griseoatra, lapidacea, leucophaea, variegatula), Lepraria (latebrarum, membranacea, neglecta), Leprocaulon microscopicum, Micarea (intrusa, subnigrata), Mosigia intercedens, Opegrapha (gyrocarpa, lithyrga, zonale), Ophioparma ventosa, Parmelia (conspersa, disjuncta, incurva, loxodes, mougeotii, omphalodes, panniformis, pulla, somloensis, sorediosa, stygia, verrucilifera), Pertusaria (corallina, excludens, flavicans, iridioides, lactea, leucosora, maculosa, oculata), Phylliscum demangeonii, Placopsis lambii, Porpidia (albocaerulescens, athroocarpa, glaucophaea, pseudomelinoides), Rhizocarpon (distinctum, eupetraeum, geographicum, hochstetteri, lecanorinum, obscuratum, polycarpum, viridiatrum), Rimularia insularis, Rinodina (aspersa, atrocinerea, interpolata, occulta), Schaereria tenebrosa, Sphaeroporus fragilis, Stereocaulon (dactylophyllum, evolutum, leucophaeopsis, vesuvianum), Thelidium rehmii, Trapelia (coarctata, involuta, mooreana, obtegens, placodioides), Tremolecia atrata, Umbilicaria (grisea, hirsuta)* |
| H3.1d Mediterranean siliceous inland cliff | Siliceous (rich in quartz and silicate minerals, such as feldspar or mica) rock walls and cliffs in the Mediterranean, with cliff-dwelling vascular plants (chasmophytes), bryophytes, lichens, epi- and endolithic micro-organisms. Siliceous cliffs chiefly consist of igneous rocks, such as granite, diorite and andesite, or of metamorphic rocks, such as gneiss, slate, schist and quartzite. The ability of plants to root in siliceous cliffs depends on the rock texture, schistosity, moisture content and chemistry. Perennial herbs prevail, many as cushion or rosulate plants, some are succulent. Other common chasmophytes are dwarf shrubs and small ferns. Well represented genera of vascular plants in siliceous inland cliffs all over the Mediterranean are *Asplenium*, *Hieracium* and *Saxifraga*.  Siliceous inland cliffs are less common in the Mediterranean than calcareous cliffs but also rich in rare and/or endemic plants. Plant communities are numerous and, like many of their species, frequently restricted to a single mountain range, larger islands or cliff systems. Overall variation in species composition follows chiefly phyto-geographical patterns and reflects evolutionary history.  Local variations are typically due to the rock type, exposition, moisture and cliff height. Many species are poor dispersers and plant communities require long time to establish. Most of the characteristic species are not found in anthropogenic habitats, such as walls.  Mediterranean siliceous inland cliffs occur in the western, southern, central and eastern parts of the Iberian peninsula, southern France, Corsica, Sardinia, Sicily, southern Italy, Albania, Greece, a few Aegean islands (e.g. Samothraki), and Mediterranean Turkey. Included are all levels from the Mediterranean coastal areas to the high mountains.  Indicators of quality:  Mediterranean siliceous inland cliffs harbour many local and regional endemics. Populations of such species indicate high habitat quality. As there is much regional variation in chasmophytic vegetation and species richness the habitat quality of a local cliff or cliff system must be seen in relation to the regional chasmophytic species pool: the higher the proportion, the better the quality. Cliff habitats are naturally protected due to their poor accessibility but they may be destroyed through rock control structures and quarrying. Abandoned siliceous quarries are generally, even after decades, much poorer in species and lower habitat quality compared to the natural cliffs.  The following characteristics may be used as indicators of favourable quality:  • Occurrence of a representative set of rare species, in particular narrow or regional endemics  • Presence of different aspects of rock walls, different exposure, moisture and rock structures such as vertical rock faces, overhangs, cavities, rock shelters, and ledges  • Contact with natural habitats such as screes, boulder fields, rock shrubs and pioneer grasslands  • Absence of quarrying and control structures  • Absence of garbage dumping and nutrient input from above the cliff  • Absence of rock climbing facilities  Characteristic species:  Vascular plants: *Alchemilla (crenulata, saxatilis, serratisaxatilis), Allosorus (hispanicus, tinaei), Androsace vandellii, Aquilegia bernardii, Armeria leucocephala, Asarina procumbens, Antirrhinum grosii, Asplenium (adiantum-nigrum, x alternifolium, foreziense, obovatum subsp. billotii, septentrionale, trichomanes subsp. trichomanes), Bufonia macropetala, Campanula samothracica, Castroviejoa frigida, Centaurea avilae, Centranthus nevadensis subsp. nevadensis, Cystopteris fragilis subsp. dickieana, Dianthus sylvestris (subsp. longicaulis, subsp. siculus), Draba (dubia, loiseleurii), Dryopteris pallida, Erigeron paolii, Erodium rupicola, Festuca sardoa, Hieracium (carpetanum, schmidtii subsp. graniticum), Hypericum cuisinii, Jasione crispa subsp. mariana, Leucanthemum (corsicum, monspeliense), Linaria capraria, Minuartia recurva su bsp. condensata, Murbeckiella boryi, Narcissus rupicola subsp. rupicola, Phyteuma serratum, Polygonum icaricum, Potentilla crassinervia, Saxifraga (genesiana, nevadensis, pedemontana subsp. cervicornis, pentadactylis subsp. almanzorii, pentadactylis subsp. willkommiana, sibirica, vayredana), Scabiosa corsica, Sempervivum minutum, Silene (boryi, foetida, requienii).*  Bryophytes: *Amphidium mougeotii, Bartramia pomiformis, Diplophyllum albicans, Grimmia (affinis, decipiens, donniana, hartmanii, laevigata, montana, ovalis, trichophylla), Hedwigia (ciliata, stellata), Isothecium alopecuroides, Metzgeria conjugata, Racomitrium (heterostichum, lanuginosum), Tritomaria quinquedentata.*  Lichens: *Acarospora (fuscata, gallica, macrospora, oligospora, nitrophila, umbilicata, versicolor), Aspicilia (cinerea, simoensis, recedens), Caloplaca (irrubescens, subpallida), Chrysothrix chlorina, Diploicia canescens, Diploschistes scruposus, Lecidea (speirodes, umbonata), Parmelia (mougeotii, verrucilifera), Pertusaria (excludens, flavicans), Rhizocarpon (distinctum, epipsilum, eupetraeum, geographicum, obscuratum, polycarpum), Rimularia insularis, Stereocaulon evolutum, Trapelia placodioides, Umbilicaria (grisea, polyrrhiza, subglabra).* |
| H3.2a Boreal and arctic base-rich inland cliff | These are vegetated cliffs of calcareous and other base-rich rocks found in the boreal and arctic biogeographical regions, in Iceland, Svalbard, the North Sea Island groups of the Hebrides, Shetlands and Faroes, Fennoscandia, and further in northern Russia. As extensive limestone mountains are almost absent in Northern Europe, base-rich cliff habitats are confined to areas of igneous bedrock and, locally, dolomitic rocks or calcareous siltstone and beyond, though the habitat type has a circumpolar distribution in the northern Palaearctic, it is fragmented for geological reasons.  It does not include cliffs in the immediate sea spray zone (in B3.1a) or ultramafic cliffs (in H3.2e).  Boreal and arctic base-rich cliffs are important habitats for low-competitive bryophytes, lichens and specialist vascular plants and from a phytogeographic and evolutionary point of view the boreal mountains and the arctic share interesting relict Arctic-alpine plants with the Alps and the Carpathians. Nordic cliffs are poor in vascular plants but species of the genera *Asplenium*, *Draba* and *Saxifraga* may be gregarious in sheltered humid places, the latter especially in the alpine belt. Regional and altitudinal variation in species composition is high but among vascular plants, *Asplenium viride, Woodsia glabella* and *Saxifraga nivalis* may be regarded as characteristic for the base-rich boreal cliffs of northern and eastern Fennoscandia, although *A. viride* also occurs in ultrabasic cliffs.  The bryophyte component of the vegetation may be species-rich particularly in sun-averted crevices and on damp rock and is best developed in oceanic areas such as in southwestern Norway and Iceland. Numerous acrocarpous moss genera and hepatics are represented, among others *Anoectangium*, *Didymodon*, *Encalypta*, *Grimmia*, *Gymnostomum*, *Gyroweisia*, *Leiocolea*, *Orthotrichum*, *Schistidium*, *Tortella*, and *Tortula* and among the most abundant and widespread bryophytes are *Distichium capillaceum, Ditrichum flexicaule, Encalypta streptocarpa* and *Tortella tortuosa.* Exposed rock faces may be covered by crustose lichens (e.g. *Acarospora*, *Caloplaca*, Collema, *Farnoldia*, *Thelidium*, *Polyblastia, Protoblastenia* and *Verrucaria*) and other epilithic organisms.  Indicators of good quality   * Occurrence of rare species of bryophytes, lichens and phytogeographically significant vascular plants, * Presence of sizeable open exposed rock with species-rich bryophyte carpets and lichen crusts * Variety of aspects of rock walls, exposure to insolation, moisture and rock structures such as overhangs, cavities, rock shelters, ledges * Contact with natural habitats such as screes, boulder fields and pioneer grasslands * Absence of quarrying and control structures * Absence of garbage dumping and anthropogenic nutrient input from above the cliff * Absence of rock climbing facilities * Absence of alien species   Characteristic species  Vascular plants: *Arabidopsis petraea, Arabis alpina, Arenaria norvegica subsp. norvegica, Asplenium ruta-muraria, A. scolopendrium, A. trichomanes subsp. quadrivalens, A. viride), Campanula rotundifolia, Cystopteris fragilis (subsp. fragilis, subsp. alpina, subsp. dickieana), Draba fladnizensis, D. incana, Poa glauca, Polypodium vulgare, Potentilla crantzii, Rhodiola rosea, Saxifraga adscendens subsp. adscendens, S. nivalis, S. paniculata, S. rivularis, Sedum spp., Viscaria alpina, Woodsia alpina*. Bryophytes: *Anoectangium aestivum, Anomodon spp., Barbula convoluta, Brachythecium glareosum, Bryoeryhtrophyllum recurvirostrum, Campyliadelphus chrysophyllus, Cnestrum alpestre, Conocephalum conicum, Ctenidium molluscum (esp. in the west), Didymodon icmadophilus, Distichium capillaceum, Ditrichum flexicaule, Encalypta affinis, Encalypta streptocarpa, Grimmia anodon, Gymnostomum aeruginosum, Gyroweisia tenuis, Homalothecium sericeum, Hypnum recurvatum, Isopterygiopsis pulchella, Leiocolea bantriensis, Leiocolea collaris, Leiocolea heterocolpos, Lophozia gillmanii, Lophozia heterocolpos, Mnium stellare, Myurella julacea, Neckera crispa, Orthothecium strictum, Orthotrichum anomalum, Plagiopus oederiana, Pohlia cruda, Preissia quadrata, Rhytidium rugosum, Saelania glaucescens, Sauteria alpina, Schistidium spp., Timmia austriaca, Timmia comata, Tortella tortuosa* Lichens: *Aspicilia calcarea, Aspicilia contorta, Acarospora heppii, Acarospora glaucocarpa, Acarospora macrospora, Caloplaca citrina, Caloplaca ruderum, Caloplaca saxicola, Collema cristatum, Farnoldia jurana, Farnoldia micropis, Farnoldia similigena, Gyalecta jenensis, Lecanora albescens, Lecanora dispersa, Lecanora crenulata, Lecidella stigmatea, Lepraria crassissima, Phaeophyscia nigricans, Physcia caesia, Protoblastenia calva, Protoblastenia incrustans, Rhizocarpon umbilicatum, Rinodina bischoffii, Sarcogyne pruinosa, Squamarina lentigera, Thelidium decipiens, Thelidium incurvatum, Thelidium papulare, Thelidium pyrenophorum, Toninia alutacea, Toninia candida, Verrucaria calciseda, Verrucaria nigrescens, Verrucaria foveolata.* |
| H3.2b Temperate high-mountain base-rich inland cliff | This habitat comprises calcareous or base-rich rock faces and crevices in at high altitudes of European mountain ranges in the temperate bioclimatic region. The chasmophytes, dwarf- and cushion-formed chamaephytes and hemicryptophytes, and numerous fern species and mosses, are very well adapted to the extreme habitat conditions, like strong solar radiation, a low water content, high day/night and seasonal temperature fluctuations, strong winds, and the absence of snow cover protection. The soil is in general very poorly developed, but in the crevices a small amount of fine soil may accumulate. Due to geographical isolation and variety in site conditions numerous relict, endemic, rare and protected species can be found on these cliffs.  Also the variation in species composition is high, resulting in a large number of alliances. In this habitat type we can find alliances from three orders*.* The *Potentilletalia caulescentis* comprises alliances of sunny rock faces and crevices. In the Central and Eastern Alps and in the Western Carpathians we find the alliance *Potentillion caulescentis,* in the Southern Alps the *Phyteumato-Saxifragion petraeae,* in the Maritime Alps the *Saxifragion lingulatae,* and in the Southern and Eastern Carpathians the *Gypsophilion petraeae.* On the Iberian Peninsula occur the alliances *Saxifragion mediae*, *Sedo albi-Seslerion hispanicae*, *Asplenio celtiberici-Saxifragion cuneatae, Jasionion**foliosae* and *Saxifragion camposii,* in the Apennines the *Saxifragion australis* and on the Balkan Peninsula the alliances *Micromerion croaticae* and *Edraiantho graminifolii-Erysimion comati.* The order *Violo biflorae-Cystopteridetalia alpinae* comprises chasmophytic communities on shaded calcareous rock faces and crevices. Here the variation is much less, and only the alliance *Amphoricarpion neumayeri* is included, occurring in the central and south-eastern Dinarides. Other alliances of this order are found in lower altitudes (habitat H3.2c). In the alpine belt of the south-central Balkan mountain ranges we can find chasmophytic vegetation of the alliance *Ramondion nathaliae* from order *Potentilletalia speciosae.*  Many endemic and legally protected species occur in this habitat. The main threats are air pollution, exploitation of limestone, intensive tourism (climbing), grazing, collecting of flowers, erosion, and natural destruction of the rocks.  Indicators of good quality: •    natural erosion processes, •    species richness of the cliffs and presence of the characteristic species, •    presence of habitat rare species, relict species and endemics.  Characteristic species:  Flora*: Achillea schurii, Agrostis schleicheri, Androsace cylindrica, A. helvetica, A. lactea, A. pubescens, Arabis serpyllifolia, A. stellulata, Artemisia eriantha, Asperula hirta, Asplenium celtibericum, A. viride, Athamantha cretensis, Avena setacea, Ballota frutescens, Bupleurum petraeum, Campanula cochleariifolia, C. tanfanii, Cystopteris fragilis, Draba aizoides, D. kotschyi, D. norvegica, D. sauteri, D. tomentosa, Festuca stenantha, Gypsophila petraea, Hieracium humile, Kernera saxatilis, Minuartia rupestris, Phyteuma charmelii, P. cordatum, Potentilla alchimilloides, P. caulescens, P. nebrodensis, P. nitida, P. nivalis, P. saxifraga, Primula allionii, P. latifolia, P. marginata, Ptilotrichum pyrenaicum, Ramonda myconi, Rhamnus pumila, Saxifraga aretioides, S. australis, S. callosae* ssp*. lingulata, S. longifolia, S. marginata* ssp*. rocheliana, S. media, S. moschata, S. mutata* spp*. demissa, Silene campanula, Silene pusilla, Thymus pulcherrimus, Trisetum bertolonii.* |
| H3.2c Temperate, lowland to montane base-rich inland cliff | This habitat type includes calcareous or base-rich rock faces and crevices in lowland to montane belts of European mountains in the temperate bioclimatic region.  Plant species growing on these rocks are adapted to extreme habitat conditions, such as strong solar radiation, a low water content, strong fluctuations in day/night and seasonal temperature, strong winds, absence of snow cover, and poorly developed soil. However, the conditions in lower altitudes are not as severe as in high altitudes (habitat H3.2b): radiation is lower, many species grow in more shady places, the fluctuation of temperature is not so extreme, and winds are less strong. Despite this, many endemic and rare species occur in these habitats.  On more sunny rocks we can find communities of the order *Potentilletalia* *caulescentis*, namely in the Central and Easter Alps and Western Carpathians from the alliance *Potentillion* *caulescentis* and in the Southern Carpathians from the *Micromerion* *pulegii.* On more shady rocks communities from the order *Violo* *biflorae-Cystopteridetalia* *alpinae* appear, in the Southern Dinarides the alliance *Edraianthion* and in the rest of Europe the alliance *Violo* *biflorae-Cystopteridion* *alpinae.*  Indicators of quality: Many endemic and legally protected species occur in this habitat. The main threats are air pollution, exploitation of limestone, intensive tourism (climbing), grazing, collecting of flowers, erosion, natural destruction of the rocks. The following characteristics may be considered as indicators of good quality: •    occurrence of natural erosion processes, •    species richness of the cliffs and presence of the characteristic species, •    presence of rare species at their typical frequency.  Characteristic species: Flora: *Vascular plants: Androsace lactea, Asplenium fontanum, A. ruta-muraria, A. scolopendrium, A. trichomanes, A. viride, Campanula cochlearifolia, C. cespitosa, C. rotundifolia, Cardaminopsis arenosa subsp. borbasii, Carex brachystachys, Ceterach officinarum, Cystopteris fragilis, Draba aizoides, D. norvegica, D. sauteri, Erinus alpinus, Hieracium amplexicaule, H. bupleuroides, H. humile, Globularia cordifolia, Kernera saxatilis, Moehringia muscosa, Polypodium interjectum, Potentilla caulescens, Rhamnus pumila,Valeriana montana, V. tripteris.* |
| H3.2d Mediterranean base-rich inland cliff | This habitat is composed of cliffs of limestone, calcareous conglomerates and other base-rich rocks in the Mediterranean, except if they are halophytic as a result of being under sea spray influence, with calcicole vascular plants, growing in fissures and crevices (chasmophytes), bryophytes, lichens and epi- and endolithic micro-organisms. The chasmophytic flora is diverse in composition and growth form; it consists mainly of perennial herbs, small ferns, dwarf shrubs, shrubs, tussock grasses, and sometimes woody climbers and small trees. Rosulate, prostrate, succulent and cushion are characteristic growth forms. Genera such as *Asplenium, Campanula, Centaurea, Hieracium, Saxifraga, Silene* and *Teucrium* are particularly species-rich and well represented in many Mediterranean regions. Cliff habitats are known to promote speciation and relict endemism through geographical isolation and long-term habitat continuity. Although not particularly rich in species per site (alpha diversity), relicts, as well as neo-endemisms, lead to an extraordinary regional and supra-regional diversity. The large number of floristically well-defined plant communities and alliances reflects these geographical and altitudinal patterns. Apart from the striking biogeographical variation, local-scale differences in species composition occur due to exposure, cliff topography, rock texture, mineral composition and humidity.  Mediterranean base-rich inland cliffs occur in most of the Iberian Peninsula (except the northern part), the Balearic islands, southern France, Corsica, Sardinia, Sicily, the Tyrrhenian coastal region with the islands, the Apennines, the Adriatic and Ionian coastal regions and islands, the southern Balkans (as far as Mediterranean climate is prevailing), the Aegean, Cyprus, further to Mediterranean Turkey (Anatolia) and the Mediterranean parts of Syria, Lebanon, Jordan and Israel, as well as to northern Africa (i.e. Cyrenaica in Lybia, Tunisia, Algeria and Morocco). Non-halophytic cliffs are present from sea-level up to the high mountains, exposed or sheltered, in ravines, gorges, precipices and summit areas. Ultramafic cliffs are included under habitat H3.2g, while halophytic coastal cliffs are included under habitat B3.1-3b.  Indicators of quality:  Mediterranean limestone cliffs are mostly natural habitats with only little or marginal human influence. Mediterranean cliffs support a characteristic chasmophytic flora rich in local and regional endemics. There are several examples of neo-endemics (Quaternary speciation) as well as paleo-endemics (Tertiary relics). The occurrence of rare and phytogeographically significant endemics indicates high quality. Since the chasmophytic flora varies much between areas, the quality of particular sites should be judged by the chasmophytes occurring in the site proportional to those in the wider area.  Cliff habitats are mostly inaccessible and as such to some extent they are naturally protected. Human impacts such as quarrying and rock control structures are tantamount to the destruction of the habitat. The following characteristics may be used as indicators of good quality:   * Occurrence of a representative set of rare species, in particular narrow or regional endemics * Presence of different aspects of rock walls, different exposure to insolation, moisture and rock structures such as vertical rock faces, overhangs, cavities, rock shelters and ledges * Contact with natural habitats such as extensive screes, rock shrubs and dry grasslands * Absence of limestone mining and quarrying * Absence of rock control structures * Absence of garbage dumping and nutrient input from above the cliff * Absence of rock climbing facilities   Characteristic species:  Vascular plants: *Achillea (ageratifolia subsp. aizoon, cretica, pindicola subsp. integrifolia), Aethionema (lycium, saxatile, schistosum, spicatum), Alchemilla ellenbergiana, Allium (antonii-bolosii, grosii), Allosorus (acrosticus, hispanicus, persicus), Alyssoides cretica, Alyssum (baeticum, cadevallianum), Amelanchier parviflora, Anogramma leptophylla, Antirrhinum (hispanicum subsp. mollissimum, microphyllum, pertegasii, pulverulentum, subbaeticum, valentinum), Anthriscus kotschyi, Arabis (alpina subsp. brevifolia, alpina subsp. caucasica, bryoides), Arenaria (balearica, cretica, deflexa, kotschyana subsp. kotschyana, pamphylica, tmolea, uninervia), Artemisia chamaemelifolia subsp. cantabrica, Asperula (arcadiensis, boissieri, boryana, paui subsp. dianensis, paui subsp. paui, pubescens, serotina, stricta subsp. grandiflora, tournefortii), Asplenium (aegaeum, ceterach, creticum, fissum, fontanum, lepidum subp. lepdium, lepidum subsp. haussknechtii petrarchae, ruta-muraria, sagittatum, seelosii subsp. glabrum, tadei, trichomanes), Asyneuma (compactum, linifolium subsp. linifolium, lycium), Athamanta vayredana, Aubrieta (canescens subsp. canescens, deltoidea, thessala), Aurinia (corymbosa, rupestris subsp. cyclocarpa, saxatilis subsp. orientalis), Bellium bellidioides, Biscutella frutescens, Brassica (balearica, cretica subsp. cretica, cretica subsp. aegaea, cretica subsp. laconica, cretica subsp. nivea), Bubon macedonicum, Bufonia calyculata, Bupleurum (barceloi, kakiskalae), Campanula (affinis, aizoon, celsii, cretica, cymbalaria, isaurica, laciniata, mollis, oreadum, pelviformis, rotundifolia subsp. hispanica, rupestris, rupicola, tubulosa, versicolor), Capparis orientalis, Cardamine plumierii, Carex rorulenta, Carum meoides, Centaurea (argentea, boissieri subsp. mariolensis, cariensis subsp. microlepis, clementei, drabifolia, lancifolia, mariana, ossaea, poculatoris, redempta, resupinata subsp. lagascae, rouyi, saxicola, segariensis), Centranthus ruber subsp. sibthorpii, Cephalaria squamiflora (subsp. balearica, subsp. mediterranea), Chaenorhinum (origanifolium subsp. cadevallii, origanifolium subsp. crassifolium, origanifolium subsp. origanifolium, origanifolium subsp. segoviense, tenellum), Chiliadenus glutinosus, Clinopodium (rouyanum, serpyllifolium subsp. fruticosum), Cosentinia vellea, Crepis (auriculifolia, triasii), Crocus cambessedesii, Cystopteris fragilis, Danthoniastrum compactum, Davallia canariensis, Dianthus (elegans, fruticosus, juniperinus, rupicola, xylorrhizus), Digitalis dubia, Doronicum cacaliifolium, Dorystaechas hastata, Draba (acaulis, lacaitae, lasiocarpa subsp. dolichostyla, scardica), Ebenus cretica, Erodium reichardii, Eryngium ternatum, Erysimum candicum, Euphorbia herniariifolia, Festuca pseudosupina, Ficus carica, Galatella cretica, Galium (canum, crespianum, degenii, erythrorrhizon, fruticosum subsp. ephedroides, fruticosum subsp. fruticosum, graecum), Geranium glaberrimum, Globularia majoricensis, Gnaphalium leucopilinum, Gypsophila montserratii, Helichrysum (crassifolium, heldreichii, melitense, orientale), Helictochloa crassifolia, Hieracium (amplexicaule, arragonense, bourgaei subsp. baeticum, candidum, elisaeanum, humile, laniferum, lawsonii, loscosianum, mixtum, pannosum, sartorianum, scapigerum, texedense), Hippocrepis (balearica, valentina), Hirtellina (fruticosa, lobelii), Hormathophylla reverchonii, Hypericum (aciferum, amblycalyx, jovis, origanifolium, taygeteum), Iberis gibraltarica, Inula (candida, heterolepis, methanaea, oxylepis, parnassica, pseudolimonella, verbascifolia), Jacobaea gnaphalioides, Jankaea heldreichii, Jasione foliosa, Lactuca acanthifolia, Lafuentea rotundifolia, Laserpitium petrophilum, Lepidium villarsii subsp. anticarium, Linaria (anticaria, cavanillesii, verticillata), Linum arboreum, Lomelosia (albocincta, crenata, cretica, hymettia, minoana, variifolia), Macrotomia densiflora, Melica rectiflora, Michauxia tchihatcheffii, Micromeria (filiformis, myrtifolia), Minuartia valentina, Moehringia intricata (subsp. castellana, subsp. intricata, subsp. tejedensis), Myosotis speluncicola, Narcissus calcicola, Naufraga balearica, Nepeta (concolor, phyllochlamys), Odontites linkii, Omphalodes luciliae subsp. cilicica, Onobrychis sphaciotica, Onosma graeca, Origanum dictamnus, Papaver rupifragum subsp. rupifragum, Petrorhagia dianthoides, Petromarula pinnata, Phagnalon (rupestre subsp. graecum, sordidum), Poa cenisia, Polypodium (cambricum subsp. cambricum, interjectum, vulgare), Potentilla (caulescens subsp. caulescens, caulescens subsp. nebrodensis, deorum, kotschyana, pulvinaris, speciosa), Pseudoscabiosa (grosii, saxatilis), Ptilostemon chamaepeuce, Ramonda myconi, Ranunculus (creticus, weyleri), Rhamnus (alpina subsp. fallax, libanotica, pumila, sibthorpiana), Rosularia (libanotica, serrata), Rubia angustifolia, Rupicapnos africana subsp. decipiens, Sanguisorba (ancistroides, cretica, rupicola), Sarcocapnos (baetica subsp. baetica, baetica subsp. integrifolia, crassifolia subsp. speciosa, enneaphylla subsp. saetabensis, pulcherrima), Satureja parnassica, Saxifraga (biternata, bourgaeana, camposii, corsica subsp. corsica, corsica subsp. cossoniana, cuneata, exarata, federici-augusti subsp. grisebachii, fragilis subsp. fragilis, fragilis subsp. paniculata, glabella, granatensis, kotschyi, latepetiolata, longifolia subsp. longifolia, losae, luteoviridis, marginata, moncayensis, paniculata, porophylla, reuteriana, rigoi, scardica, sempervivum, sibthorpii, spruneri, taygetea), Scorzonera cretica, Scrophularia (depauperata, heterophylla, kotschyana, libanotica), Scutellaria sieberi, Securigera globosa, Sedum (dasyphyllum subsp. dasyphyllum, dasyphyllum subsp. glanduliferum, dasyphyllum subsp. granatense, magellense), Selaginella denticulata, Sempervivum marmoreum, Senecio castagneanus, Sesleria (doerfleri, insularis), Sibthorpia africana, Sideritis (glauca, perfoliata, stachydioides), Silene (andryalifolia, auriculata, boryi, congesta, gazulensis, gigantea, hifacensis, leptoclada, mollissima, odontopetala, parnassica, pusilla, saxifraga, tomentosa), Solenopsis balearica, Stachys (candida, chrysantha, parolinii, spreitzenhoferi, swainsonii), Staehelina petiolata, Symphytum creticum, Tanacetum (argenteum subsp. canum, argenteum subsp. flabellifolium, armenum), Teucrium (aroanium, buxifolium subsp. buxifolium, cuneifolium, fragile, francisci-werneri, freynii, halacsyanum, hifacense, intricatum, rivasii, rivas-martinezii, rotundifolium subsp. rotundifolium, thymifolium), Thymus richardii (subsp. ebusitanus, subsp. richardii), Trisetum velutinum, Umbilicus (horizontalis, luteus, rupestris), Valeriana (apula, asarifolia, longiflora, sisymbriifolia, speluncaria, tripteris), Verbascum (arcturus, pestalozzae), Veronica (bellidioides subsp. lilacina, kotschyana), Viola (chelmea, herzogii, parnonia, perinensis, poetica).*  Bryophytes: *Anoectangium aestivum, Anomodon viticulosus, Didymodon vinealis, Brachythecium glareosum, Brachythecium laetum, Bryum elegans, Ctenidium molluscum, Distichium capillaceum, Ditrichum flexicaule, Distichium inclinatum, Encalypta streptocarpa, Encalypta vulgaris, Frullania tamarisci, Gymnostomum calcareum, Grimmia anodon, Grimmia capillata, Grimmia crinita, Grimmia orbicularis, Grimmia teretinervis, Grimmia tergestina, Gymnostomum aeruginosum, Gymnostomum viridulum, Gyroweisia tenuis, Homalia trichomanoides, Homalothecium lutescens, Homalothecium philippeanum, Homalothecium sericeum, Isothecium myosuroides, Leiocolea collaris, Mnium marginatum, Mnium stellare, Myurella tenerrima, Neckera complanata, Neckera crispa, Orthotrichum anomalum, Orthotrichum cupulatum, Plagiochila exigua, Plagiochila spinulosa, Porella platyphylla, Pseudoleskea incurvata, Pseudoleskeella catenulata, Pterogonium gracile, Reboulia hemisphaerica, Schistidium apocarpum, Schistidium brunnescens, Schistidium crassipilum, Seligeria calcarea, Targionia hypophylla, Timmia bavarica, Tortella tortuosa, Tortula calcicolens, Tortula crinita, Tortula muralis, Tortula norvegica, Tortula ruralis, Trichostomum crispulum.* |
| H3.2e Boreal ultramafic inland cliff | Boreal ultramafic inland cliffs are habitats which host unique serpentine plant communities. The concept *ultramafic* refers to rock types that have a low content of silica and rather high content of magnesium and iron. This kind of rock, in particular serpentinite, produces extreme edaphic conditions with low calcium-to-magnesium ratio, severe scarcity of essential nutrients such as nitrogen, potassium, and phosphorus, and often also high levels of heavy metals such as nickel, chromium or cobalt. As a consequence of these chemical conditions, vegetation is often very scarce with large spots of bare rock. As an adaptation to harsh environment some species have developed morphological features of dry site plants.  Some plants have adapted to these harsh conditions. In the Boreal region, this group includes *Arenaria pseudofrigida, Asplenium adulterinum, A. viride, Cerastium alpinum, C. fontanum* ssp. *vulgare*, *Dianthus superbus, Minuartia biflora, Sagina nodosa* and *Viscaria alpina* var. *serpentinicola.* In addition to these special plants, some common plants also grow in serpentine environments, e.g. *Calluna vulgaris, Juniperus communis, Deschampsia flexuosa, Festuca ovina* and *Sedum telephium.*  Bryophyte and lichen communities of serpentine cliffs often show a special mixture of calciphilous and other species. Typical bryophytes include *Campyliadelphus chrysophyllus, Encalypta streptocarpa, Sanionia uncinata, Schistidium apocarpum* coll., *Tortella tortuosa* and *Weissia controversa*, but in contrast to calcareous cliffs they do not form luxuriant turfs. Both bryophyte and lichen vegetation cover is generally lower than on other kinds of rocks and large areas on rock walls are entirely unvegetated.  The relationship between serpentine plant communities and rock types is under discussion. All ultramafic rock types do not host distinct serpentine plant communities. For example, communities on unchanged peridotite usually resemble those of ordinary siliceous cliffs more than serpentine cliffs.  Ultramafic cliffs with serpentine plant communities occur from the lowlands of eastern Finland to the middle alpine zone of the Scandinavian mountains. Two vegetation types have been recognized: the more widespread *Asplenium viride – Arenaria norvegica–*type (with a variant without *A. norvegica* in the eastern parts of the region) and the oceanic *Asplenium adulterinum*–type.  Indicators of good quality:   * bedrock intact (no quarrying) * presence of natural disturbance regime (relevant especially in forested areas: forest fires are prevented, which means that vegetation coverage is slowly increasing; on the other hand, intensive forestry and particularly clearcutting causes abrupt changes in microclimate, which destroy plant communities adapted to stable humid conditions) * absence of alien species   The species diversity varies enormously also in entirely natural communities in cliff habitats. Usually, the smallest rock formations with monotonous microtopography and little variation in rock types show low diversity, whereas larger cliff complexes with heterogeneous geomorphology and varying rock types may represent local biodiversity hotspots. Therefore, low species diversity or absence of rare species should not be interpreted by itself as an indicator of low habitat quality, unless it is caused by anthropogenic influence.  Characteristic species:  Flora:  Vascular plants: *Agrostis stolonifera, Arenaria humifusa, A. norvegica, A. pseudofrigida, Asplenium adiantum-nigrum, A. adulterinum, A. trichomanes, A. viride, Calluna vulgaris, Campanula rotundifolia, Cardaminopsis petraea, Cerastium alpinum* and its subspecies, *C. fontanum* var. *kajanense, C. nigrescens* subsp. *nigrescens,* *Festuca ovina, Juncus trifidus, Luzula spicata, Minuartia biflora, M. rubella, Molinia caerulea, Rumex acetosa* var. *serpentinicola, Silene dioica, S. uniflora, Trichophorum caespitosum, Viscaria alpina* var. *serpentinicola* (=*Silene suecica var. serpentinicola*).  Bryophytes: *Brachythecium velutinum, Bryum nitidululm, Campyliadelphus chrysophyllus, Ditrichum flexicaule, Encalypta streptocarpa*, *Sanionia uncinata, Schistidium apocarpum* coll., *Tortella tortuosa*, *Weissia controversa, Zygodon* spp.  Lichens: Lichens of serpentine cliffs are not well known in the Boreal zone. These species were found to be characteristic in the Finnish studies of serpentine cliffs:  *Calvitimela aglaea, Fuscopannaria leucophaea, Micarea erratica, Miriquidica complanata, Phaephyscia endococcina, Physconia muscigena, Protopannaria pezizoides.*  Additionally on slightly more calcareous serpentine cliffs: *Botryolepraria lesdainii, Caloplaca obliterans, Candelariella vitellina, Fuscopannaria praetermissa, Heterodermia speciosa, Physcia tenella, Physconia perisidiosa, P. detersa, Protoparmeliopsis muralis, Ramalina pollinaria, Xanthoparmelia somloënsis, Xanthoria elegans* |
| H3.2f Temperate ultramafic inland cliff | This habitat occurs on southern, south-eastern and south-western slopes, from lowland to alpine belts, on bare ultramafic (e.g. serpentine) cliffs and rocks covered by shallow soil. The ultramafic rocks are ophiolitic, the content of calcium and silica is very low, but they contain high concentrations of aluminium, iron, magnesium, nickel, cobalt and chromium. The pH varies from basic to ultra-basic (5.5-8). The fluctuation of temperature, heat and drought is an important ecological factor.  The vegetation cover is low, consisting mainly of annuals, grasses and several fern species, which are adapted to the ultramafic conditions. The flora contains some rare and endemic species. The communities of this habitat are classified within the alliance *Asplenion serpentini* (order *Asplenietalia septentrionalis*) in Central Europe, and *Ramondion nathaliae* (*Potentilletalia speciosae*) in the south-central Balkan. The endemic and relict species *Ramonda nathaliae* is a typical chasmophyte which primarily grows on limestone rocks, but in the central part of Macedonia it can be found also on serpentine and siliceous rocks.  Communities on ophiolitic rocks are also found in the Western Alps (France, Italy and Switzerland) and in the Apennines. Ophiolitic cliffs are local phenomena and occur in restricted mountainous areas of those regions. *Carex fimbriata, Noccaea alpestris* subsp. *sylvium*, and *Cardamine plumieri* are three species occurring almost exclusively in sub- and alpine communities on ophiolitic substratum (cliffs, rock outcrops and open grasslands). *Carex fimbriata* is endemic to the Western Alps and the Apennines. Those communities have not been distinguished from other sub- and alpine alliances (cliffs*: Potentillion caulescentis*, *Violo-Cystopteridion* or *Androsacion vandelii*).  The main threats of the ultramafic rocks are mining, erosion processes, grazing, and fires.  Indicators of quality:   * species richness of the cliffs and presence of the characteristic species, * presence of rare and endemic species.   Characteristic species:  Flora  Vascular plants: *Asplenium adulterinum, A. alternifolium, A. cuneifolium, A. trichomanes, A. septentrionale, Alysum murale, Asyneuma limonifolium, Campanula rotundifolia, Cardamine plumieri, Carex fimbriata, Cistus incanus, Dorycnium herbaceum, Festuca pallens, Halacsya sendtneri, Minuartia hybrida, M. viscose, Noccaea alpestris subsp. sylvium, Notholaena marantae, Onosma echioides, Polypodium vulgare, Potentilla mollis, Silene flavescens, Thlaspi praecox.*  Mosses: *Brachythecium velutinum, Frullania dilatata, Homalothecium sericeum, Hypnum cupressiforme, Polytrichum piliferum* |
| H3.2g  Mediterranean ultramafic inland cliff | Ultramafic (igneous and mostly igneous-metamorphic rock with high magnesium and iron content) rocks and cliffs in the Mediterranean with few vascular plant species and cryptogams growing in rock fissures and crevices. The cliffs may be textured as ophiolite or like a breccia. Many ophiolites are built of ultramafic rocks such as peridotite and, after transformation, serpentinite. The high magnesium and iron content, and the frequently elevated amounts of chromium and nickel are toxic to most plants. Due to this unmitigated toxic effect only few adapted plants are able to grow on ultramafic cliffs.  The vegetation is mainly composed of small ferns of the genera *Allosorus* and *Asplenium*, together with *Paragymnopteris marantae* and others. The plant composition is unique. It consists of highly specialised species and rare ecotypes of more common and widespread species. Plant cover is low.  Mediterranean ultramafic cliffs, though widely distributed, are local phenomena and occur in restricted hilly and mountainous areas of the Iberian Peninsula, southern France, Corsica, Sardinia, Sicily, Italian Peninsula, western and southern Balkans, Aegean, Cyprus, Mediterranean Turkey (Anatolia) and northern Africa (Cyrenaica, Tunisia, Algeria, and Morocco).  Indicators of quality:  The vegetation of Mediterranean ultramafic cliffs consists chiefly of highly specialised ferns and other plants (serpentinophytes). Any of these, and sometimes their hybrids, indicate favourable habitat quality. Although cliff habitats generally enjoy protection through inaccessibility, quarrying destroys the habitat and its populations of specialised plants. While most serpentinophytes are restricted largely to primary cliff habitats, some, such as *Paragymnopteris marantae* and a few bryophytes, occur occasionally on abandoned gravel heaps. The following characteristics may be used as indicators of favourable quality:   * Occurrence of rare species, in particular serpentinophytes, * Presence of different aspects of rock walls, different exposure, moisture and rock structures such as rock shelters and ledges * Contact with natural habitats such as serpentine screes and dry metal-rich grasslands * Absence of mining and quarrying * Absence of rock control structures and garbage dumping   Characteristic species:  Vascular plants: *Allosorus guanchicus, Allosorus pteridioides, Asplenium balearicum, Asplenium foreziense, Asplenium obovatum, Cosentinia vellea, Paragymnopteris marantae, Pellaea calomelanos, Rosularia serpentinica, Viola sandrasica*  Bryophytes: *Coscinodon cribrosus, Mielichhoferia mielichhoferiana*  Lichens: *Acarospora sinopica, Lecanora (epanora, handelii, subaurea), Lecidea silacea, Rhizocarpon (furfurosum, oederi, ridescens), Scoliciosporum umbrinum, Stereocaulon nanodes* |
| H3.3 Macaronesian inland cliff | Perennial vegetation of rock walls not under the influence of sodium chloride of maritime origin. The habitat includes an enormous diversity of plant communities that, in turn, include several hundreds of *taxa* endemic to Macaronesia. The main large groups, that we consider as subtypes within H3.3,  are: i) plant communities dominated by succulent rosetted chamaephytic *crassulaceae* (*Aeonium, Aichryson, Greenovia and Monanthes*) of rock surface or crevices, endemic to the Canaries and Madeira ( *Greenovio-Aeonietea* vegetation class). Although a few taxa reach the Azores archipelago (e.g. *Aichryson*), this vegetation type is not recognized there; ii) communities of shady, humid, earthy, rock wall surfaces dominated by ferns and mosses (*Anomodonto-Polypodietea* vegetation class); iii) plant communities strictly of rock wall crevices directly exposed to rainfall, made up of  a great diversity of habitat-specialists, both pteridophytes and vascular plants (*Asplenietea trichomanis* vegetation class); iv) semi-nitrogen prone vegetation of rock wall crevices, including artificial old walls and buildings, dominated by hemi-criptophytes and chamaephytes (*Parietarietea judaicae*). The later, in spite of cosmopolitan distribution includes some endemic elements in Macaronesia. The subtypes thus considered are:  1.       Succulent rosette *crassulaceae* vegetation of the Canaries and Madeira. (i) This subtype has an enormous diversity and endemicity (see flora). Alliances included are *Soncho acaulis-Aeonion* (all canarian archipelago); *Greenovion aureae* (western Canaries); *Aichryso monanthi-Monanthion laxiflorae* (canarian and madeiran archipelagos, one taxon (*Aichryson villosum*) reaches the Azores but it belongs to subtype #2 there; *Sinapidendro-Aeonion glutinosi* (madeirean only).  2.       Brio-pteridophytic shady earthy rock wall, seldom epiphytic communities of Canaries, Madeira and Azores. (ii) This subtype shares some flora with exclusively epiphytic communities (*Hymenophylion thumbrigensis*) which is not considered here. Canaries, Madeira and Azores.  The alliances included are: *Barthamio-Polypodion*, *Sellaginelo-Annogramion leptophyllae* and *Thelypterido-Woodwardion* of wet walls with large ferns.  3.       Exposed rock wall crevices vegetation of the Canaries and Madeira. (iii) One alliance only: *Cheilanthion pulchellae* of xerophytic and termophyllous mafic rock crevices.  4.       Semi nitrogen-prone wall vegetation. (iv) *Parietario-Galion*, *Cymbalario-Asplenion* and *Asplenion maritimi* alliances are present. All archipelagos.  Indicators of good quality:  Physiognomical integrity and presence of local/regional bioindicator sets should be maximal. Disturbance regimes, mostly soil/rock removal or removal of protective arboreal vegetation, for shade, in the case of subtype #2 are indicative of collapse/loss of ecological quality. Nitrogen-prone rock vegetation, *i.e* subtype #4 tends to dominate if disturbance increases. Sometimes type F6.8a ( macaronesian halo-nitrophyllous tender- leaf shrubs) can also tend to invade the habitat under disturbance.  Characteristic species:  *Flora*  Vascular plants:  Subtype #1[the majority of characteristic *taxa*, but not the exhaustive list of all taxa to be found in the habitat]:  *Aeonium holochrysum, Aeonium smithii, Aeonium spathulatum, Aeonium urbicum, Andryala varia, Arabis caucasica, Ceterach aureum, Ceterach aureum var. parvifolium, Festuca agustini, Habenaria tridactylites, Hypericum reflexum, Monanthes muralis, Monanthes subcrassicaulis, Pericallis lanata, Rhamnus integrifolius, Senecio palmensis, Silene berthelotiana, Sonchus acaulis, Sonchus gummifer,Tinguarra cervariaefolia, Tolpis lagopoda, Aeonium balsamiferum, Aeonium canariense,Aeonium castello-paivae, Aeonium cuneatum, Aeonium decorum, Aeonium gomeraense, Aeonium goochiae, Aeonium haworthii, Aeonium hierrense, Aeonium lancerottense, Aeonium manriqueorum, Aeonium mascaense, Aeonium nobile, Aeonium palmense, Aeonium percarneum, Aeonium rubrolineatum, Aeonium saundensii, Aeonium sedifolium, Aeonium subplanum, Aeonium tabulaeforme, Aeonium undulatum, Aeonium valverdense, Aeonium vestitum, Aeonium virgineum, Aeonium viscatum, Aeonium xburchardii, Aichryson bethencourtianum, Aichryson bollei, Aichryson brevipetalum, Allagopappus viscosissimus, Chrysoprenanthes pendula, Crambe arborea, Crambe laevigata, Crambe scaberrima, Dendriopoterium menendezii, Greenovia dodrentalis, Hypochoeris oligocephala, Micromeria teneriffae, Minuartia platyphylla, Parietaria filamentosa, Phyllis viscosa, Polycarpaea carnosa, Salvia broussonetii, Sedum lancerottense, Sonchus congestus, Sonchus radicatus, Sonchus tectifolius, Sonchus tuberifer, Tolpis crassiuscula, Vieraea laevigata, Aeonium simsii, Babcockia platylepis, Greenovia aizoon, Greenovia aurea, Greenovia diplocycla, Silene pogonocalyx, Tolpis calderae, Aichryson bituminosum, Aichryson inmaculatum, Aichryson laxum, Aichryson pachycaulon, Aichryson parlatorei, Aichryson punctatum, Aichryson tortuosum, Monantheds adenoscepes, Monanthes amydros, Monanthes anagensis, Monanthes brachycaulon, Monanthes icterica, Monanthes laxiflora, Monanthes lowei, Monanthes pallens, Monanthes polyphylla, Aeonium glandulosum, Aeonium glutinosum, Aeonium x meyerheymii, Andryala crithmifolia, Crepis andryaloides, Galium productum, Matthiola maderensis, Micromeria thymoides subsp. thymoides var. cacuminicolae, Monizia edulis, Musschia aurea, Plantago leiopetala, Saxifraga maderensis var. maderensis, Saxifraga maderensis var. pickeringii, Sedum brissemoretii, Sedum farinosum, Sedum fusiforme, Sedum nudum, Sinapidendron angustifolium, Sinapidendron frutescens, Sinapidendron gymnocalyx, Sinapidendron rupestre, Sonchus ustulatus subsp. maderensis, Sonchus ustulatus subsp. ustulatus, Tolpis macrorhiza, Aichryson divaricatum, Aichryson dumosum, Aichryson villosum, Monanthes lowei*  Subtype 2#  *Davallia canariensis, Polypodium interjectum, Polypodium macaronesicum, Polypodium azoricum, Polypodium cambricum, Polypodium x fontqueri, Sellaginela denticulata, Asplenium hemionitis, Saxifraga portosanctanae, Annogramma leptophylla, Cystopteris viridula, Woodwardia radicans, Cystopteris diaphana, Sellaginela azorica, Thelypteris pozoi, Asplenium monanthes*  Subtype #3  *Asplenium adiantum-nigrum, Asplenium septentrionale, Asplenium trichomanes subsp. trichomanes, Asplenium trichomanes subsp. maderensis, Cheilanthes acrostica, Cheilanthes tinaei, Cosentinia vellaea subsp. bivalens, C. vellaea subsp. vellaea, Cheilanthes guanchica. Cheilantes maderensis, Notholaena marantae subsp. maranthae, Adiantum reniforme subsp. pusillum, A. reniforme subsp. reniforme, Asplenium aethiopicum subsp. aethiopicum, Asplenium aethiopicum subsp. braitwaitii, Asplenium monanthes, Cheilanthes pulchella, Notholaena maranthae subsp. cupripaleacea, Notholaena maranthae subsp. subcordata.*  Subtype #4.  Macaronesian endemics: *Tolpis suculenta*, *Hypericum* x *inodorum*, *Ceterach lolegnamense, Sonchus ustulatus* subsp. *maderensis*, *Sonchus ustulatus* subsp. *ustulatus*; most frequent dominant cosmopolitans: *Anthirrhinum majus, Chelidonium majus, Cymbalaria muralis, Cyrthomium falcatum, Erigeron karvinskianus, Parietaria judaica, Sonchus tenerrimus, Asplenium trichomanes subsp. quadrivalens, Trachelium caeruleum, Asplenium marinum, Centranthus ruber, Hyoscyamus albus, Umbilicus rupestris*.  Mosses (any subtype):  *Bartamia stricta, Exormotheca pustulosa, Pterogonium gracile, Reiboulia hemisphaerica, Frullania polistycha, Porella canariensis, Frullania microphylla, Corcenia coriandrena, Targionia hypophylla* (incomplete). |
| H3.4 Wet inland cliff | Plant species growing on wet cliffs are exposed to very specific ecological conditions. They occur on north-faced, very damp, dripping, overhanging or vertical calcareous rocks, in shady places. Species are mainly hygrophytic and shade-resistant. Communities are rich in ferns and mosses, on the more constantly watered places also green and blue-green algae occur. The habitat is strongly depending on the period of watering and appears on very small areas.  The habitat is found in temperate and in Mediterranean regions. In many sites, the areas of the habitat are very small and isolated. Wet cliffs of the Macaronesian islands are considered under habitat H3.3.  Indicators of good quality:  Main threats are various human activities that change the water regime.  The following characteristics may be considered as indicators of good quality:   * species richness of the cliffs and presence of the characteristic species * presence of habitat rare species at their typical frequency * constant supply of water   Characteristic species*:*  Vascular plants: *Adiantum capillus-veneris, Alchemilla glabra, Asplenium scolopendrium, A. viride, Aurinia saxatilis, Blackstonia perfoliata, Borago pygmaea, Brachypodium sylvaticum, Carex brachystachys, C. distans, Cystopteris alpina, C. fragilis, Dianthus nitidus, Dittrichia viscosa, Eupatorium cannabinum, Ficus carica, Hypericum hircinum, H. nummularium, Moehringia muscosa, Mycelis muralis, Phegopteris connectilis, Phyllitis scolopendrium, Pinguicula grandiflora* subsp. *coenocantabrica*, *Pinguicula hirtiflora*, *Pinguicula longifolia*, *Pinguicula mundi*, *Pinguicula vallisneriifolia*, *Polypodium interjectum*, *Samolus valerandi*, *Saxifraga paniculata*, *Viola palustris*.  Bryophytes: *Conocephalum conicum, Eucladium verticillatum, Palustriella commutata* (*=Cratoneurum commutatum*)*.* |
| H3.5a Limestone pavement | Limestone pavements are geomorphological landscapes resulting from dissolution processes exerted on hard limestone tables probably formed by glacial erosion. They consist of usually gently-sloping platforms with blocks of limestone separated by a network of vertical fissures. The size, shape and regularity of the blocks vary according to the local features of the bedrock and of the climate, but the regular mosaic of contrasting microhabitats is a common feature to all limestone pavements. This unit has a purely geomorphologic definition. It occurs from sea level up to 3000 m  in the Alps and extends to a wide range including different karstic regions of Europe, where it receives different local names: lapiaz, karren, limestone pavement, alvar. This specific geomorphology is apparently linked to glacial origins. Karstic outcrops occurring in the Mediterranean region are often less typical. Only large tabular surfaces showing typical dissolution features come into consideration for habitat H3.5a. The rock surface of the pavement is almost devoid of soil, with a resulting vegetation cover well under 30%. Spots of thin soil allow locally the presence of drought-resistant communities: cushions of lichens and bryophytes, fragments of dry tufted grasslands.  Most of the vascular plants root in the fissures, where rubble and fine sediment, including aeolian and organic matter, accumulate, sometimes also the long-weathered remnants of pre-Quaternary deposits. These fissures (called grikes or Kluftkarren) offer a sheltered microclimate, favoring ferns and macroforb communities; heath and scrub can also occur (wooded pavements belong to other units). Espaliered plants, with their stems expanding at the rock surface, are also a typical component of the mosaic but exposure to wind and grazing by wild herbivores or farm stock may limit expansion of vegetation from the fissures.  According to the diversity of climates encountered in the large range of this unit, the floristic composition is variable and not very helpful for the identification: the communities occurring in the pavement mosaic are not the same in the Alps as in Britain. Anyway, none of those communities is unique to limestone pavements. What is characteristic is the pattern of contrasting microhabitats, and the resulting mosaic of small patches of different vegetation types.  Indicators of good quality: Typical limestone pavements are large and uniformly level, sub-horizontal tables of blocks made of unfragmented frost-resistant hard stone. The vegetation covers less than 30%. Trees are absent or very scattered. Limestone outcrops of small extent (less than 1000 m2) or not showing the typical pattern are excluded. This habitat does not recover after quarrying and other extractive activities.  Characteristic species: Flora The flora varies greatly according to the climate of the region and the exact conformation of the limestone surface. |
| H4.1 Snow pack | Snow packs are immobile near-permanent habitats that may persist in the limit of perpetual snow, in particular in avalanche corridors. However, they are susceptible to disappear completely during hot summers, thus excluding accumulation of ice. In spite of the extreme conditions of the habitat, some organisms do grow in this hostile habitat. This is the case of several cryosestonic unicellular algae, whose proliferation gives a reddish or greenish colour to snow packs. Some animals complete part of their life cycle on melting snow, e.g. chip snow (*Boreus hyemalis*, a Mecoptera) and several Coleoptera and Diptera, where they feed of pollen grains, frozen insects, etc. In Fennoscandia, reindeer gather on snow pack areas for the hottest summer days. Snow pack habitats are found mainly in high altitudes or latitudes. In Europe, the summits of the Alps, the Pyrenees, the Scandes, the Carpathian range, Balkan mountains and the Caucasus are concerned, as well as the arctic regions.  Indicators of good quality:  Quality indicators are difficult to propose for this habitat. Animal species cited below could be candidates.  Characteristic species:  Flora  Algae: *Chlamydomonas nivalis, Chrococcus sp.pl., Chlorogonium elongatum, Chloromonas alpine, Chloromonas brevispina, Chloromonas nivalis, Chloromonas pichinchae, Chloromonas platystigma, , Haematococcus pluvialis, Koliella nivalis, Koliella tatrae,*  *Prasicola crispa, Stichococcus baciliaris, Trebouxia arboricola, Trebouxia jamesii*  Fungi: e.g. *Selenotila nivalis*  Fauna  *Ascoliocerus hyperboreus* (Elateridae), *Oreonebria bremii* (Carabidae), *Boreus hyemalis* (Mecoptera) |
| H4.2 Ice cap and glacier | Glaciers are permanent or near-permanent ice masses, created by the compaction of the snow accumulated in cold climates. These deposits, when they are under pressure, behave like a viscous liquid. So, a glacier is a mobile element, because of its ability to slowly flow along a slope under the effect of gravity. Different types of glacier exist. Characteristic for the arctic regions, ice sheets and ice caps are dome-like ice masses unconstrained by topography. More characteristic of the large mountain ranges, but also present in the arctic regions, most glaciers are constrained by topography. This is the case for cirque glaciers, valley glaciers, mountain glaciers and piedmont glaciers. The smallest form of glacier is derived from snow-drifting, avalanches, or ice deposition in cold-bottom karst dolines. Called glacierets, these small ice masses may have an existence limited to a few years. They are especially sensitive to global warming of the climate. Climate change may cause variations in both temperature and snowfall, causing changes in the surface mass balance. Due to the extreme conditions of this habitat, especially at low temperatures, very few organisms occur in this environment, which could almost be considered sterile. Only some unicellular algae occasionally grow on the melting snow cover of glaciers during summer. These ice formations are found in high altitude or high latitude. In Europe, they occur only in the summit region of the Alps, the Pyrenees, the Scandes, and in the arctic regions.  Indicators of good quality:   * Long-term balance between accumulation of ice and melting (crucial for sustainable surviving of glaciers), usually expressed as “mass balance” or “surface mass balance” (SMB) and in this way used as a sensitive climate indicator for glaciers.   Characteristic species:  Flora, Algae: *Chlamydomonas nivalis* |
| H4.3 Rock glacier and unvegetated ice-dominated moraine | As indicated by its name, a rock glacier is a mixture of frozen rock detritus and ice. It takes the form of a lobate, spatulate or tongue-like mass of angular boulders, behaving as a lava flow, due to the presence of internal ice that flows very slowly under gravity forces. This movement is 100 to 1000 times slower than in a true glacier. The origin of ice of rock glaciers can be glacial or periglacial; thereby, rock glacier occurs also when permafrost (frozen soil) creeps downslope during thaw periods. This habitat type is endangered by the global warming of the climate. Moraines are glacially formed accumulations of unconsolidated mineral debris. Ice-dominated moraines occur in the vicinity of retreating glaciers. Few organisms have the ability to colonize these particular habitats, because of the low temperatures and the mobility of the substrate. The flora is limited to pioneer plants, lichens and some vascular plants, occurring principally on the lateral and terminal borders of the rock glacier. Active rock glaciers have a very low vegetation cover, while inactive or relict ones are characterized by higher covers (>70%). The diversity of the fauna increases with the vegetation cover; it includes Collembola, spiders, Homoptera, Diptera, parasitoid wasps, ground beetles and aphids. These ice-rich formations are found in altitude or in high latitudes. In Europe, they occur only in the high mountain regions of the Alps, the Pyrenees, the Scandes, and in the arctic region.  Indicators of good quality:  Independently of the poverty of the flora and fauna of this habitat, quality can be estimated by the degree of activity of the rock glacier. An active rock glacier moves because it has ice-rich frozen debris and its internal temperature is low. Inactive and fossil rock glaciers haven’t coherent ice-core and stop moving.  Characteristic species:  Algae: *Chlamydomonas nivalis*  Lichens: *Cetraria islandica, Rhizocarpon geographicum*  Vascular plants: *Androsace alpina, Arabis alpina, A. caerulea, Artemisia mutellina, Cardamine resedifolia, Cerastium uniflorum, Erigeron uniflorus, Gentiana bavarica, Geum reptans, Leucanthermopsis alpina, Linaria alpina, Oxyria digyna, Poa alpina, P. laxa, Prizelago alpina, Ranunculus glacialis, Salix herbacea, S. retusa, Saxifraga, bryoides, S. exarata, S. oppositifolia, S. seguieri, Sibbaldia procumbens*  Fauna: Collembola, Homoptera |
| H5.1a Fjell field | This habitat occurs on mountain summits, ridges and slopes of the mountains in the boreal zone. Herb layer is sparse and short, including graminoids such as *Carex bigelowii, Deschampsia flexuosa, Festuca ovina* agg. and *Juncus trifidus*, dicot herbs *Hieracium alpinum* agg. and *Lychnis alpina*, and dwarf shrubs such as *Arctostaphylos alpina, A. uva-ursi, Empetrum nigrum* agg. and *Loiseleuria procumbens.* The vegetation is dominated by fruticose lichens, especially those of the genera *Cladonia* (*Cladina*) and *Cetraria* (incl. *Flavocetraria*), and bryophytes.  This vegetation is distributed in the alpine belt of the Scandinavian mountains and also at lower altitudes in northern Scandinavia and Scotland. It is confined to convex landforms affected by strong winds, which blow off snow and fine soil particles. Therefore the vegetation is exposed to winter climatic extremes, which are tolerated only by arctic-alpine cryptograms and a few adapted species of vascular plants. Soils are shallow, stony and often affected by cryoturbation. They are drier than soils in other landforms of arctic and alpine landscapes, poor in nutrients, with low microbial activity, and usually – but not always – acidic.  Compared to the polar deserts (type H5.1b) the summer temperatures on fjell fields are higher. The volcanic sparsely vegetated ash fields of Iceland are included as a separate, somewhat similar type as well (habitat H5.1c). Besides, similarities exist with tundra vegetation dominated by Racomitrium species in the arctic region. In the temperate mountains of Europe this kind of sparsely-vegetated summits in most cases are part of the mountain grassland communities on siliceous substrates (habitat E4.3b) or calcareous substrates (habitat E4.4a, E4.4b), or may be considered under limestone pavements (habitat H3.5a).  Indicators of good quality:  This is natural vegetation occurring mostly in remote areas which are under limited human influence. It is generally rather stable. Locally these habitats can be overgrazed by reindeer. The following characteristics can be considered as indicators of good quality:   * No signs of overgrazing * No disturbance by man * Presence of thick lichen carpets   Characteristic species:  Vascular plants: *Antennaria alpina* subsp. *borealis, Arctostaphylos alpinus, A. uva-ursi, Carex bigelowii, Deschampsia flexuosa, Diapensia lapponica, Empetrum nigrum* agg., *Festuca ovina* agg., *Hieracium alpinum* agg., *Juncus trifidus, Loiseleuria procumbens, Luzula spicata, Lychnis alpina*  Bryophytes: *Dicranum elongatum, D. fuscescens, Gymnomitrion coralloides, Polytrichum juniperinum, P. piliferum, Prasanthus suecicus, Racomitrium lanuginosum*  Lichens: *Alectoria ochroleuca, A. nigricans, Bryocaulon divergens, Cetraria cucullata, C. islandica, C. nivalis, Cladonia amaurocraea, C. coccifera, C. gracilis, C. mitis, C. rangiferina, C. stellaris, C. uncialis, Stereocaulon paschale, Thamnolia vermicularis* |
| H5.1b Polar desert | Polar deserts comprise stone- and gravel-dominated areas north of or at elevations above the Arctic tundra zone where the vegetation cover is fragmentary owing to low temperatures and where woody plants and sedges are lacking. This is a circumpolar arctic habitat type that has in common with the ‘true deserts’ that precipitation is extreme low (< 200 mm yearly) and the vegetation growth period is very short. Around the Isfjord on Svalbard, an area very positively affected by the north atlantic current, the growing season for example is about 40-50 days. The habitat is characterized by extreme low summer temperatures (< 2 °C mean summer temperature, considered as the most important abiotic factor), shallow soils over permafrost (which is instable due to cryoturbation, causing honeycomb soil patterns), and little relief (resulting in low snow cover). Polar deserts consist of fine to medium coarse substrates resulting from frost weathering processes with particle sizes ranging from silt to gravel and stones. The sediment in most sites is calcium-rich, but acidic bedrock may occur as well. Polar deserts are restricted to continental areas influenced by cold sea currents from the Arctic Ocean.  The habitat has in general a very low vegetation cover (1-10%) or is in some areas completely free of plants. Species characteristic for Polar deserts are *Cerastium nigrescens* subsp. *arcticum*, *C. regelii*, *Draba pauciflora, Luzula confusa, Papaver dahlianum*, *Phippsia algida,* *Saxifraga hyperborea* and *S. oppositifolia*, which usually grow scattered. In between mosses and crustose lichens may be found in rock crevices; these are mainly wide-spread species. Locally, plant cover in Polar deserts may be increased owing to favourable abiotic conditions. For instance, at sites better protected from wind and frost, species like *Stereocaulon rivulorum* and *Phippsia algida* may be abundant. Increased nutrient input in areas colonized for long time by reindeer, like on the plateaus of Edgeøya, may enable an increased growth of byrophyte mats dominated by *Tomentypnum nitens*. Such areas, although in the climatic region of the polar desert, are considered Moss tundra habitat (F1.2). Some of the polar desert species (*Luzula confusa*, *Papaver dahlianum*, *Phippsia algida*) also grow in slightly warmer climates, in habitats with little competition with other species.  Polar deserts are typically found in the flat or slightly undulating lowlands and on mountain plateaus of eastern and northern Svalbard, and on glacier free parts of the Russian islands in the Barents Sea (Franz-Jozef-Land, Victoria islands and Nowaja Semlja). The mountains of these regions may have a similar plant species composition on scree habitats (type H2.1, H2.1). Moreover, Polar deserts occur all over Svalbard at elevations above 200 to 500 m a.s.l.  A difference with Moss and lichen tundra (F1.2) is the general lack of typical tundra species (e.g. *Carex* spp.) including woody species (e.g. *Salix* spp., *Dryas octopetala* and *Silene acaulis*)*.*  **Indicators of good quality**:  This is natural vegetation occurring in remote areas which are under limited human influence. It is generally rather stable, but may be threatened by global warming.  The following characteristics can be considered as indicators of good quality:   * Long-term stability of low vegetation cover * Abundance of species sensitive to changes in soil moisture and temperature (like *Draba adamsii*, *Cerastium regelii*, *Saxifraga hyperborea*) * Absence of long living and slow colonizing species indicating global warming, like *Silene acaulis*, *Dryas octopetala*, *Salix polaris* and *Festuca rubra* ssp. *richardsonii*   **Characteristic species:**  ***Flora***  Vascular plants: *Alopecurus alpinus*, *Cerastium nigrescens* subsp. *arcticum*, *Cerastium regelii*, *Draba adamsii*, *Draba corymbosa, Draba pauciflora, Luzula confusa, Papaver dahlianum (= P. polare)*, *Phippsia algida*, *Poa arctica*, *Ranunculus sabinii*  (Russia), *Saxifraga cespitosa, Saxifraga hyperborea, Saxifraga oppositifolia*  Mosses:  *Andreaea blyttii, Andreaea rupestris, Aulacomnium palustre, Aulacomnium turgidum, Bryocaulon divergens, Dicranoweisia crispula, Dicranum elongatum*, *Drepanocladus cossonii, Orthothecium chryseon, Polytrichum spp*., *Sanionia uncinata, Tomentypnum nitens*  Lichens: *Alectoria ochroleuca, Allantoparmelia alpicola, Cetraria nivalis, Lecanora ssp., Lecidea ementiens, Ochrolechia frigida, Rhizocarpon spp., Stereocaulon rivulorum, Umbilicaria proboscidea, Usnea sphacelata* |
| H5.1c Subarctic volcanic field | The habitat covers sparsely vegetated volcanic areas in subarctic and arctic regions of Europe. It includes active volcanos, recently formed lava streams, and older lava fields and rocks, as well as volcanic slopes and plains with sparse vegetation. It is a relatively broad defined type, but in its distribution it is rather limited to a small part of Northern Europe. The habitat is found on large parts of the central highland of Iceland, almost everywhere where the volcanos and rocks are not covered by glaciers, and also in lowlands. Besides it covers small parts of the Norwegian arctic island Jan Mayen, in places where lava fields have been only sparsely colonized.  The central Icelandic highland has a naturally sparse vegetation cover, due to erosion by wind and rain. Here, on old lava soils, sparsely vegetated fields dominate with stony, gravelly, coarse-sandy, sometimes slightly loamy black soil, with spread pebbles and rocks. These gravel fields are called *melar* in Icelandic. They are well-drained, nutrient-poor and desiccate quickly due to wind and strong heat on sunny days. The dry conditions in these ‘edaphic deserts’ cause erosion of soil by wind, which prevents development of higher vegetation cover. Only few vascular plants are resistant to the harsh environment, mainly hemicryptophytic species. Examples are *Silene acaulis*, *Armeria maritima*, *Agrostis vinealis*, *Cerastium alpinum*, *Thymus arcticus*, *Festuca pruinosa* (= *F. rubra* s.l.), *Poa glauca* and *Cardaminopsis* *petraea*. Cryptogams are relatively rare and occur with low cover. Snow cover on wind-exposed fields is low, but in sheltered depressions transitions to snow beds occur, with higher vegetation cover and species of the alliance *Salicion herbacea*. Where soils are more stabilised lichens and mosses have higher cover and transitions towards heathlands occur. The typical plant community on these gravel fields is the association *Armerio-Silenetum acaulis*, which is classified in the alliance *Veronico-Poion glaucae*. This alliance is sometimes placed in the grassland class *Koelerio-Corynephoretea*, sometimes under the *Sedo-Scleranthetea*.  Relatively recent lava fields are colonized by lichens only, including species of *Stereocaulon* (S. denudatum), *Pletigera malacea*, *Cladonia* spp (*C. mitis*, *C. rangiformis*, *C. uncialis*, *C. coccifera*) and *Alectoria ochroleuca*. Further succession leads to *Racomitrium* dominated habitats, included under Moss and lichen tundra (F1.2).  Habitat H5.1c is also related to Fjell fields (H5.1a), which is also a sparsely vegetated habitat. This however is a (sub)alpine temperate and boreal mountain habitat, found in most cases on siliceous bedrock (acidic soil). In most Fjell fields lichens and mosses play an important role.  Indicators of good quality:   * Long-term stability of patches with extreme low vegetation cover * No dominance of mosses * Low cover of pioneer lichens   Characteristic species:  Flora, Vascular plants: *Agrostis vinealis, Arenaria norvegica*, *Armeria maritima, Cardaminopsis petraea*, *Cerastium alpinum*, *Luzula spicata*, *Lychnis alpina*, *Oxyria digyna*, *Poa glauca, Saxifraga oppositifolia*, *Silene acaulis, Thymus arcticus*. |
| H6.1 Mediterranean and temperate volcanic field | The habitat includes permanent habitats occurring on the volcanic areas of the Mediterranean and Macaronesian regions, and - very rarely - in temperate parts of Europe. The plant communities of such environments are typically characterized by pioneer, floristically poor and endemic-rich bio-coenoses. Soils are very primitive, eroded and, as such, they reflect with unusual fidelity the chemical composition of the bedrock. The severe ecological conditions hamper the development of soils, and hence the habitat usually looks very stony, with a feeble accumulation of finer particles wherever conditions become slightly better.  Intense solar radiation, remarkable daily temperature variations, long lasting snow-cover, and mechanical disturbances caused by strong winds are usual conditions for this habitat type. Vegetation typically is scattered and discontinuous with very low cover values (<25%), chiefly dominated by few, relic vascular plants. Large areas are completely unvegetated or only occupied by a cryptogamic vegetation. The most frequent vascular plants are *Cerastium tomentosum, Anthemis aetnensis, Scleranthus vulcanicus, Rumex aetnensis, Senecio aethnensis, Saponaria sicula, Viola cheirantifolia, Silene nocteolens,* and *Argyranthemum tenerifae*. Bryophytes (e.g*. Isopterygium tenerum, Campylopus pilifer, C. introflexus, Calymperes erosum*, etc.) and lichens (e.g. *Stereocaulon vesuvianum, Xanthoparmelia conspersa,* etc.) are widely spread.  These habitats are found on recently deposited volcanic scoriae (tephra), lava flows or orifices in volcanic areas emitting hot gases and vapours of Italy (Tuscany, Sicily, Latium and Campania), and the Canary Islands. At lower altitudes or where ecological conditions are more suitable, they are dynamically connected with the hemicrypto-chamaephytic plant communities dominated by dwarf, thorny, cushion-like species and/or grasses. Furthermore, they may be contiguous to the phanaerophytic communities chiefly dominated by conifers (e.g. *Pinus* sp. pl., *Juniperus* sp. pl., etc.). The great phytogeographical and scientific value of these habitats is given by the high number of relic, mostly endemic, taxa. Outside the Mediterranean and Macaronesian region, some marginal (unvegetated) sites are found in the temperate parts of Europe, like in Romania. Subarctic volcanic features on Iceland are considered under habitat H5.1c.  Indicators of quality:  Natural vegetation chiefly occurring in hostile areas not or slightly affected by human activities, as touristic facilities (e.g. skiing areas, etc.). It is generally rather stable, but local surface area variations linked to the volcanic activity may occur.  Indicators of good quality are:   * occurrence of rare, endemic and phyto-geographically significant plants * no disturbance by hiking, skiing activities, roads, etc. * contacts with other natural habitats such as cliffs, mountain woodlands, etc.   Characteristic species:  Vascular plants: *Cerastium tomentosum, Anthemis aetnensis, Scleranthus vulcanicus, Rumex aetnensis, Senecio aethnensis, Saponaria sicula, Viola cheirantifolia, Silene nocteolens, Argyranthemum tenerifae, Agrostis canina ssp. monteluccii, A. castellana*  Bryophytes: *Isopterygium tenerum, Campylopus pilifer, Campylopus introflexus, Calymperes erosum, Racomitrium lanuginosum, Racomitrium canescens, Bryum pallens, Ceratodon purpureus*  Lichens: *Stereocaulon vesuvianum, Xanthoparmelia conspersa* |
| I1.3 Arable land with unmixed crops grown by low-intensity agricultural methods | This habitat includes arable fields managed using low-intensity agricultural techniques with occurrence of rare native or archaeophyte weed species, survivors of a farming style that has existed in Europe since the Neolithic. The most common crops of such fields have been cereals including *Avena* *sativa, Hordeum vulgare, Triticum aestivum, T. turgidum* and *Secale cereale,* managed without herbicides, without application of non-organic fertilizers and often without irrigation systems. They were originally sown manually, which resulted in more patchy distribution of crop plants than when mechanical sowing is used, thus leaving space for the development of weeds and the crop seeds were often contaminated with weed seed.  Traditionally managed rain-fed fields have been preserved especially in the mountainous areas of the Mediterranean and although they are no longer profitable for corn production, they are still used locally for planting winter cereals as a source of fodder for livestock. Wheat is the most common crop but rotation with other cereals is common. Such fields are small in size, often located on terraces and are ploughed and sown in autumn and, when the crop biomass increases, they are either grazed or mown for hay. The fields are rich in low-competitive winter-annual weed species which reach their peak of biomass development in spring. Their species composition differs considerably from the irrigated Mediterranean fields, which are rich in weeds that germinate only in warmer periods in spring and reach their phenological optimum in summer or autumn. The latter also contain many more neophytes.  Outside the Mediterranean, the traditionally managed low-intensity fields are much rarer . They occur locally especially on soils with limited water-storage capacity such as on limestone slopes or on sandy plains but most arable fields in such unproductive environments have been abandoned during the last decades. Also here, cereals are the most common crop in such low-intensity farming systems as survive. Wherever low site fertility does not allow the development of dense stands of the crop and the use of herbicides is limited, species-rich weed communities including several archaeophytes of the Mediterranean and Near East origin may develop. Some of these weed species were relatively common until the first half of the 20th century, but they declined dramatically due to agricultural intensification including the use of herbicides, chemical fertilizers, improved seed-cleaning methods, sowing highly productive and competitive varieties of cereals, and removal of refugial habitats in the landscape due to merging of small fields into large ones. Nowadays in many cases, species-rich weed communities only occur in narrow stripes along field margins that are not treated with herbicides or in restoration initiatives.  Indicators of good quality:  ·      Occurrence of rare or declining, native or archaeophytic weed species  ·      Low incidence of neophytic weeds  ·      No use of mineral fertilizers  ·      No or limited use of herbicides  ·      No irrigation in dryland areas  Characteristic species*:*  Vascular plants: *Adonis aestivalis, A. flammea, Agrostemma githago, Ajuga chamaepitys, Allium nigrum, Alopecurus myosuroides, Anagallis arvensis, Anthemis altissima, Aphanes arvensis, A. australis, Arnoseris minima, Asperula arvensis, Bifora radians, B. testiculata, Bupleurum rotundifolium, Caucalis platycarpos, Centaurea cyanus, Chrysanthemum segetum, Conringia orientalis, Euphorbia exigua, Galium tricornutum, G. verrucosum, Gladiolus italicus, Hypecoum procumbens, Hypochaeris glabra, Legousia speculum-veneris, Lilium bulbiferum, Lithospermum arvense, Lolium rigidum, L. temulentum, Medicago polymorpha, Muscari comosum, Nigella arvensis, Papaver argemone, P. hybridum, P. rhoeas, Ranunculus arvensis, Raphanus raphanistrum, Reseda phyteuma, Rhagadiolus stellatus, Roemeria hybrida, Scandix pecten-veneris, Silene gallica, Stachys annua, Teesdalia nudicaulis, Thymelaea passerina, Turgenia latifolia, Veronica agrestis, V. triloba, Vicia sativa* |