4 Forests

41 Broad-leaved deciduous forests

Forests and woodland of native deciduous trees, other than floodplain or mire woods; forests dominated by broad-leaved deciduous trees, but comprising broad-leaved evergreen trees, are included.

41.1 BEECH FORESTS

Forests dominated by *Fagus sylvatica* or, in Greece, *F. orientalis* or *F. moesiaca*. Many montane formations are beech-fir or beech-fir-spruce forests, to be noted as 43 (mixed forests), but with the suffixes below; they are discussed with the corresponding deciduous forest.

41.11 CENTRAL EUROPEAN ACIDOPHILOUS BEECH FORESTS WITH WOODRUSH *LUZULO-FAGENION*

Medio-European beech and, in higher mountains, beech-fir or beech-fir-spruce forests on acid soils, with *Luzula luzuloides, Polytrichum formosum*, and often *Deschampsia flexuosa, Vaccinium myrtillus, Pteridium aquilinum.*

(Noirfalise, 1956, 1984, 1986, 1987; Vanden Berghen and Mullenders, 1957; Roisin, 1962; Ellenberg, 1963, 1988; Oberdorfer, 1967, 1990; Noirfalise and Vanesse, 1977; Renault, 1978; Ozenda, 1979, 1985; Ozenda *et al.*, 1979; Petermann and Seibert, 1979; Timbal, 1981; Thill *et al.*, 1988)

41.111 Collinar woodrush beech forests

Beech forests of the lesser Hercynian ranges and Lorraine, never accompanied by spontaneous conifers.

41.112 Montane woodrush beech forests

Beech, beech-fir or beech-fir-spruce (43.112) of the greater Hercynian ranges, the Jura, the Alps and the Bavarian Plateau.

41.1121 Bayerischer Wald woodrush beech forests

Near-natural forests of the Bayerischer Wald.

41.1122 Semi-natural montane woodrush beech forests

Other formations.

41.12 ATLANTIC ACIDOPHILOUS BEECH FORESTS

Ilici-Fagenion

Atlantic forests on acid soils, differing from 41.11 by the absence of *Luzula luzuloides* and a greater abundance of *Ilex aquifolium.*

(Tüxen and Oberdorfer, 1958; Roisin, 1961; Hofmann, 1966; Braun-Blanquet, 1967a; Durin *et al.*, 1967; Baudière, 1974a; Bugnon and Rameau, 1974; Clément *et al.*, 1974; Frileux, 1974; Géhu, 1974; Ozenda, 1979, 1985; Ozenda *et al.*, 1979; Aaby, 1983; Noirfalise, 1984, 1986, 1987; Coquillard *et al.*, 1985; Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Vigo and Ninot, 1987; Izco Sevillano, 1987; Peinado Lorca and Martinez Parras, 1987; Rivas-Martinez *et al.*, 1987; Oberdorfer, 1990; Rodwell, 1991)

41.121 North Sea acidophilous beech forests

Periclymeno-Fagetum, Ilici-Fagetum, Milio-Fagetum, Fago-Quercetum p.

Fragmented and insularized forests of the western seaboard of Europe, in Denmark, northern Germany, The Netherlands, middle Belgium, Picardy, Normandy and southern England.

41.122 Sub-Atlantic acidophilous beech forests

Deschampsio-Fagetum i.a.

Transition forests of the Paris basin, the Morvan, the periphery of the Central Massif, the eastern and central Pyrenees.

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41.123 Armorican acidophilous beech forests
Rusco-Fagetum
Hyper-Atlantic forests of Brittany with an abundance of epiphytes and an understorey of ferns and evergreen bushes.

41.124 Pyreneo-Cantabrian acidophilous beech forests
Saxifrago hirsutae-Fagetum
Humid forests with luxuriant epiphytism of the western Pyrenees and eastern Cantabrian mountains.

41.125 Western Cantabrian acidophilous beech forests
Luzulo henriquesii-Fagetum
Humid acidophilous beech forests of western Cantabrian and Asturian mountains.

41.126 Galician acidophilous beech forests
Luzulo henriquesii-Fagetum mercurialetosum perennis
Humid beech forests of high, snowy dolomitic and calcareous sierras of Galicia (Ancares, Cebreiro, Caurel), somewhat intermediate between unit 41.12 and unit 41.13.

41.127 Humid Iberian acidophilous beech forests
Galio rotundifolii-Fagetum p.
Humid acidophilous beech forests of the northern Iberian Range.

41.128 Hyper-humid Iberian acidophilous beech forests
Ilici-Fagetum
Hyper-humid acidophilous beech forests of the northern Iberian Range.

41.129 Ayllon acidophilous beech forests
Galio rotundifolii-Fagetum p.
Relict acidophilous beech forests of the Sierra de Ayllon (Montejo, Puerto de la Quesera, Cantalojas).

41.13 NEUTROPHILOUS BEECH FORESTS
Asperulo-Fagenion (Galio odorati-Fagenion)
Medio-European and Atlantic forests, on neutral or near-neutral soils, with mild humus (mull), characterized by a strong representation of species belonging to the ecological groups of *Anemone nemorosa*, of *Lamium galeobdolon*, of *Galium odoratum* and *Melica uniflora* and, in mountains, various *Dentaria*, forming a richer and more abundant herb layer than in 41.11 and 41.12.
(Vanden Berghen and Coûteaux, 1955; Noirfalise, 1962, 1984, 1986, 1987; Noirfalise and Sougnez, 1963; Ellenberg, 1963, 1988; Sougnez, 1967; Dethioux, 1969; Coûteaux, 1969; Renault, 1978; Rogister, 1978, 1981; Ozenda, 1979, 1982, 1985; Bournérias, 1979; Petermann and Seibert, 1979; Ozenda *et al.*, 1979; Timbal, 1981; Oberdorfer, 1990; Rodwell, 1991)

41.131 Wood melick beech forests
Melico-Fagetum, Asperulo-Fagetum, Cardamino bulbiferae-Fagetum, Hordelymo-Fagetum, Lathyro-Fagetum
Medio-European collinar beech and beech-oak forests of the Hercynian arc and peripheral regions, the Jura, Lorraine, the Paris basin, Burgundy and a few localities of the North Sea-Baltic plain.

41.1311 Calcicline wood melick beech forests
Slightly-moist beech forests developed over calcareous bedrock on stony, neutral or weakly acid rendzina or similar humus-carbonate soils, with *Galium odoratum, Melica uniflora, Mercurialis perennis, Lathyrus vernus, Asarum europaeum, Hordelymus europaeus, Epipactis helleborine, E. leptochila, Neottia nidus-avis, Circaea lutetiana, Viola reichenbachiana.*

41.1312 Neutrocline wood melick beech forests
Beech forests developed on a more or less deep layer of brown loess-loam, less rich in calciphile plants and richer in acid- and drought-tolerant species; *Melica uniflora* (in northern formations) and *Galium odoratum* are usually well represented; *Carex brizoides, C. pilosa, Milium effusum* are characteristic of various subtypes.

41.132 **Bluebell beech forests**
Endymio-Fagetum
Atlantic beech and beech-oak forests with *Hyacinthoides non-scripta*, of southern England, the Boulonnais, Picardy, the Oise, Lys and Schelde basins.

41.1321 **Calcicline bluebell beech forests**
Atlantic beech, beech-oak or beech-ash forests developed on base-rich and calcareous soils, particularly of limestone scarplands, of southern Engalnd *(Fagus sylvatica-Mercurialis perennis* woodland) and neighbouring regions of western France.

41.1322 **Neutrocline bluebell beech forests**
Atlantic beech and beech-ash forests developed on neutral or slightly acid brown soils of southern England *(Fagus sylvatica-Rubus fruticosus* woodland) and adjacent regions of the mainland.

41.133 **Bittercress beech forests**
Lonicero alpigenae-Fagenion: Abieti-Fagetum, Dentario enneaphyllidi-Fagetum, Aposeri-Fagetum, Dentario heptaphyllidi-Fagetum, Cardamino trifoliae- Fagetum
Montane beech or beech-fir (43.133) formations of the Jura, the northern Alps and the great Hercynian ranges.

41.14 PYRENEO-CANTABRIAN NEUTROPHILE BEECH FORESTS
Scillo-Fagenion
Neutrophile beech forests of the south-western Central Massif, the Pyrenees, the Cantabrian mountains, and, very locally, the northern Iberian Range.
(Tüxen and Oberdorfer, 1958; Braun-Blanquet, 1967a; Vanden Berghen, 1969; Dendaletche, 1973; Gruber, 1978; Ozenda, 1979, 1985; Bernard, 1983; Rivas-Martinez *et al.*, 1984; Dupias, 1985; Noirfalise, 1986, 1987; Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Vigo and Ninot, 1987; Bolos y Capdevila, 1987)

41.141 **Hygrophile Pyrenean beech forests**
Scillo-Fagetum p.
Humid montane beech and beech-fir (43.141) forests on neutral soils with mild humus (mull) of the western Pyrenees, characterized by the vernal bloom of *Scilla lilio-hyacinthus* and *Lathraea clandestina* and by a summer cover rich in ferns (*Athyrium filix-femina, Gymnocarpium dryopteris, Asplenium scolopendrium, Dryopteris spp., Polystichum spp.*) and species of the ecological group of *Melica uniflora* and *Galium odoratum*; they are locally represented in the eastern Pyrenees and the Montes Olositanicos.

41.142 **Mesophile Pyrenean beech forests**
Helleboro-Fagetum
Neutrophilous mesophile beech forests of the Pyrenees, the Montes Olositanicos and the northern Montes Catalanidicos, less species-rich than the preceding, characterized by the abundance of *Helleborus viridis* ssp. *occidentalis.*

41.143 **Sub-humid oro-Cantabrian beech forests**
Carici sylvaticae-Fagetum
Neutrophilous beech forests of the subhumid montane areas of the Cantabrian mountains and, locally, of the northern Iberian Range, with *Carex sylvatica, Galium odoratum, Lathyrus occidentalis, Melica uniflora, Mercurialis perennis, Paris quadrifolia, Scilla lilio-hyacinthus.*

41.144 **Humid Central Massif fir-beech forests**
Scillo-Fagetum p.
Fir-birch or beech forests of volcanic soils in the 1 100-1 600 metre range of the central and southern Massif Central, with *Galium odoratum, Euphorbia hyberna, Lilium martagon, Scilla lilio-hyacinthus.*

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41.15 SUBALPINE BEECH WOODS

Aceri-Fagenion

Woods usually composed of low, low-branching trees, with much sycamore (*Acer pseudoplatanus*) situated near the tree limit, mostly in low mountains with oceanic climate (Vosges, Black Forest, Rhön, Jura, outer Alps, Central Massif, Pyrenees). Herb layer similar to that of 41.13 or locally 41.11 and with elements of adjacent open grasslands.

(Ozenda, 1979, 1985; Timbal, 1981; Oberdorfer, 1990)

41.16 BEECH FORESTS ON LIMESTONE

Cephalanthero-Fagenion

Xero-thermophile medio-European and Atlantic forests on calcareous, often superficial, soils, usually of steep slopes, with a generally abundant herb and shrub undergrowth, characterized by sedges (*Carex digitata, C. flacca, C. montana, C. alba*), grasses (*Sesleria albicans, Brachypodium pinnatum*), orchids (*Cephalanthera spp., Neottia nidus-avis, Epipactis leptochila, E. microphylla*) and thermophile species, transgressive of the *Quercetalia pubescenti-petraeae.* The bush-layer includes several calcicolous species (*Ligustrum vulgare, Berberis vulgaris*) and *Buxus sempervirens* can dominate.

(Tüxen and Oberdorfer, 1958; Duvigneaud, 1961; Noirfalise, 1962, 1984, 1986, 1987; Ellenberg, 1963, 1988; Durin *et al.*, 1964; Bournérias, 1979; Ozenda *et al.*, 1979; Ozenda, 1979, 1982, 1985; Timbal, 1981; Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Oberdorfer, 1990)

41.161 **Sedge beech forests**

Carici-Fagetum s.l.

Middle European slope sedge and orchid beech woods.

41.162 **North-western Iberian xerophile beech woods**

Epipactido helleborine-Fagetum

Beech forests of relatively low precipitation zones of the southern ranges of the Pais Vasco and of superficially dry calcareous soils of the Cordillera Cantabrica, with *Brachypodium pinnatum* ssp. *rupestre, Sesleria argentea* ssp. *hispanica, Carex brevicollis, C. ornithopoda, C. sempervirens, C. caudata, Cephalanthera damasomium, C. longifolia, Epipactis helleborine, E. microphylla, Neottia nidus-avis.*

41.17 SOUTHERN MEDIO-EUROPEAN BEECH FORESTS

Fagion sylvaticae p.

Forests of the southern flanks of the Alps and the western Mediterranean mountains with an often species-rich herb layer composed of an admixture of medio-European, Mediterranean and local endemic species.

(Delvosalle, 1953; Malaisse, 1963, 1964a, b and c, 1975; Vanden Berghen, 1963; Barbero, 1970; Tomaselli, 1973; Baudière, 1974a and b; Ozenda, 1975, 1981, 1985; Gruber, 1978; Dupias, 1985; Gamisans, 1985; Noirfalise, 1986, 1987; Vigo and Ninot, 1987; Bolos y Capdevila, 1987; Bassani, 1987; Ellenberg, 1988)

41.171 **Southern Alpine and Apennine acidophilous beech forests**

Luzulo niveae-Fagetum, Luzulo pedemontanae-Fagetum

Acidophilous forests with *Luzula nivea* and *Luzula pedemontana* of the Maritime, Ligurian, Insubrian and Illyro-Gardesian Alps and pre-Alps and of the northern and central Apennines.

41.172 **Eastern Pyrenees and Cévennes acidophilous beech forests**

Similar acidophilous forests of the eastern Pyrenees and Cévennes, with *L. nivea*, clearly distinguished from forests of the *Scillo-Fagenion* by their impoverished herb layer and replacing the more Atlantic forests of the *Ilici-Fagenion.*

41.173 **Corsican beech forests**

Poo-Fagetum, Helleboro lividi-Fagetum

Beech forests of Corsica, acidophilous, with *Luzula pedemontana, Galium rotundifolium* and insular endemics such as *Helleborus lividus.*

41.174 Southern Alpine and Apennine neutrophile beech forests
Trochischanto-Fagetum, Geranio nodosi-Fagetum i.a.
Neutrophile montane beech forests of the south-western Alps, the Maritime Alps, the Ligurian Alps, the Insubrian, Gardesian and Illyric southern pre-Alps, the northern and central Apennines, with *Trochischantes nodiflorus, Geranium nodosum, Calamintha grandiflora,* various *Dentaria.*

41.1741 South-western Alpine neutrophile beech forests
Hygrophile and meso-hygrophile forests of the upper montane level of the south-western outer Alps in the Baronnies, the Ventoux, the Montagne de Lure.

41.1742 Maritime Alps neutrophile beech forests
Isolated La Cabanette beech forest of Peira-Cava, in the Maritime Alps, with a unique species cortège.

41.1743 Southern Alpine neutrophile beech forests
Ligurian, Insubrian, Gardesian and Illyric hygrophile and meso-hygrophile beech forests with *Cardamine (Dentaria) spp.*, including the eastern *Cardamine Kitaibelii (C. polyphylla),* or with *Calamintha grandiflora.*

41.1744 Northern Apennine neutrophile beech forests
Mesotrophic beech forests of the Toscano-Emilian and Abruzzian Apennines, with *Trochiscanthes nodiflora, Geranium nodosum, G. reflexum, Aquilegia vulgaris, Pulmonaria saccharata, Neottia nidus-avis.*

41.175 Sub-Mediterranean calcicolous beech forests
Buxo-Fagetum
Thermophile beech forests often rich in box and lavender of the warm, calcareous slopes of the south-western pre-Alps, Haute Provence, Maritime Alps, of the Causses, the eastern Pyrenees, the Aragonese central Pyrenees.

41.1751 Box beech forests
Beech forests with an undergrowth dominated by *Buxus sempervirens.*

41.1752 Androsace beech forests
Beech forests with a more reduced shrub layer and a herb layer characterized by the presence of the restricted south-western Alpine endemics *Androsace chaixii* and *Fritillaria involucrata.*

41.1753 Lavender beech forests
Beech forests with *Lavandula angustifolia.*

41.1754 Sainte-Baume beech forest
Isolated, species-rich beech forest of the Sainte-Baume range of Provence, characterized by the strong representation of evergreen undergrowth, the development of the vegetation strata and the multiple waves of flowering. Among accompanying species are *Taxus baccata, Ilex aquifolium, Acer opulifolium, Viburnum lantana, Coronilla emerus, Ruscus aculeatus, Mycelis muralis, Lilium martagon, Neottia nidus-avis, Helleborus foetidus, Digitalis lutea.*

41.176 Beech forests with hop-hornbeam
Ostryo-Fagenion
Thermophile calcicolous forests rich in *Ostrya* and *Fraxinus ornus* of the sub-montane level of the Ligurian and Gardesian southern pre-Alps, mostly reduced to tall coppice.

41.18 SOUTHERN ITALIAN BEECH FORESTS
Geranio versicolori-Fagion
Forests of Italian mountains, south of 42°N. They are highly fragmented and harbour many endemics. Altidudinal and hygric variants can be distinguished.
(Bonin, 1968; Fenaroli, 1970; Tomaselli, 1973; Ozenda, 1973, 1979; Bonin and Gamisans,1976; Ozenda *et al.*, 1979; Pignatti, 1982; Pratesi and Tassi, 1985; Noirfalise, 1986, 1987)

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41.181 **Gargano beech forest**
Monte Gargano Foresta Umbra, rich in *Taxus baccata,* extremely isolated.

41.182 **Campano-Lucanian beech forests**
Still relatively extensive beech forests of Campania and Basilicata with *Daphne laureola, Galium odoratum, Ranunculus brutius, Geranium versicolor, Melica uniflora, Lathyrus venetus, Euphorbia amygdaloides, Aquilegia vulgaris, A. viscosa, Cardamine bulbifera.*

41.183 **Pollino beech forests**
Extensive calcicolous beech forests of the montane level of the Pollino system, with *Lathyrus venetus, Daphne laureola, Melica uniflora, Ranunculus brutius, Geranium versicolor, Doronicum orientale, Calamintha grandiflora, Epipactis microphylla, E. gracilis, E. purpurata, Monotropa hypopitys.*

41.184 **Sila beech forests**
Silicicolous beech forests occupying more humid locations of the Sila, alternating with forests of *Pinus laricio.*

41.185 **Aspromonte beech forests**
Silicicolous beech forests of the Aspromonte range of Calabria with *Taxus baccata, Populus tremula, Sorbus aucuparia, Betula pendula.*

41.186 **Northern Sicilian beech forests**
Relict beech forests of the Madonie, Nebrodi and, very locally, the Monti Peloritani, with *Ilex aquifolium, Daphne laureola, Crataegus monogyna, Prunus spinosa.*

41.187 **Etna beech forests**
Isolated beech forests of Mount Etna, at the southern limit of the range of the species.

41.19 BALKANIC BEECH FORESTS
Fagion moesiacum
Forests of the mountains of north-eastern Greece (Vermion, Vernon, border ranges of northern Macedonia, the Chalkidiki, Thrace, and locally, Olympus and Ossa), with a pronounced medio-European character, marked by the frequency of *Acer pseudoplatanus, Quercus petraea, Fragaria vesca, Oxalis acetosella*, mostly without fir, or, very locally, with *Abies alba.*
(Horvat *et al.*, 1974; Ozenda, 1975, 1979; Mavrommatis, 1978; Gamisans and Hebrard, 1979; Noirfalise, 1987)

41.1A HELLENIC BEECH FORESTS
Fagion hellenicum
Forests of the central Pindus, the Smolikas, the Grammos, the Hasia and Olympus, with reduced medio-European character and high endemism, characterized by *Abies borisii-regis, Doronicum caucasicum, Galium laconicum, Lathyrus venetus, Helleborus cyclophyllus.*
(Horvat *et al.*, 1974; Ozenda, 1975, 1979; Gamisans and Hebrard, 1979; Strid, 1980; Noirfalise, 1987)

41.1B BEECH FORESTS WITH HUNGARIAN OAK
Quercion frainetto p.
More thermophile forests of the transition zone between the supra-Mediterranean and montane levels of Thrace and Macedonia, characterized by the presence of numerous species of the *Quercion frainetto.*
(Gamisans and Hebrard, 1979)

41.2 OAK-HORNBEAM FORESTS

Carpinion betuli

Atlantic and medio-European forests dominated by *Quercus robur* or *Q. petraea*, on eutrophic or mesotrophic soils, with usually ample and species-rich herb and bush layers. *Carpinus betulus* is generally present. They occur under climates too dry or on soils too wet or too dry for beech or as a result of forestry practices favouring oaks.

(Mullenders, 1955; Breton, 1957; Vanden Berghen and Mullenders, 1957; Ellenberg, 1963, 1988; Izard *et al.*, 1963; Tanghe, 1964b, 1967, 1968, 1970; Gaussen, 1964; Dupias, 1966, 1985; Durin *et al.*, 1967; Oberdorfer, 1967, 1990; Sougnez, 1967; Noirfalise, 1968, 1969, 1984, 1986, 1987; Couteaux, 1969; Lavergne, 1969; Duvigneaud and Denaeyer-De Smet, 1970; Fenaroli, 1970; Barbero *et al.*, 1971; Dendaletche, 1973; Sougnez, 1973, 1978; Baudière, 1974a; Bugnon and Rameau, 1974; Richard, 1974; Ozenda and Wagner, 1975; Westhoff and den Held, 1975; Caron and Géhu, 1976; Chastagnol *et al.*, 1978; Dethioux, 1978; Braque, 1979; Ozenda *et al.*, 1979; Rameau and Timbal, 1979; Thill and Palm, 1979; Bournérias, 1979, 1984; Chastagnol and Vilks, 1982; Bernard, 1983; Botineau and Chastagnol, 1983; Gésan and Plat, 1983; Rivas-Martinez *et al.*, 1984; Ozenda, 1985; Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Bolos y Capdevila, 1987; Vigo and Ninot, 1987; Gruber, 1988; Rodwell, 1991)

41.21 MIXED ATLANTIC BLUEBELL OAK FORESTS

Endymio-Carpinetum, Corylo-Fraxinetum p.

Atlantic forests of the British Isles, western Belgium and north-western France, mostly on more or less water-retaining soils, characterized by a diverse tree layer, dominated by *Quercus robur* and rich in *Fraxinus excelsior,* and by a herb layer rich in species of the group of *Hyacinthoides non-scripta.* Included are British *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodlands.

41.22 AQUITANIAN ASH-OAK AND OAK-HORNBEAM FORESTS

Rusco-Carpinetum, Saniculo-Carpinetum

Ash-oak forests of valley bottoms and cool, damp lower slopes of south-western France, south to the Pyrenean piedmont, with *Sorbus torminalis, Ruscus aculeatus* and many thermocline, acidocline and Mediterraneo-Atlantic species.

41.23 SUB-ATLANTIC OXLIP ASH-OAK FORESTS

Primulo-Carpinetum

Oak-hornbeam forests rich in ash, on more or less wet, meso-eutrophic soils, in regions of moderate Atlantic influence, characterized by the abundance of species of the ecological groups of *Primula elatior*, of *Lamium galeobdolon*, of *Anemone nemorosa* and by the absence of *Hyacinthoides non-scripta.*

41.231 Arum ash-oak forests

Typical neutrocline and acidocline ash-oak forests with primrose, developed on silts, marls and clays, characterized by the presence of the ecological groups of *Galium odoratum* of *Arum maculatum*, or by the abundance of *Lamium galeobdolon.*

41.232 Corydalis ash-oak forests

Ash-oak forests occupying damp colluvions at the bottom of slopes in valleys within sub-Atlantic forests, characterized by the presence of the group of *Anemone ranunculoides, Corydalis solida, Gagea lutea* and *Lathraea squamaria* or of *Aconitum vulparia*, transitional to ravine or alluvial forests.

41.233 Garlic ash-oak forests

Ash-oak forests rich in *Allium ursinum*, of alluvial terraces and adjacent colluvions.

41.24 SUB-ATLANTIC STITCHWORT OAK-HORNBEAM FORESTS

Stellario-Carpinetum s.l.

Sub-Atlantic and medio-European forests of *Quercus robur* and *Quercus petraea*, on meso-oligotrophic and less hydromorphic soils, characterized by the replacement of the groups of *Primula elatior* and *Lamium galeobdolon* by those of *Deschampsia flexuosa* and of *Maianthemum bifolium*, transgressives from the *Quercion.*

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41.241 **North-western oak-hornbeam forests**
Stellario-Carpinetum s.s.
Typical formations of northern Europe, the eastern Paris basin and Lorraine, with *Stellaria holostea, Carex brizoides, Narcissus pseudonarcissus, Polygonatum verticillatum, Potentilla sterilis, Ranunculus nemorosus, Poa chaixii, Luzula sylvatica, L. luzuloides.*

41.242 **Lorraine marl oak-hornbeam forests**
Pulmonario-Carpinetum
Oak-hornbeam forests of Lorraine marls, with *Quercus robur, Carpinus betulus, Acer campestre, Sorbus torminalis, Lonicera xylosteum, Galium odoratum, Carex umbrosa, Pulmonaria obscura* and *Ornithogalum pyrenaicum.*

41.243 **Burgundy collinar oak-hornbeam forests**
Scillo-Carpinetum p., Poo-Carpinetum
Oak-hornbeam forests of the mesozoic hills and plateaux of north-western Burgundy (Nivernais, Langres Plateau, Barrois, Morvan piedmont).

41.244 **Burgundy plain oak-hornbeam forests**
Oak-hornbeam forests of the Saône plain in southern Burgundy and Bresse, of the southern Lyonnais and of the Limagne basin, including the outstanding multicentury-old stands of Cîteaux and similar stations.

41.25 FAMENNIAN OAK-HORNBEAM FORESTS
Stellario-Carpinetum caricetosum
Sub-Atlantic forests, generally with a low canopy, on soils with an alternating hydric regime, characterized by the abundance of *Carex flacca* and the coexistence of acidocline and calcicline species.

41.26 EASTERN OAK-HORNBEAM FORESTS
Galio-Carpinetum, Tilio-Carpinetum
Sub-continental and continental forests dominated by *Quercus petraea* and richer in lime, *Tilia cordata*, than the previous formations.

41.261 **Wood bedstraw oak-hornbeam forests**
Galio-Carpinetum
Oak-hornbeam forests of regions with subcontinental climate within the central European range of *Fagus sylvatica*, such as the Upper Rhine plain, the rain shadows of the Harz, Rhön and Spessart, the Swabian-Franconian basin, the Bavarian plateau and Thuringe, with *Sorbus torminalis, S. domestica, Ligustrum vulgare, Convallaria majalis, Carex montana, C. umbrosa, Festuca heterophylla.*

41.262 **Mixed lime-oak-hornbeam forests**
Tilio-Carpinetum
Lime-oak forests of eastern central European regions with continental climate, east of the range of *Fagus sylvatica*, with *Quercus petraea, Q. robur, Tilia cordata, Acer platanoides, Carpinus betulus.*

41.27 CALCIPHILE OAK-HORNBEAM AND ASH-OAK FORESTS
Antherico-Carpinetum, Carici-Carpinetum (Ligustro-Carpinetum), Scillo-Carpinetum p., i.a.
Often low, open formations dominated by *Quercus robur* or *Q. petraea,* developed on superficial to deep soils associated with calcareous substrates in southern Germany, eastern and southern Belgium, eastern and central France; they generally constitute substitution forests of the *Cephalanthero-Fagion,* either regressive phases brought about by coppicing or recolonization phases permitted by abandonment of *Bromion* grasslands.

41.271 **Limestone xerophile oak-hornbeam forests**
Generally low formations characteristic of superficial calcareous soils on often steep sunny slopes of southern Germany, southern Belgium and eastern France, with *Quercus robur* (usually dominant). *Q. petraea, Tilia platyphyllos, Fraxinus excelsior, Carpinus betulus, Acer campestre, Corylus avellana, Cornus sanguinea, C. mas, Crataegus laevigata, C. monogyna, Prunus spinosa, Euonymus europaeus, Ligustrum vulgare, Viburnum lantana, Daphne laureola, Primula veris, Viola hirta, Mercurialis perennis, Scilla bifolia, Orchis mascula, Carex digitata, C. montana.*

41.272 **Schist xerophile oak-hornbeam forests**
Low, open formations characteristic of steep, sunny slopes on slightly calcareous schists in the Ardenne-Eifel periphery, with *Quercus petraea* (dominant). *Carpinus betulus, Quercus robur, Sorbus torminalis, S. aria, Pyrus pyraster, Malus sylvestris, Prunus avium, Amelanchier ovalis, Stellaria holostea, Anemone sylvestris. Silene nutans, S. inflata, Campanula persicifolia, Anthericum liliago, Melica nutans, Carex montana.*

41.273 **Calciphile ash-oak forests**
Formations richer in *Fraxinus excelsior* and in species characteristic of well-drained, often deep, sometimes rocky, moist or partly dry calcareous soils on gentle slopes of the south Paris basin and adjacent regions, with *Quercus robur, Fraxinus excelsior, Carpinus betulus, Acer campestre, Cornus mas, Pyrus pyraster, Daphne laureola, Arum italicum, Asarum europaeum, Doronicum plantagineum, Helleborus foetidus, Hepatica triloba, Orobanche hederae, Lilium martagon, Carex montana.*

41.28 SOUTHERN ALPINE OAK-HORNBEAM FORESTS
Salvio-Fraxinetum, Physospermo-Quercetum petraeae, Euphorbio-Carpinetum
Fragmentary mesophile or mesohygrophile formations of the Insubrian pre-Alps, the Ligurian Apennines, the Esterel and the Tanneron and very locally, the southern French Alps (forêt du Saou, Drôme), with *Quercus petraea, Q. robur, Fraxinus excelsior, Tilia platyphyllos, T. cordata* and *Carpinus betulus*, developed on deep soils in conditions of sufficient atmospheric and edaphic humidity.

41.29 PYRENEO-CANTABRIAN OAK-ASH FORESTS
Polysticho setiferi-Fraxinetum excelsioris, Crataego laevigatae-Quercetum roboris, Mercurialidi perennis-Fraxinetum excelsioris, Isopyro-Quercetum roboris
Forests dominated by *Quercus robur*, or, in parts of the Pyrenees and in the Oro-Cantabrian interior, *Q. petraea*, with *Fraxinus excelsior, Tilia platyphyllos, Corylus avellana, Acer campestre, A. pseudoplatanus, Prunus avium, Ulmus glabra*, many shrubs and lianas, abundant *Hedera helix*, many ferns, such as *Polystichum setiferum, Dryopteris affinis, D. dilatata, Asplenium scolopendrium*, and with *Arum italicum, Veronica montana, Hypericum androsaemum, Primula vulgaris, Pulmonaria longifolia, Helleborus viridis ssp. occidentalis, Isopyrum thalictroides, Ajuga reptans, Carex sylvatica, Bromus racemosus, Melica uniflora*, of the collinar, sub-montane and, in a somewhat impoverished form with *Crataegus laevigata*, montane levels of the piedmont of the Cordillera Cantabrica, in Navarra, Guipuzcoa, Vizcaya, Cantabria, Asturias and Castilla-Leon, as well as of the sub-montane level of the northern slope, and locally in Navarra and Catalonia, the southern slope of the Pyrenees.

41.3 **ASH FORESTS**
Carpinion betuli (Fraxino-Carpinion): Corylo-Fraxinetum p., Polysticho setiferi-Fraxinetum excelsioris p., Mercurialidi perennis-Fraxinetum excelsioris p., Isopyro-Quercetum roboris, Adoxo-Aceretum
Non-alluvial Atlantic or sub-Atlantic forests dominated by *Fraxinus excelsior*, particulary characteristic of Britain, of the north-western Iberian peninsula and of the Baltic moraine hills of Mecklenburg. Secondary formations pioneering on abandoned cultivated land (e.g. Belgian Condroz) are included.
(Saintenoy-Simon, 1965; Thill, 1970; Bournérias, 1979, 1984; Ozenda *et al.*, 1979; Vanden Berghen, 1979; Noirfalise, 1984, 1986, 1987; Rivas-Martinez *et al.*, 1984; Dupias, 1985; Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Vigo and Ninot, 1987; Ellenberg, 1988; Rodwell, 1991)

41.31 ASH-ROWAN-MERCURY FORESTS
Forests and woodland of *Fraxinus excelsior,* with some *Ulmus glabra, Acer pseudoplatanus, Quercus petraea, Betula pubescens, Sorbus aucuparia* and an understorey dominated by *Corylus avellana,* often accompanied by *Crataegus monogyna* or occasionally *C. laevigata,* characteristic of sub-montane climates and moist soils on calcareous bedrocks of the northern and western British Isles, particularly in valley heads of the upland fringes, distributed in Ireland, Scotland, northern England, Wales and locally Devon. Ferns *(Athyrium filix-femina, Dryopteris spp., Blechnum spicant)* grasses *(Brachypodium sylvaticum, Deschampsia cespitosa, Poa trivialis, Arrhenatherum elatius, Dactylis glomerata, Holcus lanatus, H. mollis, Agrostis capillaris, Anthoxanthum odoratum), Oxalis acetosella* are abundant and characteristic in the field layer. often with *Hyacinthoides non-scripta, Mercurialis perennis,* tall herbs *(Crepis paludosa, C. mollis, Filipendula ulmaria, Conopodium majus, Trollius europaeus)* and an extensive and diverse bryophyte flora.

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41.32 BRITISH ASH-FIELD MAPLE-MERCURY FORESTS

Forest and woodland of *Fraxinus excelsior,* with *Quercus robur* (in the south-west), or *Q. petraea, Acer pseudoplatanus, Ulmus glabra* (in the north-west), with an understorey dominated by *Corylus avellana,* frequently accompanied by *Crataegus monogyna, C. laevigata, Acer campestre, Sambucus nigra,* characteristic of often calcareous base-rich soils in relatively warm and dry lowlands of southern Britain, distributed mostly in southern and central England, eastern Wales, southern and eastern Scotland. The field layer comprises *Mercurialis perennis, Hyacinthoides non-scripta, Circaea lutetiana, Geum urbanum, Arum maculatum, Viola riviniana, V. reichenbachiana, Sanicula europaea, Lamium galeobdolon, Carex sylvatica; Primula vulgaris* and *Glechoma hederacea, Anemone nemorosa, Deschampsia cespitosa, Hedera helix, Geranium robertianum, Allium ursinum, Teucrium scorodonia* characterize geographical and edaphic subtypes. In humid northern and western Britain, well outside of the range of *Fagus sylvatica* and *Carpinus betulus,* the separation between this unit and the ravine forests of 41.41, developed on unstable screes and colluvions, is poorly marked.

41.33 PYRENEO-CANTABRIAN ASH FORESTS

Fraxinus excelsior-dominated facies of the Pyreneo-Cantabrian ash-oak forests (41.29).

41.34 BALTIC MOSCHATEL ASH-SYCAMORE FORESTS

Fraxinus excelsior forests of Baltic moraine hills (Mecklenburg), possibly related to the peri-Alpine slope-foot forests of 41.43.

41.35 MIXED ATLANTIC BLUEBELL ASH FORESTS

Fraxinus excelsior-dominated facies of the mixed Atlantic bluebell oak forests (41.21), including ash-dominated facies of British oak-bracken-bramble woodland.

41.36 AQUITANIAN ASH FORESTS

Fraxinus excelsior-dominated facies of Aquitanian ash-oak forest (41.22).

41.37 SUB-ATLANTIC ASH FORESTS

Fraxinus excelsior-dominated facies of sub-Atlantic oxlip oak forests (41.23).

41.38 LUTETIAN CALCIPHILE ASH FORESTS

Fraxinus excelsior-dominated facies of calciphile oak-ash forests (41.273), characteristic of the French Paris basin, particularly on chalk deposits; their affinities are with the south-eastern British formations of 41.31.

41.39 POST-CULTURAL ASH WOODS

Corylo-Fraxinenalia

Pioneer formations of *Fraxinus excelsior* occupying abandoned agricultural land.

41.4 **MIXED RAVINE AND SLOPE FORESTS**

Tilio-Acerion, Carpinion betuli p.

Cool, moist forests with a multispecific tree layer of variable dominance, most often on more or less abrupt slopes.

(Lebrun *et al.*, 1949; Vanden Berghen, 1953, 1969; Tüxen and Oberdorfer, 1958; Tanghe, 1959, 1964a, 1964b, 1968, 1970; Noirfalise, 1960, 1984, 1986, 1987; Duvigneaud and Mullenders, 1962; Roisin and Thill, 1962; Ellenberg, 1963, 1988; Durin *et al.*, 1967; Oberdorfer, 1967, 1990; Seibert, 1969; Duvigneaud and Denaeyer-De Smet, 1970; Horvat *et al.*, 1974; Ozenda and Wagner, 1975; Bournérias, 1979, 1984; Ozenda, 1985; Vigo and Ninot, 1987; Rodwell, 1991)

41.41 RAVINE ASH-SYCAMORE FORESTS

Fraxino-Aceretum pseudoplatani (Phyllitido-Fraxinetum, Tilio-Aceretum, Ulmo-Aceretum, Dicrano-Aceretum, Arunco-Aceretum, Lunario-Aceretum, Aceri-Fraxinetum)

Atlantic and medio-European forests of *Fraxinus excelsior, Acer pseudoplatanus, A. platanoides, Ulmus glabra, Tilia platyphyllos, Fagus sylvatica, Quercus robur,* on unstable scree or colluvions of abrupt, shady and humid slopes, with abundant ferns, characterized by *Asplenium scolopendrium* and the ecological group of *Actaea spicata, Lunaria rediviva* and *Helleborus viridis.*

41.42 HERCYNIAN SLOPE FORESTS

Carpineto-Fraxinetum

Mixed forests of *Quercus robur, Q. petraea, Fagus sylvatica, Ulmus glabra, Acer pseudoplatanus, A. platanoides, Tilia platyphyllos, Fraxinus excelsior, Carpinus betulus, Alnus glutinosa*, with *Hedera helix, Polygonatum verticillatum, Galium odoratum, Ranunculus platanifolius, Centaurea montana, Poa chaixii, Pulmonaria montana, Circaea alpina, Sambucus racemosa* of large, shaded slopes of the Ardennes and Lorraine, probably also represented in other Hercynian ranges and their periphery, within the zone of transition from oceanic to continental climates.

41.43 ALPINE AND PERI-ALPINE SLOPE FORESTS

Aceri-Fraxinetum sensu

Mixed forests of *Acer pseudoplatanus, A. platanoides, Fraxinus excelsior, Ulmus glabra, Fagus sylvatica, Carpinus betulus, Quercus robur* developed on colluvial deep soils at the foot of very rainy slopes of the collinar to sub-montane belts of the Alps and neighbouring ranges, often with *Allium ursinum, Mercurialis perennis* or the ecological group of *Corydalis solida* in the luxuriant herb layer; more montane form of 41.42.

(Etter, 1947)

41.44 PYRENEO-CANTABRIAN MIXED ELM-OAK FORESTS

Androsaemo-Ulmetum

Mixed forests of *Ulmus glabra, Acer campestre, A. opalus, Fraxinus excelsior, Fagus sylvatica, Quercus petraea, Q. robur, Tilia cordata, T. platyphyllos, Sorbus aria, S. mougeotii, Alnus glutinosa, Pinus sylvestris, Hedera helix*, with an nderstorey comprising numerous shrubs, such as *Corylus avellana* and *Crataegus monogyna*, and a rich and luxuriant herb layer including numerous ferns, characteristic of the bottom colluvions of steep, shaded valleys, canyons and gorges of the collinar to montane levels of the Pyrenean and Cantabrian ranges.

41.45 THERMOPHILOUS ALPINE AND PERI-ALPINE MIXED LIME FORESTS

Asperulo-Tilietum, Seslerio-Tilietum

Thermophilous forests of *Tilia cordata, T. platyphyllos, Acer platanoides, Fraxinus excelsior, Ulmus glabra, Fagus sylvatica* with *Euonymus latifolia, Corylus avellana*, restricted to the warm valleys of the Alpine system and some peripheral ranges, characterized by *Asperula taurina, Cyclamen purpurascens* and numerous transgressives of the *Quercetalia pubescenti-petraeae*. These remarkable relict forests are particularly characteristic of the föhn valleys of the Insubrian and northern Alps; they occur in similar situations in the Jura and the Hercynian ranges, north to the Harz.

41.46 GREEK CHASM FORESTS

Formations of *Aesculus hippocastanum, Juglans regia, Fraxinus excelsior* of narrow, warm, humid, shaded ravines, gorge walls and abrupt slopes of the beech zone of the Pindus.

41.5 **ACIDOPHILOUS OAK FORESTS**

Quercion robori-petraeae

Forests of *Quercus robur* or *Q. petraea* on acid soils with a herb layer mostly constituted by the ecological groups of *Deschampsia flexuosa, Vaccinium myrtillus, Pteridium aquilinum, Lonicera periclymenum, Holcus mollis*, and of *Maianthemum bifolium, Convallaria majalis, Hieracium sabaudum, Hypericum pulchrum, Luzula pilosa,* and the mosses *Polytrichum formosum* and *Leucobryum glaucum.*

(Roisin, 1962; Ellenberg, 1963, 1988; Oberdorfer, 1967, 1990; Durin *et al.*, 1967; Delelis-Dusollier and Géhu, 1974; Barkman, 1974; Olsson, 1974; Sougnez, 1974; Kelly and Moore, 1974; Tosco, 1975; Westhoff and den Held, 1975; Noirfalise, 1986, 1987)

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41.51 PEDUNCULATE OAK AND BIRCH WOODS

Querco-Betuletum, Trientalo-Quercetum roboris

Acidophilous forests of the Baltic-North Sea plain, composed of *Quercus robur, Betula pendula* and *B. pubescens*, often mixed with *Sorbus aucuparia* and *Populus tremula*, on very oligotrophic, often sandy and podsolized or hydromorphic soils; the bush layer, poorly developed, includes *Frangula alnus*; the herb layer, formed by the group of *Deschampsia flexuosa*, always includes *Molinia caerulea* and is often invaded by bracken. Forests of this type often prevail in the northern European plain, from Jutland to Flanders; they occupy more limited edaphic enclaves in the Ardennes, in north-western France, Normandy, Brittany, the Paris basin, the Morvan and Great Britain.

(Oberdorfer, 1967, 1990; Durin *et al.*, 1967; Tüxen, 1974; Tombal, 1974; Bugnon and Rameau, 1974; Sissingh, 1974; Sougnez, 1974; Clément *et al.*, 1974; Westhoff and den Held, 1975; Bournérias, 1979, 1984; Noirfalise *et al.*, 1980; Aaby, 1983; Noirfalise, 1984, 1987; Ellenberg, 1988)

41.52 ATLANTIC ACIDOPHILOUS OAK FORESTS WITH BEECH

Fago-Quercetum (Ilici-Quercetum, Polypodio-Quercetum, Convallario-Quercetum, Violo-Quercetum, Holco-Quercetum)

Forests analogous to those of the *Ilici-Fagion* but dominated by *Quercus petraea*, accompanied by *Q. robur* and *Fagus sylvatica*. They differ from 41.51 by the representation of the group of *Maianthemum bifolium* in the herb layer.

(Roisin, 1962; Noirfalise and Sougnez, 1963; Oberdorfer, 1967, 1990; Durin *et al.*, 1967; Tüxen, 1974; Sissingh, 1974; Frileux, 1974; Géhu, 1974; Clément *et al.*, 1974; Tombal, 1974; Bugnon and Rameau, 1974; Timbal, 1974; Westhoff and den Held, 1975; Bournérias, 1979, 1984; Aaby, 1983; Noirfalise, 1984, 1987; Rodwell, 1991)

41.521 **North-western sessile oak forests**

Typical formations of the Baltic and North Sea plains, Picardy, Normandy, Perche, Paris region, western Morvan, Argonne, middle Belgium.

41.522 **Armorican sessile oak forests**

Polypodio-Quercetum

Formations of Brittany, richer in epiphytes, mosses and evergreen shrubs, transitional to 41.53.

41.523 **Dutch dune oak woods**

Convallario-Quercetum dunense

Oak formations on dunes of the Netherlands, with *Acer pseudoplatanus, Euonymus europaeus, Primula vulgaris, Cynoglossum officinale, Cirsium palustre, Doronicum pardalianches, D. plantagineum, Convallaria majalis, Hyacinthoides non-scripta, Polygonatum odoratum, Ornithogalum umbellatum, Asparagus officinalis, Calamagrostis epigejos, Carex arenaria, Dryopteris carthusiana, D. dilatata, Mnium hornum.*

41.524 **Pennine sessile oak-birch-wavy hairgrass woods**

Woods of *Quercus petraea, Betula spp.* and *Sorbus aucuparia,* with abundant ericoid shrubs, in particular *Vaccinium myrtillus, Deschampsia flexuosa,* ferns, notably *Pteridium aquilinum* and *Dryopteris dilatata,* and a rather sparse muscinal layer, which is, however, more diverse than in the next unit. They are characteristic of very acid soils on the Pennine fringes, in northeastern England, the central Pennines, Lancashire, the Welsh border hills and the western Midlands.

41.525 **English pedunculated oak-birch-wavy hairgrass woods**

Woods of *Quercus robur* and *Betula pendula,* occasionally *Quercus petraea,* with a species-poor field layer often almost limited to *Deschampsia flexuosa* and *Pteridium aquilinum,* with, locally, *Calluna vulgaris* and *Vaccinium myrtillus,* characteristic of very acid soils, in central, south-eastern, and locally south-western, England. Differentiation from this unit of the uncommon English representatives of 41.51 is probably not well-marked and all highly acidophilous *Q. robur* stands are perhaps best listed here.

41.53 BRITISH AND IRISH SESSILE OAK WOODS

Blechno-Quercetum petraeae

Acidophilous *Q. petraea* woods of the British Isles, with low, low-branched, trees, with many ferns, mosses, lichens and evergreen bushes; the herb layer is formed by the group of *Deschampsia flexuosa.*

(Massey, 1974; Kelly and Moore, 1974; Ozenda *et al.*, 1979; Condry, 1981; Noirfalise, 1987; Rodwell, 1991)

41.531 **Irish sessile oak woods**

Formations of Ireland, particularly rich in evergreen bushes, including *Arbutus unedo.*

41.532 **British sessile oak woods**

Acidophilous *Quercus petraea* woods of western Britain, mostly found in Scotland, Cumbria, Wales and south-western England, with a few outliers in northern England, in particular in Yorkshire.

41.5321 **Sessile oak-pubescent birch-wood sorrel woods**

More neutrocline formations, characteristic of argilous soils, shales, colluvions, till and fluvio-glacial deposits, dominated by *Quercus petraea* — occasionally *Q. robur* — with *Betula pubescens, B. pendula, Sorbus aucuparia,* occasional *Tilia cordata, Fraxinus excelsior;* the bush layer is generally sparse, with *Corylus avellana* the most abundant species; grasses are prominent in the herb layer, in particular *Holcus mollis, Deschampsia flexuosa, Anthoxanthum odoratum, Agrostis spp., Festuca spp.; Hyacynthoides non-scripta* is often a typical vernal dominant; other components of the field layer, some characteristic of various subtypes, are *Anemone nemorosa, Trientalis europaea, Viola riviniana, Oxalis acetosella, Galium saxatile, Potentilla erecta, Stellaria holostea, Hypericum pulchrum, Luzula sylvatica, Dryopteris dilatata, Blechnum spicant, Pteridium aquilinum.* Bryophytes are abundant and varied, in particular, *Rhytidiadelphus squarrosus, Pseudoscleropodium purum, Thuidium tamariscinum, Hylocomium splendens.*

41.5322 **Sessile oak-pubescent birch-*Dicranum majus* woodland**

Highly acidophile formations characteristic of often shallow, strongly leached soils developed over Palaeozoic sandstones and igneous rocks in cooler and wetter parts of western Britain, dominated by *Quercus petraea* — rarely *Q. robur* — with *Betula pubescens, B. pendula, Sorbus aucuparia,* occasional *Tilia cordata, Fraxinus excelsior, Acer pseudoplatanus. Corylus avellana* and occasional *Ilex aquifolium,* together with tree saplings form the bush layer. Grasses (mostly *Deschampsia flexuosa),* bracken and ericoid shrubs *(Vaccinium myrtillus, Calluna vulgaris, Erica cinerea)* constitute the herb layer. Bryophytes are abundant and varied, often forming a dense carpet that covers ground, rocks, roots and lower trunks of trees; *Dicranum majus, Rhytidiadelphus loreus, Polytrichum formosum, Pleurosum schreberi, Plagiothecium undulatum* are characteristic.

41.54 AQUITANO-LIGERIAN OAK FORESTS ON PODSOLS

Peucedano-Quercetum roboris

Forests of *Q. robur* and, sporadically *Q. pyrenaica* or hybrids, on podzols of south-western France, with a herb layer constituted by the group of *Deschampsia flexuosa*, with *Molinia caerulea* and *Peucedanum gallicum.*

(Braun-Blanquet, 1967; Delelis-Dusollier and Géhu, 1974; Bournérias, 1979, 1984; Noirfalise, 1986, 1987)

41.55 AQUITANO-LIGERIAN OAK FORESTS ON LEACHED OR ACID SOILS

Rusco-Quercetum petraeae

Silicicolous thermocline forests of *Quercus petraea, Q. robur, Sorbus torminalis, S. domestica, Pyrus communis, Malus acerba, Ilex aquifolium, Mespilus germanica* with an undergrowth of *Ruscus aculeatus, Festuca heterophylla, Pulmonaria longifolia, Melica uniflora* and the *Deschampsia flexuosa* and *Convallaria majalis* groups of the *Quercion.*

(Izard *et al.*, 1963; Lavergne, 1963, 1969; Gaussen, 1964, 1974; Dupias, 1966; Braun-Blanquet, 1967, 1970; Durin *et al.*, 1967; Izard *et al.*, 1968; Delelis-Dusollier and Géhu, 1974; Rameau and Royer, 1974; Chastagnol *et al.*, 1978; Braque, 1979; Bournérias, 1979, 1984; Ozenda *et al.*, 1979; Noirfalise, 1986, 1987)

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41.56 IBERO-ATLANTIC ACIDOPHILOUS OAK FORESTS

Blechno-Quercetum roboris, Tamo-Quercetum roboris, Linario-Quercetum petraeae, Teucrio-Quercetum petraeae, Veronico-Betuletum, Rusco-Quercetum roboris p., Vaccinio-Quercetum roboris, Narcisso-Quercetum roboris

Forests or tall coppice of *Quercus robur* or *Quercus petraea* of the Pyrenees and north-western Iberia, with an often species-poor herb layer formed by the groups of *Deschampsia flexuosa* and of *Hypericum pulchrum*, by *Ruscus aculeatus* and often various ericaceous plants including *Daboecia cantabrica.*

(Braun-Blanquet *et al.*, 1956; Tüxen and Oberdorfer, 1958; Vanden Berghen, 1969; Dendaletche, 1973; Ozenda *et al.*, 1979; Rivas-Martinez *et al.*, 1984; Dupias, 1985; Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Bolos y Capdevila, 1987, Vigo and Ninot, 1987; Izco Sevillano, 1987)

41.561 Pyrenean acidophilous oak forests

Quercus petraea forests, often with *Tilia platyphyllos, Prunus avium, Quercus robur, Betula pendula, Sorbus torminalis, Castanea sativa* and with *Rhamnus frangula, Ilex aquifolium, Mespilus germanica, Corylus avellana, Vaccinium myrtillus, Pteridium aquilinum, Teucrium scorodonia, Melampyrum pratense, Lathyrus montanus, Luzula sylvatica, L. forsteri, Deschampsia flexuosa.*

41.5611 Mesophile Pyrenean acidophilous oak forests

Teucrio-Quercetum petraeae

Mesophile, typical formations.

41.5612 Hygrophile Pyrenean acidophilous oak forests

Veronico-Betuletum

Hygrophile formations, characteristic of humid ubacs and valley floors, with abundance of *Vaccinium myrtillus* and presence of beech forest species.

41.562 Cantabrian acidophilous oak forests

Cantabrian and peri-Cantabrian acidophilous *Quercus robur* or *Q. petraea* forests, sometimes rich in *Betula celtiberica, Quercus pyrenaica* or *Castanea sativa*, with *Teucrium scorodonia, Blechnum spicant, Lonicera periclymenum, Deschampsia flexuosa, Veronica officinalis, Hypericum pulchrum, Lathyrus montanus, Melampyrum pratense, Euphorbia dulcis, E. amygdaloides, Stellaria holostea, Oxalis acetosella, Pteridium aquilinum, Dryopteris dilatata, D. affinis, D. aemula, Oreopteris limbosperma, Polypodium vulgare, Ulex europaeus, U. gallii, Vaccinium myrtillus, Daboecia cantabrica, Erica cinerea, E. vagans.*

41.5621 Eastern Cantabrian acidophilous oak forests

Tamo communis-Quercetum roboris

Cantabro-Euskaldian collinar to montane *Quercus robur* forests.

41.5622 Western Cantabrian acidophilous oak forests

Blechno spicanti-Quercetum roboris

Galicio-Asturian collinar to montane *Quercus robur* forests, richer in western Iberian species such as *Linaria triornithophora, Omphalodes nitida, Saxifraga spathularis.*

41.5623 Oro-Cantabrian acidophilous oak forests

Linario triornithophorae-Quercetum petraeae

Oro-Cantabrian montane *Quercus petraea* forests.

41.563 Luso-Galician collinar acidophilous oak forests

Galician and northern Portuguese collinar *Quercus robur* forests, with *Ilex aquifolium, Frangula alnus, Pyrus communis, Laurus nobilis, Crataegus monogyna.*

41.5631 Mesophile Luso-Galician collinar acidophilous oak forests

Rusco aculeati-Quercetum roboris p.

Widely distributed mesophile formations.

41.5632 **Humid Luso-Galician collinar acidophilous oak forests**
Narcisso cyclaminei-Quercetum roboris
Meso-hygrophile formations rich in ferns, with *Betula celtiberica* and the north-western Iberian endemic *Narcissus cyclamineus*, limited to valley situations in contact with riparian forests.

41.564 **Luso-Galician montane acidophilous oak forests**
Vaccinio myrtilli-Quercetum roboris
Galician and extreme northern Portuguese (Serra do Gerez) montane *Quercus robur* forests, characterized by the presence of *Betula celtiberica, Vaccinium myrtillus, Saxifraga spathularis, Melampyrum pratense* and the absence of thermophile, in particular lauriphyllous, species.

41.57 MEDIO-EUROPEAN ACIDOPHILOUS OAK FORESTS
Luzulo-Quercetum (Genisto tinctoriae-Quercetum petraeae), Sileno-Quercetum petraeae, Calamagrostio-Quercetum
Medio-European acidophilous forests of *Quercus petraea*, sometimes accompanied by *Fagus sylvatica* and *Q. robur*, with a shrub layer comprising *Sorbus aucuparia, Frangula alnus*, often *Ilex aquifolium,* and a herb layer similar to that of the *Luzulo-Fagion*, of which they often constitute a substitution formation.
(Noirfalise and Sougnez, 1956; Noirfalise and Thill, 1958; Roisin, 1962; Oberdorfer, 1967, 1990; Sougnez, 1967, 1974; Tanghe, 1968, 1970; Bugnon and Rameau, 1974; Dumont, 1974; Duvigneaud, 1974; Ozenda and Wagner, 1975; Ozenda *et al.*, 1979; Noirfalise, 1984, 1987; Ellenberg, 1988)

41.571 **Woodrush oak forests**
Luzulo-Quercetum
Mesophile, meso-xerophile or meso-hygrophile oak forests with wood-rush of the middle European Hercynian ranges and their periphery (central, southern and eastern Germany, southern Belgium, Lorraine, Champagne, Burgundy, eastern Morvan).

41.572 **Xero-thermophile acidophilous oak forests**
Sileno-Quercetum petraeae
Xerophile oak woods on sunny escarpments with dry superficial, siliceous, often schistous soils of the Rhine rift and the schistous Hercynian ranges.

41.58 SUBCONTINENTAL PINE-OAK FORESTS
Vaccinio vitis-idaeae-Quercetum (Pino-Quercetum)
Acidophilous forests of *Quercus robur, Q. petraea* and *Pinus sylvestris* on sandy substrates and granitic arenas of subcontinental climate regions in High-Palatinate, Erz, Vogtland, the southern Saxony hills and Brandenburg, with an undergrowth of *Vaccinium myrtillus, V. vitis-idaea, Calluna vulgaris, Deschampsia flexuosa, Melampyrum pratense, Luzula luzuloides, Dicranum spp., Polytrichum spp.*
(Oberdorfer, 1957, 1990; Tüxen, 1974; Ozenda and Wagner, 1975; Ozenda *et al.*, 1979; Noirfalise, 1986, 1987; Ellenberg, 1988)

41.59 INSUBRIAN ACIDOPHILOUS OAK FORESTS
Castaneo-Quercetum
Acidophilous forests of *Quercus petraea,* often mixed with *Castanea sativa,* of the southern foothills of the Alps in Liguria, Piedmont and Lombardy. The herbaceous layer is often dominated by *Festuca ovina (s.l)* and the undergrowth includes, in addition to plants characteristic of the *Quercion*, transgressives of the *Fagion* and of the *Quercetalia pubescenti-petraeae.*
(Tomaselli, 1973; Richard, 1974; Tosco, 1975; Ozenda and Wagner, 1975; Ozenda *et al.*, 1979; Lardelli, 1983; Ozenda, 1985; Noirfalise, 1987; Ellenberg, 1988)

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41.5A PORTUGUESE PEDUNCULATE OAK FORESTS
Rusco-Quercetum roboris viburnetosum
Relict forests of *Q. robur* of central Portugal, often mixed with *Q. suber, Q. pyrenaica* or *Castanea sativa* and with a luxuriant understorey rich in lauriphyllous and xerophyllous lustrous-leaved shrubs and small trees such as *Prunus lusitanica, Arbutus unedo, Viburnum tinus, Ilex aquifolium, Laurus nobilis, Myrtus communis* and *Ruscus aculeatus,* limited to the basins of the Mondego and the Zezere, reduced to a very few, extremely fragile stands of exceptional biological and aesthetic value.
(Braun-Blanquet *et al.*, 1956; Delvosalle and Duvigneaud, 1962)

41.6 ***QUERCUS PYRENAICA* FORESTS**
Quercion robori-pyrenaicae
Q. pyrenaica-dominated forests of the Iberian peninsula and, locally, south-western France.
(Braun-Blanquet *et al.*, 1956; Braun-Blanquet, 1967; Ortuno and Ceballos, 1977; Meson, 1982, 1983; Noirfalise, 1986, 1987; Loidi Arregui, 1987; Dias Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Peinado Lorca and Martinez Parras, 1987; Martinez Parras and Peinado Lorca, 1987; Costa, 1987; Bolos y Capdevila, 1987; Izco Sevillano, 1987; Rivas-Martinez *et al.*, 1987; Ladero Alvarez, 1987)

41.61 CENTRAL IBERIAN *QUERCUS PYRENAICA* FORESTS
Supra- and sometimes meso-Mediterranean *Quercus pyrenaica* forests of western Iberia, the Leonese interior, the Cordillera Central, the Iberian Range, the Montes de Toledo and the Sierra Morena.

41.611 **Sub-Atlantic Iberian *Quercus pyrenaica* forests**
Quercus pyrenaica forests of the Orensano-Sanabrian and Leonese mountains and of the western Cordillera Central.

41.6111 **Sub-Atlantic sub-humid *Quercus pyrenaica* forests**
Genisto falcatae-Quercetum pyrenaicae
Supra- and meso-Mediterranean sub-humid *Quercus pyrenaica* forests of the Orenso-Sanabrian mountains and the Sierra de Gata complex.

41.6112 **Sub-Atlantic humid *Quercus pyrenaica* forests**
Holco mollis-Quercetum pyrenaicae
Supra-Mediterranean humid to hyper-humid *Quercus pyrenaica* forests of the Orensano-Sanabrian and Leonese mountains, the Serra da Estrela and the Sierra de Gata complex.

41.612 **Iberian sub-continental *Quercus pyrenaica* forests**
Quercus pyrenaica forests of the central and eastern Cordillera Central and of the northern and eastern Iberian Ranges.

41.6121 **Sub-continental sub-humid *Quercus pyrenaica* forests**
Luzulo forsteri-Quercetum pyrenaicae
Supra-Mediterranean sub-humid *Quercus pyrenaica* forests of Bejar, Gredos, Guadarrama, Ayllon and of the northern and eastern Iberian Ranges.

41.6122 **Sub-continental humid *Quercus pyrenaica* forests**
Festuco heterophyllae-Quercetum pyrenaicae
Supra-Mediterranean humid to hyper-humid *Quercus pyrenaica* forests of the Sierra de Ayllon, the northern Iberian Range and, very locally, the Castillian flank of the Cantabrian chain.

41.613 **Mariano-Oretanian *Quercus pyrenaica* forests**
Quercus pyrenaica forests of the southern Hercynian ranges, limited to enclaves of the Montes de Toledo system and Sierra Morena satellites.

41.6131 **Lower Mariano-Oretanian *Quercus pyrenaica* forests**
Arbuto unedonis-Quercetum pyrenaicae
Quercus pyrenaica forests of the meso-Mediterranean level of the Montes de Toledo and Sierra Morena systems.

41.6132 **Upper Mariano-Oretanian *Quercus pyrenaica* forests**
Sorbo torminalis-Quercetum pyrenaicae
Quercus pyrenaica forests developed above 1 000 metres in the highest ranges of the Montes de Toledo (Villuercas, Rocigalgo) and in a few satellites of the Sierra Morena (Sierra Madrona, Sierra Palomera).

41.62 CANTABRIAN *QUERCUS PYRENAICA* FORESTS
Melampyro pratense-Quercetum pyrenaicae, Linario triornithophorae-Quercetum pyrenaicae
Quercus pyrenaica formations of medio-European character, of the collinar and montane levels of the Cantabrian chain and its satellite ranges, west to the Sierra de Picos de Ancares in Galicia, characteristic of areas with comparatively low precipitation, in the rain shadow of the coastward ranges or the interior oro-Cantabrian hills.

41.63 MAESTRAZGAN *QUERCUS PYRENAICA* FORESTS
Cephalanthero rubrae-Quercetum pyrenaicae
Quercus pyrenaica forests of the sub-Mediterranean siliceous enclaves of the Maestrazgo and eastern Catalonian ranges, reduced to a very few relicts in the Penagolosa and Prades massifs.

41.64 BAETIC *QUERCUS PYRENAICA* FORESTS
Adenocarpo decorticantis-Quercetum pyrenaicae
Quercus pyrenaica forests of siliceous supra-Mediterranean areas with sub-humid climate of the western Sierra Nevada, the Sierra de Alfacar, the northern flanks of the Sierra de Cazulas and the Sierra Tejeda; in more humid locations *Fraxinus angustifolius* and *Acer granatense* accompany *Q. pyrenaica.*

41.65 FRENCH *QUERCUS PYRENAICA* FORESTS
Betulo-Quercetum pyrenaica i.a.
Quercus pyrenaica forests of south-western France, north to the Sologne where they constitute relatively extensive formations on poor soils, with *Betula pendula, Lonicera periclymenum, Deschampsia flexuosa, Holcus mollis, Molinia caerulea, Teucrium scorodonia.*

41.7 **THERMOPHILOUS AND SUPRA-MEDITERRANEAN OAK WOODS**
Quercetalia pubescenti-petraeae
Forests or woods of sub-Mediterranean climate regions and supra-Mediterranean altitudinal levels, dominated by deciduous or semi-deciduous thermophilous oak species; they may, under local microclimatic or edaphic conditions, replace the evergreen oak forests in meso-Mediterranean or thermo-Mediterranean areas, and irradiate far north into medio-European or sub-Atlantic regions.
(Duvigneaud, 1953; Rey *et al.*, 1963; Vanden Berghen, 1963; Oberdorfer, 1967, 1990; Archiloque *et al.*, 1970; Fenaroli, 1970; Debazac and Mavrommatis, 1971; Barbero *et al.*, 1971; Tomaselli, 1973, 1981a; Tombal, 1974; Horvat *et al.*, 1974; Tosco, 1975; Ozenda and Wagner, 1975; Ozenda, 1975; Ortuno and Ceballos, 1977; Ozenda *et al.*, 1979; Noirfalise, 1984, 1986, 1987; Peinado-Lorca and Rivas-Martinez, 1987; Ellenberg, 1988)

41.71 WESTERN WHITE OAK WOODS AND RELATED COMMUNITIES
Quercion pubescenti-petraeae: Buxo-Quercetum, Lithospermo-Quercetum petraeae, Potentillo albae-Quercetum, Pteridio-Quercetum pubescentis, Aceri-Quercetum petraeae; Quercion ilicis p.
Quercus pubescens forests and woods of the supra-Mediterranean zone of France, west of the Alpine arc, and of north-eastern Spain, with irradiations to southern Germany and Belgium. Low medio-European forests of *Q. petraea* or *Q. robur* occupying warm exposures beyond the range of *Q. pubescens* and linked to the *Quercion pubescenti-petraeae* by the presence of *Buxus sempervirens* or other thermophile calcicolous plants (*Limodorum abortivum, Melittis melissophyllum*).
(Duvigneaud, 1953; Rey *et al.*, 1963; Vanden Berghen, 1963; Oberdorfer, 1967, 1990; Archiloque *et al.*, 1970; Barbero *et al.*, 1971; Tomaselli, 1981a; Tombal, 1974; Ozenda and Wagner, 1975; Ozenda, 1975; Ortuno and Ceballos, 1977; Ozenda *et al.*, 1979; Noirfalise, 1984, 1986, 1987; Loidi Arregui, 1987; Bolos y Capdevila, 1987; Vigo and Ninot, 1987; Ellenberg, 1988)

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41.711 **Western *Quercus pubescens* woods**
Quercus pubescens ssp. *pubescens* formations of sub- and supra-Mediterranean regions of France, and of thermal stations in more northerly locations.

41.712 **Sub-Mediterranean *Quercus petraea-Q. robur* woods**
Continental thermophilous *Quercus petraea* or *Q. robur* woods, outside of the range of *Q. pubescens* but accompanied by the thermophile, calcicolous cortège of the *Quercion pubescenti-petraeae*.

41.713 ***Quercus palensis* woods**
Quercus pubescens ssp. *palensis* formations of the Pyrenees and north-eastern Spain.

41.714 **Eu-Mediterranean white oak woods**
Quercion ilicis p.
Q. pubescens forests occupying fresh stations within the meso-Mediterranean zone, usually on ubacs and relatively deep soils, accompanied by *Q. ilex* and an associated vegetation characteristic of the *Quercion ilicis*.

41.72 CYRNO-SARDINIAN WHITE OAK WOODS
Lathyrion veneti
*Quercus pubescens (*with *Q. virgiliana, Q. congesta)* woods of Sardinia and Corsica.
(Fenaroli, 1970; Pignatti, 1982; Gamisans, 1985; Chiappini, 1985a, 1985b; Barneschi, 1988)

41.73 EASTERN WHITE OAK WOODS
Ostryo-Carpinion p., Cyclamino-Quercion brachyphyllae p., Cyclamino-Quercion ilicis p.
Often varied forests of the supra-Mediterranean (mostly lower supra-Mediterranean), and occasionally meso- or thermo-Mediterranean, levels of Greece and Italy, in which *Quercus pubescens* or its allies are the dominant deciduous oaks, usually associated with *Ostrya carpinifolia, Carpinus orientalis, C. betulus, Fraxinus ornus* and other species.
(Rechinger, 1951; Fenaroli, 1970, 1984; Debazac and Mavrommatis, 1971; Barbero *et al.*, 1971; Tomaselli, 1973; Horvat *et al.*, 1974; Tosco, 1975; Ozenda and Wagner, 1975; Ozenda, 1975; Ozenda *et al.*, 1979; Noirfalise, 1986, 1987; Bassani, 1987; Ferioli, 1989)

41.731 **Northern Italian *Quercus pubescens* woods**
Formations of *Quercus pubescens* ssp. *pubescens, Fraxinus ornus, Ostrya carpinifolia, Carpinus betulus*, and, locally, *Carpinus orientalis* occupying the lower supra-Mediterranean (100-500 m) level of the central and northern Apennines, the Ligurian ranges and the Alpine foothills of Italy, with local impoverished irradiations to the upper supra-Mediterranean level on calcareous soils.

41.732 **Southern Italian and Sicilian *Quercus pubescens* woods**
Formations of *Quercus pubescens* ssp. *pubescens, Ostrya carpinifolia, Carpinus orientalis* of the supra-Mediterranean level of southern Italy and Sicily.

41.733 **Greek *Quercus pubescens* woods**
Formations of *Quercus pubescens* ssp. *pubescens, Carpinus orientalis, C. betulus, Ostrya carpinifolia* of the lower supra-Mediterranean level of Thessaly, Macedonia, Thrace, and locally on calcareous soils, of western Greece.

41.734 ***Quercus anatolica* woods**
Usually open woods formed by *Quercus pubescens* ssp. *anatolica*, often associated with *Quercus macrolepis*, of Lesbos and Samothrace.

41.735 ***Quercus brachyphylla* woods**
Stands of *Quercus brachyphylla*, often associated with *Quercus macrolepis* or *Q. ilex*, of the Peloponnese and Crete.

41.74 NORTHERN ITALIAN *QUERCUS CERRIS* WOODS
Ostryo-Carpinion p.
Q. cerris forests of the upper supra-Mediterranean level of the northern and central Apennines and the Italian pre-Alps, with *Ostrya carpinifolia, Carpinus betulus, Fraxinus excelsior, Quercus petraea, Tilia platyphyllos, Corylus avellana, Laburnum anagyroides*; some central Apennine formations may be dominated by *Quercus petraea.*
(Fenaroli, 1970, 1984; Debazac and Mavrommatis, 1971; Barbero *et al.*, 1971; Tomaselli, 1973; Tosco, 1975; Ozenda and Wagner, 1975; Ozenda, 1975; Ozenda *et al.*, 1979; Noirfalise, 1986, 1987; Bassani, 1987; Ferioli, 1989)

41.75 SOUTHERN *QUERCUS CERRIS-Q. FRAINETTO* WOODS
Melitto-Quercion frainetto
Quercus cerris, Q. frainetto, or, sometimes, *Q. petraea*, formations of the upper supra-Mediterranean level of southern Italy, southern continental Greece and the Peloponnese.
(Fenaroli, 1970, 1984; Debazac and Mavrommatis, 1971; Barbero *et al.*, 1971; Tomaselli, 1973; Horvat *et al.*, 1974; Ozenda, 1975; Ozenda *et al.*, 1979; Noirfalise, 1986, 1987; Bassani, 1987; Ferioli, 1989)

41.751 **Southern Italian *Quercus cerris-Q. frainetto* woods**
Formations of *Quercus cerris, Q. frainetto* or, locally, *Q. petraea*, of the Campanian, Lucanian and Calabrian Apennines and of Monte Gargano.

41.7511 **Southern Italian *Quercus cerris* woods**
Q. cerris-dominated formations of the supra-Mediterranean, montane and, locally, meso-Mediterranean levels, on siliceous or calcareous substrates.

41.7512 **Southern Italian *Quercus frainetto* woods**
Q. frainetto-dominated formations, mostly on siliceous or decarbonated substrates of the supra-Mediterranean level.

41.7513 **Southern Italian *Q. petraea* woods**
Q. petraea-dominated formations.

41.752 **Southern Greek *Quercus cerris-Q. frainetto* woods**
Formations dominated by *Quercus cerris*, by *Q. frainetto*, or both, of the Peloponnese, Attica and Beotia.

41.7521 **Southern Greek *Q. cerris* woods**
Q. cerris-dominated formations.

41.7522 **Southern Greek *Q. frainetto* woods**
Q. frainetto-dominated formations.

41.76 BALKANIC THERMOPHILOUS OAK WOODS
Quercion frainetto
Q. frainetto, Q. cerris and other deciduous oak forests of the supra-Mediterranean level of continental Greece except the extreme south.
(Debazac and Mavrommatis, 1971; Horvat *et al.*, 1974; Ozenda *et al.*, 1979; Noirfalise, 1986, 1987)

41.761 **Greek *Quercus cerris* woods**
Quercus cerris-dominated formations.

41.762 **Greek *Quercus frainetto* woods**
Quercus frainetto-dominated formations.

41.763 **Greek *Quercus dalechampii* woods**
Quercus dalechampii-dominated formations.

41.764 **Greek *Quercus petraea* woods**
Quercus petraea-dominated formations.

41.765 **Greek *Quercus virgiliana* woods**
Quercus virgiliana-dominated formations.

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41.766 **Greek *Quercus pedunculiflora* woods**
Quercus pedunculiflora-dominated formations.

41.767 **Greek *Quercus polycarpa* woods**
Quercus polycarpa-dominated formations.

41.77 IBERIAN *QUERCUS FAGINEA* AND *Q. CANARIENSIS* FORESTS
Aceri-Quercion fagineae p., Quercion fagineae, Quercion fagineo-suberis
Iberian forests and woods dominated by *Quercus faginea* or *Q. canariensis*. The humid formations of south-western Iberia (41.772 and 41.773) are forest types of unique character in Europe and of extreme biological importance; also highly distinctive and vulnerable are the Baetic formations listed under 41.7714 and 41.7715.
(Braun-Blanquet *et al.*, 1956; Bolos and Molinier, 1960; Rivas-Martinez, 1974; Loidi Arregui, 1987; Dias Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Peinado Lorca and Martinez Parras, 1987; Martinez Parras and Peinado Lorca, 1987; Costa, 1987; Bolos y Capdevila, 1987; Izco Sevillano, 1987; Rivas-Martinez *et al.*, 1987; Ladero Alvarez, 1987)

41.771 **Spanish *Quercus faginea* forests**
Spiraeo obovatae-Quercetum fagineae, Cephalanthero longifoliae-Quercetum fagineae, Violo wilkommii-Quercetum fagineae, Daphno latifoliae-Aceretum granatensis, Fraxino orni-Quercetum fagineae
Xero-mesophile *Quercus faginea* formations of slopes and plateaux of middle elevations of the Spanish Meseta and associated ranges.

41.7711 **Western *Quercus faginea* forests**
Spiraeo obovatae-Quercetum fagineae
Quercus faginea forests of the supra-Mediterranean, sub-humid level of the Cantabrian periphery and upper Ebro basin.

41.7712 **Central *Quercus faginea* forests**
Cephalanthero longifoliae-Quercetum fagineae
Quercus faginea forests of the meso-supra-Mediterranean levels of the Iberian Range, upper Douro basin and neighbouring regions.

41.7713 **Eastern *Quercus faginea* forests**
Violo wilkommii-Quercetum fagineae
Quercus faginea forests of the meso-supra-Mediterranean levels of the Maestrazgo, interior Catalonia and adjacant Aragon.

41.7714 **Baetic *Quercus faginea* forests**
Daphno latifoliae-Aceretum granatensis
Southern forests of the sub-humid to humid supra-Mediterranean level of calcareous Baetic ranges, limited to a few enclaves in the Serrania de Ronda and the ranges of the upper Guadalquivir basin, dominated by *Quercus faginea* associated with *Acer granatense, A. monspessulanum, Sorbus aria, S. torminalis, Taxus baccata* and sometimes *Quercus pyrenaica*.

41.7715 **Valencian *Quercus faginea* forests**
Fraxino orni-Quercetum fagineae
Quercus faginea forests of ubacs of the southern Valencian mountains (Aitana, Montcabrer, Benicadell), with *Acer granatense, Fraxinus ornus* and *Taxus baccata*.

41.772 **Portuguese *Quercus faginea* forests**
Arisaro-Quercetum fagineae
Humid, epiphyte-clad, dense, relict *Quercus faginea* forests of Portugal, restricted to a very few isolated localities.

41.773 **Andalusian *Quercus canariensis* forests**
Rusco hypophylli-Quercetum canariensis
Humid and hyper-humid, luxuriant *Quercus canariensis* forests of the sierras of extreme southern Spain, limited to the Aljibe and a very few localities in the Serrania de Ronda.

41.774 **Catalonian *Quercus canariensis* stands**
Carici depressae-Quercetum canariensis
Formations of Catalonia rich in *Quercus canariensis*.

41.775 **Balearic *Quercus faginea* woods**
Aceri-Quercetum fagineae p.
Relict formations of Majorca dominated by, or rich in, *Quercus faginea*.

41.78 MACEDONIAN-OAK WOODLAND
Ostryo-Carpinion p.: Quercetum trojanae i.a.
Woods dominated by the semi-deciduous *Quercus trojana*.
(Fenaroli, 1970, 1984; Horvat *et al.*, 1974; Groppali *et al.*, 1983; Ferioli, 1989)

41.781 ***Quercus trojana* woods of Greece**
Usually low formations dominated by *Quercus trojana*, often with junipers or maples, of Macedonia, Thrace and Thessaly.

41.782 ***Quercus trojana* woods of Puglia**
Relict woods, sometimes of considerable height, of *Q. trojana* and *Q. pubescens*, often with an admixture of *Q. ilex* and its associated vegetation (Murge: e.g. bosco delle Pianelle, foresta Gaglione).

41.79 VALONIA OAK WOODLAND
Woods dominated by the semi-deciduous *Quercus macrolepis*, often fairly open, of the mostly meso-Mediterranean zone of Greece and, very locally, southern Italy.
(Rechinger, 1951; Horvat *et al.*, 1974; Noirfalise, 1986, 1987; Fenaroli, 1987; Ferioli, 1989)

41.791 ***Quercus macrolepis* woods of Greece**
Formations of continental Greece and its archipelagoes; well-developed forests exist, in particular, in the Ionian islands and on Lesbos.

41.792 ***Quercus macrolepis* woods of Puglia**
Relict formations of Salento (Tricase).

41.8 **HOP-HORNBEAM, ORIENTAL HORNBEAM AND MIXED THERMOPHILOUS FORESTS**
Ostryo-Carpinion p., Aceri-Quercion fagineae p., Quercion frainetto p. i.a.
Non-alluvial formations of the meso- and supra-Mediterranean zones dominated by *Ostrya carpinifolia, Carpinus orientalis, Acer spp., Fraxinus spp., Tilia spp.* or *Celtis australis.*
(Tüxen and Oberdorfer, 1958; Bolos and Molinier, 1960; Fenaroli, 1970; Barbero *et al.*, 1971; Horvat *et al.*, 1974; Lapraz, 1975; Peinado Lorca and Rivas-Martinez, 1987; Rivas-Martinez and Costa, 1987; Martinez Parras and Peinado Lorca, 1987; Peinado Lorca and Martinez Parras, 1987; Asensi Marfil and Diez Garretas, 1987)

41.81 HOP-HORNBEAM WOODS
Formations dominated by *Ostrya carpinifolia*.

41.811 **Meso-Mediterranean hop-hornbeam woods**
Ravine forests of the meso-Mediterranean *Quercus ilex* zone.

41.812 **Supra-Mediterranean hop-hornbeam woods**
Formations of the supra-Mediterranean level belonging to the *Ostryo-Carpinion.*

41.813 **Montane hop-hornbeam woods**
Formations with an accompanying flora of the *Ostryo-Fagion.*

41.82 ORIENTAL HORNBEAM WOODS
Low formations dominated by *Carpinus orientalis*, particularly abundant in Greece.

41.83 THERMOPHILOUS MAPLE WOODS
Formations dominated by *Acer spp.*

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41.831 **Andalusian *Acer granatense* woods**
Daphno latifoliae-Aceretum granatensis p.
Supra-Mediterranean formations of the mountains of the upper Guadalquivir, with *Acer granatense, A. monspessulanum, Quercus faginea, Q. pyrenaica, Sorbus aria, S. torminalis, Taxus baccata, Daphne laureola, Paeonia officinalis* ssp. *humilis*. Vestiges of this type of vegetation also survive in the Serrania de Ronda.

41.832 **Balearic *Acer granatense* woods**
Aceri-Quercetum fagineae p.
Formations, extremely rare if not extinct, of the mountains of Majorca (Puig de Maçanella, Puig Major), dominated by *Acer granatense*, with *Quercus faginea, Amelanchier ovalis* ssp. *comafredensis, Ilex aquifolium* var. *balearica, Helleborus foetidus* var. *balearicus, Sorbus aria, Primula acaulis* var. *balearica, Rubus ulmifolius, Tamus communis, Taxus baccata, Hedera helix, Smilax aspera* var. *balearica, Paeonia cambessedesii*, several of which are relict endemic taxa of very limited distribution and low numbers.

41.84 MEDITERRANEAN LIME WOODS
Supra- or meso-Mediterranean formations dominated by *Tilia spp.*.

41.85 NETTLE-TREE WOODS
Formations rich in *Celtis australis*.

41.86 THERMOPHILOUS ASH WOODS
Non-alluvial, non-ravine formations dominated by *Fraxinus angustifolia* or *F. ornus*, often mixed with *Quercus pubescens* or *Q. pyrenaica*.

41.861 **Sicilian narrow-leaved ash woods**
Fraxinus angustifolia woods of western Sicily.

41.862 **Iberian narrow-leaved ash woods**
Fraxinus angustifolia woods of the Iberian peninsula.

41.863 **Manna tree woods**
Formations dominated by *Fraxinus ornus*.

41.87 OTHER OR VERY MIXED WOODS

41.9 **CHESTNUT WOODS**
Castanea sativa-dominated formations.

41.A **HORNBEAM WOODS**
Pure or almost pure formations of *Carpinus betulus*.

41.B **BIRCH WOODS**
Formations dominated by *Betula pendula, B. pubescens*, or their allies, on non-marshy terrain.

41.B1 LOWLAND AND COLLINAR BIRCH WOODS
Quercion robori-petraeae p., i.a.
Pioneer and sub-climax birch formations of the North Sea-Baltic plains, the lower Hercynian slopes, the periphery of the Paris Basin, south-western France, north-western Iberia and Insubria, within the range of Atlantic and sub-Atlantic acidophilous oak woods.
(Simms, 1971; Westhoff and den Held, 1975; Groppali *et al.*, 1980; Condry, 1981; Nordiska ministerradet, 1984; Bournérias, 1984; Izco Sevillano, 1987; Noirfalise, 1987; Ellenberg, 1988; Ferioli, 1989; Oberdorfer, 1990; Rodwell, 1991)

41.B11 **Humid birch woods**
Formations usually formed by *Betula pubescens*, with *Molinia caerulea* and sometimes *Deschampsia flexuosa*, developed on podzolized and hydromorphic soils, as substitution facies of oak and birch woods, or colonization stages of *Molinion* grasslands or humid heaths.

41.B111 **Northern humid birch woods**
Querco-Betuletum p.
Widespread birch-dominated formations characteristic of the North Sea-Baltic plain.

41.B112 **Aquitano-Ligerian humid birch woods**
Peucedano-Quercetum p.
Southern formations common, in particular, in the Sologne and neighbouring areas.

41.B12 **Medio-European dry acidophilous birch woods**
Formations usually formed by *Betula pendula*, or, in the British Isles, *B. pubescens*, with *Deschampsia flexuosa, Agrostis tenuis, Festuca ovina, Vaccinium myrtillus*, developed notably on sands, gravels, moraines and decalcified alluvions of northern and middle European plains and hills, as substitution facies of acidophilous oak woods (*Fago-Quercetum, Blechno-Quercetum petraeae, Rusco-Quercetum, Luzulo-Quercetum*), occasionally of oak-hornbeam woods (particularly mixed Atlantic bluebell oak forests, *Endymio-Carpinetum)* or colonization stages of dry heaths and decalcified dunes.

41.B13 **Iberian acidophilous birch woods**
Holco mollis-Betuletum celtibericae i.a.
Medio-European acidophilous birch woods of the collinar and lower montane levels of north-western Iberia, formed by *Betula pendula* or *B. celtiberica* as substitution stages of acidophilous oak woods.

41.B14 **Insubrian acidophilous birch woods**
Birch woods of the collinar and lower montane levels of northern Italy, dispersed in the Alpine foothills where they constitute substitution stages of the Insubrian acidophilous oak woods (*Castaneo-Quercetum p.*), on the fluvio-glacial terraces of the Po system, as facies of the acidophilous pine-birch-oak woods, and in the Euganean hills.

41.B15 **Heavy-metal birch woods**
Sub-climax birch woods occupying soils intoxicated by heavy metals, with an herb layer that may include metallophytes and habitually calciphile species.

41.B16 **Dune birch woods**
Crataego-Betuletum
Birch woods formed by *Betula pubescens, B. pendula* and *Populus canescens* with *Viola hirta, Ligustrum vulgare, Polygonatum odoratum*, in calcareous North Sea and Baltic dunes.

41.B2 SUB-BOREAL BIRCH WOODS
Birch woods, often extensive and pure, formed by *Betula pubescens (B. odorata, B. carpatica)* or *B. pendula,* beyond and above the present range of oak woods in Scotland and northern England.
(Turrill, 1948; Simms, 1971; Clapham *et al.*, 1985; Noirfalise, 1987; Rodwell, 1991)

41.B3 MONTANE AND SUBALPINE BIRCH WOODS
Birch stands of the montane and subalpine levels of the Alps, the Apennines, the Pyrenees, the Jura and the Hercynian ranges, mostly sub-climax formations of stations with anomalous edaphic and microclimatic conditions.
(Sfikas, 1984; Ozenda, 1985; Ellenberg, 1988; Ferioli, 1989; Oberdorfer, 1990)

41.B31 **Alpine treeline birch woods**
Tree-limit birch stands, of local distribution in the Alps.

41.B32 **Birch block forests**
Betulo-Sorbetum aucuparia i.a.
Birch stands, mostly of *Betula pubescens (B. carpatica, B. tortuosa)*, occupying, in the Alps, the Jura and the Hercynian ranges, cold stations on cliff-base rocky screes and boulder-falls through which cold air flows.

41.B33 **Pyrenean birch woods**
Birch-dominated formations of the Pyrenees, locally frequent in all vegetation levels.

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41.B34 **Apennine birch woods**
Isolated birch stations of the Apennines, in the Abruzzi, bosco di Manziana (Latium), monti Alburni, monti Picentini.

41.B35 **Greek birch woods**
Southern outposts of *Betula pendula* in the Rhodopi mountains of northern Greece.

41.B4 CORSICAN BIRCH WOODS
Betula pendula formations of the upper montane level of Corsica, forming extensive sub-climax belts on rocky, rapidly eroding soils at the upper forest limit, as well as transition communities in the evolution of laricio pine or beech forests.
(Gamisans, 1985)

41.B5 MONTANE *BETULA CELTIBERICA* WOODLANDS
Formations of the upper montane and supra-Mediterranean levels of Iberia dominated by the endemic *Betula celtiberica*.
(Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Izco Sevillano, 1987; Rivas-Martinez *et al.*, 1987)

41.B51 **Cantabrian *Betula celtiberica* woodlands**
Luzulo henriquezii-Betuletum celtibericae
Oro-Cantabrian tree-limit climax formations.

41.B52 **Estrelan and Orensano-Sanabrian *Betula celtiberica* woodlands**
Saxifrago spathularis-Betuletum celtibericae
Upper montane and supra-Mediterranean climax formations of the western Cordillera Central (Serra da Estrela) and the Orensano-Sanabrian mountains, limited to tree-limit situations and humid ravines.

41.B53 **Sorian and Guadarraman *Betula celtiberica* woodlands**
Melico uniflorae-Betuletum celtibericae
Humid supra-Mediterranean climax formations of the eastern Cordillera Central (Guadarrama) and of the northern Iberian Range (Sorian mountains), restricted to relict stations on rainy ubacs and humid ravines.

41.B6 MOUNT ETNA BIRCH STANDS
Endemic *Betula aetnensis* formations of Mount Etna lavas, limited to the 1 200-2 000 metre level.
(Fenaroli, 1970; Pignatti, 1982; Ferioli, 1989)

41.C **ALDER WOODS**
Non-riparian, non-marshy formations dominated by *Alnus spp.*.
(Fenaroli, 1970; Simms, 1971; Gamisans, 1985; Noirfalise, 1986; Ferioli, 1989; Rodwell, 1991)

41.C1 *ALNUS CORDATA* WOODS
Alnus cordata-dominated formations of slopes with deep, loose, moist soils, endemic to the Campanian, Lucanian and Calabrian Apennines and the Castaniccia and San Petrone ranges of Corsica.

41.C2 *ALNUS GLUTINOSA* WOODS
Non-riparian, non-marshy formations dominated by *Alnus glutinosa,* including *Sambucus nigra* sub-community of Atlantic *Alnus glutinosa-Urtica dioica* woodland.

41.D **ASPEN WOODS**
Formations dominated by *Populus tremula*.
(Braun-Blanquet, 1975; Nordiska ministerradet, 1984; Ellenberg, 1988; Ferioli, 1989)

41.D1 INNER ALPINE ASPEN WOODS
Corylo-Populetum tremulae
Woods of *Populus tremula* and *Corylus avellana*, accompanied by a xerophile flora, of dry inner Alpine valleys.

41.D2 LOWLAND ASPEN WOODS
Quercion robori-petraeae p.
Pioneer and sub-climax *Populus tremula* formations of plains and hills, in particular the North Sea-Baltic plain and lower Hercynian slopes, within the range of Atlantic and sub-Atlantic acidophilous oak woods, and the large alluvial systems such as that of the Po.

41.D3 MONTANE ASPEN STANDS
Populus tremula formations of mountainous areas, in particular, within the beech belt of high southern mountains.

41.D4 SUPRA-MEDITERRANEAN ASPEN STANDS
Populus tremula formations occurring within the supra-Mediterranean environment of the mixed deciduous broad-leaved forests.

41.E **ROWAN WOODS**
Sorbus aucuparia-dominated formations, characteristic in particular of the Scottish Highlands.
(Noirfalise, 1987)

41.F **ELM WOODS**
Non-riparian, non-ravine *Ulmus spp.*-dominated formations.

41.F1 SMALL-LEAVED ELM WOODS
Ulmus minor (U. carpinifolia or *U. procera)* woods of base- and nutrient-rich, often ruderal, terrain, dispersed along the western seaboard of Europe, usually rich in species of southern affinities.

41.F11 **Sweet violet elm woods**
Violo odoratae-Ulmetum i.a.
Formations of the Low Countries, in particular of dunal regions, and of the Paris Basin.
(Westhoff and den Held, 1975; Bournérias, 1984; Noirfalise *et al.*, 1985)

41.F12 **Thermo-Atlantic elm woods**
Aro neglecti-Ulmetum minoris
Formations of the coasts of Normandy, Brittany and Vendée.
(Géhu and Géhu-Franck, 1985)

41.F13 **British suckering elm woods**
Woods of the British Isles, mostly of *Fraxinus-Acer-Mercurialis* type, invaded and dominated by suckering elms of the *Ulmus minor* group *(U. carpinifolia, U. procera);* postcultural small-leaved elm groves are included.
(Rodwell, 1991)

41.F2 WYCH ELM AND FLUTTERING ELM WOODS
Non-riparian, non-ravine *Ulmus glabra* or *U. laevis*-dominated formations of northern and central Europe.
(Nordiska ministerradet, 1984; Oberdorfer, 1990)

41.G **LIME WOODS**
Non-riparian, non-ravine *Tilia spp.*-dominated formations.
(Nordiska ministerradet, 1984; Oberdorfer, 1990; Rodwell, 1991)

41.H **OTHER DECIDUOUS WOODS**

42 Coniferous woodland

Forests and woodland of native coniferous trees other than floodplain and mire woods; formations dominated by coniferous trees, but comprising broad-leaved evergreen trees, are included.

42.1 FIR FORESTS
Conifer forests dominated by firs (*Abies spp.*).

42.11 NEUTROPHILOUS SILVER FIR FORESTS
Fir (*Abies alba*) and fir-spruce forests developed on neutral or near-neutral soils of the Alps, the Pyrenees, the Jura, the Hercynian ranges and the northern Apennines.
(Ellenberg, 1963, 1988; Meyer, 1970; Gruber, 1978; Ozenda, 1981, 1985; Fenaroli, 1984; Durin, 1985; Noirfalise, 1986, 1987; Bassani, 1987; Ferioli, 1989; Oberdorfer, 1990)

42.111 Inner Alpine neutrophilous fir forests
Galio rotundifolii-Abietenion (Abietetum albae) p.: Oxali-Abietetum i.a.
Neutrophilous fir and fir-spruce forests developed on brown soils of the intermediate Alps, outside of the climatic range of the beech.

42.1111 Sorrel fir forests
Typical inner Alpine formations with a predominance of mull-moder species such as *Veronica latifolia, Melampyrum sylvaticum, Prenanthes purpurea, Oxalis acetosella, Luzula nivea*; all fir forests of the intermediate and inner Alps can be included in this category with the exception of those that present clearly acidophilous or calciphilous facies and of the well-characterized local types listed immediately below.

42.1112 Tall herb fir forests
High altitude, upper montane, tall-herb rich formations with *Adenostyles alliariae, Geranium sylvaticum, Cicerbita alpina, Chaerophyllum villarsii, Peucedanum ostruthium, Alnus viridis* and *Sorbus aucuparia.*

42.1113 Trochiscanthes fir forests
Formations of the Maritime Alps with *Trochiscanthes nodiflorus, Galium sylvaticum, Luzula pedemontana, Aquilegia atrata, Phyteuma halleri.*

42.112 Neutrophilous beech-zone fir forests
Fir or fir-spruce facies of the montane beech-fir neutrophilous forests (41.13, 41.14, 41.17 *p.*) of the outer Alps, the Pyrenees, the northern Apennines, the Jura and the Hercynian arc, with rich herb and moss layers and a flora similar to that of the beech or beech-fir facies.

42.113 Inner Pyrenean fir forests
More acidophilous formations of the inner Pyrenees, with *Vaccinium myrtillus, Goodyera repens, Galium rotundifolium* and a good representation of species of the neutrophilous beech forests, intermediate between this unit and 42.13.

42.12 CALCIPHILOUS SILVER FIR FORESTS
Fir (*Abies alba*) and fir-spruce forests developed on calcareous soils of the Alps, the Pyrenees, the Jura and the Hercynian ranges.
(Tüxen and Oberdorfer, 1958; Ellenberg, 1963; Ozenda, 1981, 1985; Noirfalise, 1986, 1987; Ellenberg, 1988; Oberdorfer, 1990)

42.121 Inner Alpine calcicolous fir forests
Galio rotundifolii-Abietenion (Abietetum albae) p.: Calamagrostido variae-Abietetum, Carici albae-Abietetum, Adenostylo glabrae-Abietetum
Calcicolous fir or fir-spruce forests of the intermediate Alps with *Carex alba, Polygala chamaebuxus, Hepatica triloba, Calamagrostis varia.*

42.122 **Calcicolous beech-zone fir forests**
Fir facies of calcicolous beech-fir forests in the outer Alps, the Pyrenees, the Jura.

42.123 **Black Forest calcicolous fir-spruce woods**
Piceo-Abietetum
Fir-spruce woods of calcareous soils of the Baar Plateau in the eastern Black Forest foothills, rich in sedges and orchids.

42.13 ACIDOPHILOUS SILVER FIR FORESTS
Fir (*Abies alba*) and fir-spruce forests developed on acid soils of the Alps, the Pyrenees, the Jura, the Hercynian ranges and the northern Apennines.
(Ellenberg, 1963, 1988; Gruber, 1978; Ozenda, 1981, 1985; Dupias, 1985; Noirfalise, 1986, 1987; Oberdorfer, 1990)

42.131 **Inner Alpine acidophilous silver fir forests**
Galio rotundifolii-Abietenion (Abietetum albae) p.: Calamagrostido villosae-Abietetum, Vaccinio-Abietetum, Luzulo-Abietetum
Oligotrophic fir and fir-spruce forests of the intermediate Alps, with *Luzula nivea, Vaccinium myrtillus, Calamagrostis villosa, Festuca flavescens, Saxifraga cuneifolia.*

42.132 **Acidophilous beech-zone fir forests**
Fir or fir-spruce facies of acidophilous beech-fir formations, in the outer Alps, the Pyrenees, the Apennines, the Hercynian arc.

42.133 **Fir forests with alpenrose**
Rhodoreto-Abietetum, Homogyno-Abietetum
High-altitude fir forests characteristic of ubacs of high mountains outside of the range of spruce, with *Rhododendron ferrugineum, Vaccinium myrtillus, Homogyne alpina, Festuca flavescens.*

42.1331 **Pyrenean alpenrose fir forest**
Fir forests of the lower subalpine level of the Pyrenees, with *Rhododendron ferrugineum, Homogyne alpina, Lonicera nigra, Polystichum lonchitis, Rosa pendulina (R. alpina), Huperzia selago.*

42.1332 **Alpine alpenrose fir forests**
Fir forests of the lower subalpine level of the western Alps, with *Rhododendron ferrugineum, Vaccinium myrtillus, Homogyne alpina, Lonicera caerulea, Festuca flavescens, Huperzia selago.*

42.1333 **Block alpenrose fir forests**
Block fir forests of the montane level.

42.14 CORSICAN SILVER FIR FORESTS
Poo-Fagetum abietetosum
Fir woods and forests locally replacing, mostly in cool stations, the acidophilous beech forests of the montane level of Corsica.
(Gamisans, 1975, 1985; Noirfalise, 1986, 1987)

42.15 SOUTHERN APENNINE SILVER FIR FORESTS
Geranio versicolori-Fagion p.
Relict fir woods associated with the beech forests of the *Geranio versicolori-Fagion* of the Lucano-Calabrian Apennines (Pollino, Sila, Aspromonte).
(Fenaroli, 1970, 1984; Bonin, 1971; Noirfalise, 1986, 1987; Bassani, 1987; Ferioli, 1989)

42.16 GREEK SILVER FIR FORESTS
Fagion moesiacum p.
Very local, calciphilous, *Abies alba* forests of extreme northern Greece.
(Horvat *et al.*, 1974; Sfikas, 1978; Mavrommatis, 1978; Kassioumis, 1988)

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42.17 FOREST OF KING BORIS'S FIR
Fagion hellenicum p.
Fir forests of the Pindus with *Abies borisii-regis*, adjacent to beech and beech-fir forests of the *Fagion hellenicum*.
(Horvat *et al.*, 1974; Ozenda, 1975; Sfikas, 1978; Mavrommatis, 1978; Gamisans and Hebrard, 1979; Noirfalise, 1986, 1987)

42.18 FORESTS OF GRECIAN FIR
Abietion cephalonicae
Endemic *Abies cephalonica* or mixed *forests of the southern Pindus, the Parnassus, Cephalonia and the Peloponnese, outside of the range of beeches, Fagus spp.*
(Horvat *et al.*, 1974; Ozenda, 1975; Sfikas, 1978; Mavrommatis, 1978; Noirfalise, 1986, 1987)

42.19 PINSAPO FIR FORESTS
Forests and stands of the endemic *Abies pinsapo* of the supra-meso-Mediterranean level of Andalusia.
(Polunin and Smythies, 1973; Rigueiro Rodriguez, 1976; Ortuno and Ceballos, 1977; Ozenda *et al.*, 1979; Lopez Gonzalez, 1982; Asensi and Diez Garretas, 1987)

42.191 **Ronda pinsapo fir forests**
Paeonio coriaceae-Abietetum pinsapi
Calcicolous formations of the Serrania de Ronda and associated ranges.

42.192 **Bermeja pinsapo fir forests**
Bunio macucae-Abietetum pinsapi
Formations occupying ultra-basic serpentine outcroppings of the Sierra Bermeja and isolated stands of associated ranges.

42.1A RELICT NEBRODI FIR STANDS
Surviving stands of the endangered *Abies nebrodensis* in the Madonie mountains of Sicily.
(Fenaroli, 1970; Pignatti, 1982; Groppali *et al.*, 1983; Ferioli, 1989)

42.1B FIR REFORESTATION
Plantations of European firs within or near their area of present or recent natural occurrence. Other plantations of these species and plantations of non-European firs should be noted as 83.

42.1B1 ***Abies alba* reforestation**
Plantations of *Abies alba* within its area of occurrence or north and west of it.

42.1B2 ***Abies borisii-regis* reforestation**
Plantations of *A. borisii-regis* in Greece.

42.1B3 ***Abies cephalonica* reforestation**
Plantations of *A. cephalonica* in Greece.

42.1B4 ***Abies pinsapo* reforestation**
Plantations of *A. pinsapo* in Andalusia.

42.1B5 ***Abies nebrodensis* reforestation**
Plantations of *A. nebrodensis* in the mountains of northern Sicily.

42.2 **SPRUCE FORESTS**
Vaccinio-Piceion i.a.
Conifer forests dominated by *Picea abies*.
(Ellenberg, 1963, 1988; Ozenda, 1985; Noirfalise, 1987; Ferioli, 1989; Oberdorfer, 1990)

42.21 SUB-ALPINE SPRUCE FORESTS OF THE ALPS
Piceetum subalpinum
Picea abies forests of the lower subalpine level, and of anomalous stations in the montane level, of the outer, intermediate and inner Alps; in the latter, they are often in continuity with the montane spruce forests of 42.22. The spruces are often stunted or columnar; they are accompanied by an undergrowth of decidedly subalpine affinities.
(Ellenberg, 1963, 1988; Ozenda, 1981, 1985; Noirfalise, 1986, 1987; Oberdorfer, 1990)

42.211 **Bilberry spruce forests**
Homogyne-Piceetum, Vaccinio-Piceetum
Mostly acidophilous, mesophile, subalpine *Picea abies* forests with Oxalis acetosella, Vaccinium vitis-idaea, V. myrtillus, Calamagrostis villosa, Hylocomium splendens.

42.212 **Tall herb subalpine spruce forests**
Adenostylo hirsutae-Piceetum, Adenostylo alliariae-Piceetum
Tall herb rich, hygrophile or meso-hygrophile, *Picea abies* forests of high altitude stations subjected to prolonged snow cover and frequent fogs, with *Adenostyles spp., Chaerophyllum hirsutum, Peucedanum ostruthium, Ranunculus aconitifolius, Aconitum vulparia, A. paniculatum, Stellaria nemorum, Geranium sylvaticum, Cicerbita alpina.*

42.2121 **Calcicolous tall herb subalpine spruce forests**
Tall herb subalpine *Picea abies* forests on calcareous substrates, with *Adenostyles hirsuta.*

42.2122 **Silicicolous tall herb subalpine spruce forests**
Tall herb subalpine *Picea abies* forests on siliceous substrates, with *Adenostyles alliaria.*

42.213 **Peatmoss subalpine spruce forests**
Sphagno-Piceetum
Sphagnum-rich *Picea abies* forests of more or less peaty, humid substrates with *Listera cordata, Sphagnum acutifolium, S. quinquefarium, S. girgensohnii.*

42.214 **Xerophile subalpine spruce forests**
Picea abies forests on dry adrets, with *Vaccinium vitis-ideae* or with *Arctostaphylos uva-ursi, Polygala chamaebuxus, Carex humilis.*

42.215 **Cold station spruce forests**
Asplenio-Piceetum i.a.
Picea abies woods of anomalous stations at the montane or subalpine level, in particular block forests of 'ice cellars' (shaded rocky screes through which cold air flows), woods developed in valleys and depressions where cold air accumulates on clear nights, woods colonizing stabilized screes and narrow bands of rocks, woods on moist sites.

42.22 MONTANE SPRUCE FORESTS OF THE INNER ALPS
Piceetum montanum
Picea abies forests of the montane level of the inner Alps, characteristic of regions climatically unfavourable to both beech and fir.
(Ellenberg, 1963, 1988; Ozenda, 1981, 1985; Noirfalise, 1986, 1987)

42.221 **Acidophile montane inner Alpine spruce forests**
Calamagrostio villosae-Piceetum, Luzulo-Piceetum, Veronico-Piceetum, Oxali-Piceetum
Inner Alpine *Picea abies* forests of siliceous crystalline or schistous substrates, with *Calamagrostis villosa* and woodrushes.

42.222 **Calciphile montane inner Alpine spruce forests**
Calamagrostio variae-Piceetum
Calcicolous inner Alpine *Picea abies* forests with *Calamagrostis varia, Carex flacca, Sesleria caerulea, Hieracium trifidum, Aster bellidiastrum.*

42.223 **Xerophile montane inner Alpine spruce forests**
Melico-Piceetum and related communities
Xerophile, more or less mesotrophic inner Alpine *Picea abies* forests with *Carex montana* and *Melica nutans.*

42

42.224 **Tall herb montane inner Alpine spruce forests**
Adenostylo glabrae-Piceetum
Upper montane inner Alpine *Picea abies* forests with tall herb communities.

42.225 **Peatmoss montane inner Alpine spruce forests**
Sphagnum-rich inner Alpine *Picea abies* forests of peaty soils with *Listera cordata, Equisetum sylvaticum* and *Dryopteris dilatata.*

42.23 SUBALPINE HERCYNIAN FORESTS
Subalpine *Picea abies* forests of high Hercynian ranges.

42.231 **Subalpine spruce forests of the Bayerischer Wald**
Soldanello-Piceetum
Acidophilous *Picea abies* forest of the granitic domes of the Bayerischer Wald, with fir, *Sorbus aucuparia, Vaccinium myrtillus, Homogyne alpina, Soldanella montana, Calamagrostis villosa.*
(Ellenberg, 1963, 1988; Petermann and Seibert, 1979; Ozenda, 1985; Noirfalise, 1986, 1987; Oberdorfer, 1990)

42.232 **Subalpine spruce forests of the Harz and Erzgebirge**
Calamagrostio villosae-Piceetum
Spruce forests of the higher elevations of the Harz (above 750 m) and Erzgebirge.
(Noirfalise, 1987; Ellenberg, 1988; Oberdorfer, 1990)

42.24 SOUTHERN SPRUCE FORESTS
Outlying *Picea abies* formations of the Apennines and Rhodope, at the southern limit of the range of the species.

42.241 **Greek spruce forests**
Very local *Picea abies* formations of the Rhodope mountains of extreme northern Greece (Kara-Dere Forest).
(Sfikas, 1978; Mavrommatis, 1978)

42.242 **Apennine spruce forests**
Relict woods of spontaneous *Picea abies* of the northern Apennines (Passo del Cerreto, Emilia-Romagna; Foce del Campolino sull'Abetone, Tuscany).
(Bassani, 1987; Ferioli, 1989)

42.25 ENCLAVE SPRUCE FORESTS
Other spontaneous *Picea abies* formations occupying outlying altitudinal or edaphic enclaves within the range of more predominant vegetation types.
(Noirfalise, 1987; Ellenberg, 1988; Oberdorfer, 1990)

42.251 **Subalpine Jura spruce forests**
Subalpine *Picea abies* forests of the Jura, similar to those of the northern outer Alps.

42.252 **Subalpine Black Forest spruce forests**
Subalpine *Picea abies* forests of the Black Forest, with *Listera cordata, Lycopodium annotinum.*

42.253 **Montane edaphic spruce forests**
Asplenio-Piceetum p., Bazzanio-Piceetum p., i.a.
Edaphic *Picea abies* enclaves of the montane and sub-montane levels of the Jura and Hercynian ranges and their vicinity, and of the pre-Alpine plateaux, in particular, block forests, boulder field forests, frost-pocket forests and woods on moist soils.

42.254 **Montane beech-zone spruce forests**
Spruce facies of montane beech-fir forests in the outer Alps, the Jura system and the Hercynian arc.

42.26 SPRUCE REFORESTATION
Plantations of *Picea abies* in or near the present or recent natural range of the species, including all Hercynian and peri-Hercynian formations accompanied by semi-natural undergrowth. Intensive, very dense and out-of-station plantations of *Picea abies* and plantations of other *Picea spp.* should be listed as 83.

42.3 **LARCH-AROLLA FORESTS**
Laricio-Cembrion
Forests of the subalpine and sometimes montane levels of the Alps, dominated by *Larix decidua* or *Pinus cembra*; the two species may form either pure or mixed stands, and may be associated with *Picea abies* or, in the western Alps, *Pinus uncinata*.
(Ellenberg, 1963, 1988; Ozenda, 1985; Noirfalise, 1986, 1987; Oberdorfer, 1990)

42.31 EASTERN SILICEOUS LARCH AND AROLLA FORESTS
Larici-Cembretum
Subalpine *Larix decidua, Pinus cembra*, or *Larix decidua-Pinus cembra* forests of the eastern and central Alps, mostly of the inner ranges, usually on siliceous substrates, with an often species-poor undergrowth comprising *Vaccinium myrtillus, Rhododendron ferrugineum, Calamagrostis villosa, Luzula albida*.
(Ellenberg, 1963; Ozenda, 1985; Noirfalise, 1986, 1987)

42.311 **Bilberry arolla forests**
Larici-Cembretum myrtilletosum
Forests limited to ubacs, formed by vigorous *Pinus cembra* in often pure, dense, shady stands, with rarer *Larix decidua* and sporadic *Picea abies*; the ground layer may include *Linnaea borealis, Listera cordata*.

42.312 **Woodrush arolla forests**
Larici-Cembretum luzuletosum albidae
Forests characteristic of steep adrets in the lower subalpine level of the eastern intermediate Alps, usually dominated by *Pinus cembra*, often in dense stands.

42.313 **Rusty alpenrose arolla-larch forests**
Larici-Cembretum rhododendretosum
More open forests than those of 42.311 and 42.312, with *Pinus cembra* usually dominant, but *Larix decidua* more abundant and a more extensive heath element.

42.314 **Small-reed larch-arolla forests**
Larici-Cembretum calamagrostietosum villosae
Forests of adrets, usually open, with *Larix decidua* dominant, *Pinus cembra* and *Picea abies* in enclaves, and an undergrowth less rich in heaths but more in gramineous stands with *Calamagrostis villosa* and woodrushes.

42.315 **Dwarf pine larch-arolla forests**
Larici-Cembretum mugetosum
Xerophile forests of adrets with *Pinus mugo*.

42.316 **Dwarf juniper larch-arolla forests**
Larici-Cembretum juniperetosum
Xerophile forests of adrets with *Juniperus nana* and *Arctostaphylos uva-ursi*.

42.317 **Green alder and tall herb arolla-larch forests**
Larici-Cembretum alnetosum viridis
Hygrophile forests of stations with prolonged snow cover on lime-poor or lime-rich oligotrophic substrates, usually dominated by *Pinus cembra*.

42.318 **Lichen larch-arolla forests**
Larici-Cembretum cladonietosum
Forests of stabilized block screes, dominated by *Larix decidua* or *Larix decidua* and *Pinus cembra*, often with *Betula spp.* and *Pinus mugo*.

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42.319 Peatmoss arolla forests
Larici-Cembretum sphagnetosum
Forests of the edge of peatbogs, generally with *Pinus cembra* and no *Larix decidua*, accompanied by *Pinus mugo, Eriophorum spp.* and *Andromeda polifolia.*

42.32 EASTERN CALCICOLOUS LARCH AND AROLLA FORESTS
Laricetum, Larici-Cembretum rhododendretosum hirsuti
Subalpine and montane *Larix decidua, Larix decidua-Picea abies, Pinus cembra* or *Larix decidua-Pinus cembra* forests of the eastern and central Alps, mostly of the outer ranges, on calcareous substrates, with a usually species-rich undergrowth including *Erica herbacea, Polygala chamaebuxus, Rhododendron hirsutum* or *Pinus mugo.*
(Ozenda, 1985; Ellenberg, 1988)

42.321 Hairy alpenrose arolla and larch-arolla forests
Larici-Cembretum rhododendretosum hirsuti
Forests of the intermediate Alps and the north-eastern outer Alps, developed in particular on hard limestone plateaux.

42.3211 Hairy alpenrose larch-arolla forests
Forests of limestone plateaux with *Pinus cembra* and *Larix decidua.*

42.32111 Dwarf pine-hairy alpenrose larch-arolla forests
Forests of *Pinus cembra* and *Larix decidua* with an undergrowth of *Pinus mugo* and *Rhododendron hirsutum.*

42.32112 Green alder-hairy alpenrose larch-arolla forests
Forests of *Pinus cembra* and *Larix decidua* with an undergrowth of *Alnus viridis*, tall herbs and *Rhododendron hirsutum.*

42.32113 Other hairy alpenrose larch-arolla forests

42.3212 Hairy alpenrose arolla forests
Forests of limestone plateaux with *Pinus cembra* and no or little *Larix decidua.*

42.322 Limestone larch forests
Laricetum
Calcicolous *Larix decidua* or *Larix decidua-Picea abies* forests, mostly of the outer Alps, in which *Pinus cembra* is rare or absent.

42.3221 Limestone alpenrose larch forests
Laricetum rhododendretosum hirsuti
Larix decidua forests of limestone plateaux, with *Rhododendron hirsutum* dominating the ground layer.

42.3222 Limestone larch meadow forests
Laricetum luzuletosum sylvaticae
Calcicolous forests of ubacs, often with very tall, vigorous trees and a rich grassy undergrowth in which, together with *Luzula sylvatica* and *L. luzulina, Calamagrostis villosa, Sesleria albicans, Festuca rubra, Carex ferruginea* or *C. firma* can all locally dominate; acidophilous species, including *Vaccinium vitis-idaea, V. myrtillus* and *Lycopodium annotinum,* are confined to the foot of the larches.

42.3223 Limestone rockfall larch forests
Laricetum asplenietosum
Larix decidua forest developed on shady limestone screes.

42.3224 Limestone steep slope larch-spruce forests
Laricetum rhodothamnetosum
Larix decidua and *Larix decidua-Picea abies* forests, usually of steep slopes in the montane and locally subalpine levels of the northern and southern eastern outer Alps, with *Erica herbacea, Buphthalmum salicifolium, Polygala chamaebuxus.*

42.33 WESTERN LARCH, MOUNTAIN PINE AND AROLLA FORESTS

Subalpine *Larix decidua, Larix decidua-Pinus cembra, Larix decidua*-mountain pine, *Pinus cembra* and *Pinus cembra*-mountain pine forests of the western, and mostly south-western Alps, in regions where *Pinus uncinata* usually associates with *Larix decidua* and/or *Pinus cembra*. Characteristically xeric, open formations, they are best characterized by their understorey.
(Ozenda, 1985; Salomez *in litt.*, 1990)

42.331 **Western larch and larch-mountain pine forests**

Forests of the western inner and intermediate Alps dominated by *Larix decidua* or by mixed *Larix decidua* and *Pinus uncinata*, with an occasional admixture of *Pinus cembra* or other conifers.
(Ozenda, 1985; Salomez *in litt.*, 1990)

42.3311 **Western larch and larch-mountain pine heath forests**

Larix decidua and *Larix decidua-Pinus uncinata* forests with heath understorey formed by *Rhododendron ferrugineum, Vaccinium myrtillus, V. vitis-idaea, V. uliginosum*.

42.3312 **Western larch and larch-mountain pine meadow forests**

Larix decidua and *Larix decidua-Pinus uncinata* forests with grass-rich understorey.

42.3313 **Western larch and larch-mountain pine tall herb forests**

Larix decidua and *Larix decidua-Pinus uncinata* forests with tall herb understorey.

42.332 **Western arolla forests**

Rare forests of the western Alps, dominated by *Pinus cembra* or mixed *Pinus cembra* and *Pinus uncinata*.
(Richard and Pautou, 1983; Ozenda, 1985; Apège, 1985; Gensac, 1987; Maurin *in litt.*, 1989; Salomez *in litt.*, 1990)

42.3321 **Western silicicolous arolla forests**

Silicicolous *Pinus cembra* forests of ubacs and mesic stations in the inner and intermediate western Alps (Belledonne, Chamrousse; Briançonnais).

42.3322 **Western dwarf juniper arolla forests**

Pinus cembra forests of adrets of the western inner Alps, in which *Pinus cembra* may be accompanied by *P. uncinata* and *P. sylvestris* over a heath of *Juniperus nana* and *Arctostaphylos uva-ursi*.

42.3323 **Western calcicolous arolla forests**

Limestone and gypsum *Pinus cembra* forests, developed on raw humus accumulated over calcic or hyper-calcic substrates, with an exceptional juxtaposition of acidophilous and basiphilous companion species, occasional in the inner and intermediate Alps (Maurienne; Tarentaise, La Plagne, Mont Charvet; Flaine) and very locally the outer Alps (Haut Giffre, Les Bornes) of France.

42.34 SECONDARY LARCH FORMATIONS

Formations of *Larix decidua* colonizing abandoned fields and pastures in lower levels of the Alps. Alpine *Larix decidua* plantations; plantations of *Larix decidua* out of range and of other *Larix spp.* or hybrids should be listed under 83.
(Ozenda, 1983, 1985)

42.4 **MOUNTAIN PINE FORESTS**

Mostly subalpine forests of the Alps, the Jura, the Pyrenees and the Iberian Range, dominated by *Pinus uncinata*, usually open and with a very developed shrubby understorey.
(Ellenberg, 1963, 1988; Gruber, 1978; Ozenda, 1981, 1985; Lopez Gonzalez, 1982; Dupias, 1985; Fernandes Gonzalez, 1986; Noirfalise, 1986, 1987; Ferioli, 1989; Maurin in litt., 1989; Oberdorfer, 1990)

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42.41 RUSTY ALPENROSE MOUNTAIN PINE FORESTS

Rhododendro-Vaccinion p.

Pinus uncinata forests of the western outer Alps, the Jura and Pyrenean ubacs, developed on siliceous or decalcified soils of the subalpine level with a predominately ericaceous undergrowh comprising *Rhododendron ferrugineum* (dominant), *Vaccinium myrtillus, V. uliginosum, Calluna vulgaris, Homogyna alpina, Deschampsia flexuosa, Lycopodium annotinum.*

(Gruber, 1978; Ozenda, 1981, 1985; Richard and Pautou, 1982; Dupias, 1985; Noirfalise, 1986, 1987; Vigo and Ninot, 1987; Bolos y Capdevilla, 1987)

42.411 **Outer Alpine alpenrose mountain pine forests**

Rhododendro ferruginei-Pinetum uncinatae

Pinus uncinata forests occupying hard limestone plateaux of the outer Alps, in the Chablais, the Aravis, the Bauges, the Chartreuse, the Vercors, the Dévoluy in which the almost pure calcareous bedrock is covered by a thick layer of raw humus supporting an acidophilous undergrowth dominated by *Rhododendron ferrugineum, Vaccininium myrtillus, V. vitis-idaea, V. uliginosum* accompanied by *Empetrum hermaphroditum, Huperzia selago, Selaginella spinosa, Cladonia rangiferina, Homogyne alpina, Bartsia alpina, Astrantia minor.*

42.412 **Jura alpenrose mountain pine forests**

Lycopodio-Pinetum uncinatae

Subalpine *Pinus uncinata* forests of the western Jura, similar to the Alpine formations of 42.411.

42.413 **Pyrenean alpenrose mountain pine forests**

Rhododendro ferruginei-Pinetum uncinatae (Saxifrago-Rhododendretum pinetosum)

Pinus uncinata forests of ubacs of the Pyrenees developed on siliceous soils, or on decalcified soils in the calcareous ranges, in the more humid and snowy parts of the subalpine level, with a ground layer dominated by *Rhododendron ferrugineum* accompanied by *Vaccinium myrtillus, Homogyne alpina, Rosa pendulina, Deschampsia flexuosa, Oxalis acetosella, Juniperus nana, Calluna vulgaris, Gymnocarpium dryopteris, Dryopteris carthusiana, spinulosum, Solidago virgaurea.*

42.42 XEROCLINE MOUNTAIN PINE FORESTS

Junipero-Pinion p., Erico-Pinion p.

Pinus uncinata forests of the inner Alps, of the western outer Alps and the Jura, and of Pyrenean adrets, accompanied by a shrubby undergrowth in which *Rhododendron ferrugineum* is absent or rare, while *Juniperus nana, J. hemisphaerica, Arctostaphylos uva-ursi, A. alpina, Erica herbacea, Rhododendron hirsutum, Cotoneaster integerrimus, Daphne striata, Dryas octopetala or Polygala chamaebuxus* may be prominent.

(Gruber, 1978; Ozenda, 1981, 1985; Richard and Pautou, 1982; Dupias, 1985; Noirfalise, 1986, 1987; Vigo and Ninot, 1987; Bolos y Capdevilla, 1987)

42.421 **Inner Alpine mountain pine forests**

Subalpine or montane *Pinus uncinata*-dominated formations of the inner and intermediate Alps.

42.4211 **Dwarf sedge mountain pine forests**

Xerophile adret *Pinus uncinata* forests of limestones and gypsums in the subalpine level of the inner Alps, with *Carex humilis, Arctostaphylos uva-ursi.*

42.4212 **Spring heath mountain pine forests**

Meso-xerophile ubac *Pinus uncinata* forests of limestones and gypsums in the subalpine level of the inner Alps, with *Erica herbacea, Amelanchier ovalis, Arctostaphylos uva-ursi, Carduus defloratus, Sesleria caerulea.*

42.4213 **Rock campion mountain pine forests**

Pinus uncinata formations of dry, sunny siliceous slopes in the subalpine level of the inner Alps, with *Silene rupestris, Vaccinium vitis-idaea, Juniperus nana, Sempervivum arachnoideum, Arctostaphylos uva-ursi.*

42.4214 **Amphibolite mountain pine forests**
Dry *Pinus uncinata* facies of pine woods developed on amphibolites in the Belledonne and Taillefer ranges.

42.4215 **Restharrow mountain pine forests**
Ononido-Pinetum uncinatae
Pinus uncinata facies of montane *Pinus sylvestris* woods of inner Alpine valleys, developed, in particular, on gypsum in Haute Maurienne and Tarentaise, and on stony calcareous slopes, screes, debris cones in Briançonnais.

42.42151 **Adret restharrow mountain pine forests**
Ononido-Pinetum uncinatae s.s.
Dryer, sunny slope formations.

42.42152 **Ubac restharrow mountain pine forests**
Ononido-Pinetum uncinatae ericetosum
Heather-rich shady slope formations.

42.422 **Outer Alpine juniper-bearberry mountain pine forests**
Pinus uncinata forests of the calcareous ranges of the western pre-Alps (see 42.411) and the Jura, on less evolved soils than those of 42.411, which do not allow the development of *Rhododendron ferrugineum* heaths.

42.4221 **Xerophile outer Alpine mountain pine forests**
Subalpine xerophile, often pioneer or sub-climax formations of steep slopes and very drained soils, with *Arctostaphylos uva-ursi, Juniperus nana, Amelanchier ovalis, Rhamnus alpinus, Cotoneaster integerrimus, Dryas octopetala, Globularia cordifolia, Alchemilla hoppeana, Sesleria caerulea, Teucrium montanum, Biscutella laevigata, Saxifraga paniculata (S. aizoon).*

42.4222 ***Vaccinium* mountain pine forests**
More mesophile subalpine formations of gentler slopes, with *Vaccinium spp.*

42.4223 **Abyssal mountain pine forests**
Pinus uncinata forests of the montane level of the Grande Chartreuse, the Vercors, the Jura and the Devoluy, developed mostly on screes of massive limestone blocks with trapped ice (block forests).

42.423 **Ventoux mountain pine woods**
Spontaneous sub-summital *Pinus uncinata* woods of the Ventoux, with *Juniperus nana, J. hemisphaerica* and *Arctostaphylos uva-ursi.*

42.424 **Pyrenean adret mountain pine forests**
Pinus uncinata-dominated forests of adrets in the subalpine level of the Pyrenees, developed on both siliceous and calcicareous substrates.

42.4241 **Speedwell mountain pine forests**
Veronico-Pinetum pinetosum uncinatae
Pinus uncinata forests of siliceous Pyrenean adrets, on schist, granite or gneiss, with *Arctostaphylos uva-ursi, Juniperus nana, J. hemisphaerica, Calluna vulgaris, Genista pilosa, Cytisus purgans, Cotoneaster integerrimus* and a predominantly acidophilous herb layer comprising *Deschampsia flexuosa, Cruciata glabra, Festuca eskia, Veronica officinalis, Silene rupestris, Potentilla erecta, Antennaria dioica.*

42.4242 **Pyrenean bearberry mountain pine forests**
Arctostaphylo-Pinetum uncinatae
Pinus uncinata forests of calcareous Pyrenean adrets with *Arctostaphylos uva-ursi, Juniperus nana, J. hemisphaerica, Cotoneaster integerrimus, Rhamnus alpinus, Amelanchier vulgaris, Dryas octopetala* and a predominantly calciphilous herb layer comprising *Festuca gautieri, Valeriana montana, Teucrium pyrenaicum, Hepatica nobilis, Hippocrepis comosa, Polygala calcarea, Sesleria caerulea, Helectotrichon sedenense, Primula suaveolens.*

42

42.425 Pasqueflower mountain pine forests
Pulsatillo-Pinetum uncinatae
Pinus uncinata forests of steep calcareous ubacs of the Pyrenees with very superficial soil and a mostly grassy herb layer comprising *Sesleria caerulea, Festuca gautieri, Pulsatilla alpina, Valeriana montana, Salix pyrenaica, Hepatica nobilis, Deschampsia flexuosa, Pyrola uniflora, Listera cordata.*

42.426 Mountain pine forests of the Iberian Range
Isolated outposts of *Pinus uncinata*-dominated formations in the northern and southern Iberian Ranges.
(Lopez Gonzalez, 1982; Fernandes Gonzalez, 1986; Navarro Andres and Valle Gutierrez, 1987)

42.4261 Urbion mountain pine forests
Vaccinio myrtilli-Juniperetum nanae p.
Pinus uncinata forests of the Sierra de Urbion, usually associated with heaths of *Vaccinium myrtillus* and *Juniperus nana.*

42.4262 Gudar mountain pine forests
Pinus uncinata forests of the Sierra de Gudar, in the southern Iberian Range.

42.43 MOUNTAIN PINE REFORESTATION
Pinus uncinata plantations in, or near, the natural range of the species.

42.5 SCOTS PINE FORESTS
Forests dominated by *Pinus sylvestris.*

42.51 CALEDONIAN FOREST
Relict, indigenous Scots pine forests of endemic *Pinus sylvestris* var. *scotica*, limited to the central and north-eastern Grampians of Scotland. They are mostly open and have a ground layer usually rich in ericaceous species and mosses, in particular, *Hylocomium splendens*, and often harbouring, together with abundant *Deschampsia flexuosa, Goodyera repens, Listera cordata, Corallorhiza trifida, Linnaea borealis, Trientalis europaea, Pyrola minor, Moneses uniflora, Orthilia secunda.* Accompanying, dominated, tree species include *Juniperus communis, Sorbus aucuparia, Betula pubescens, B. pendula, Ilex aquifolium, Populus tremula.*
(Simms, 1971; Pearsall, 1971; Ratcliffe, 1977; Noirfalise, 1986, 1987; Rodwell, 1991)

42.511 Heather Caledonian forest
Pinus sylvestris var. *scotica* forests with a heath-like ground cover of *Erica cinerea* and *Calluna vulgaris.*

42.512 Bilberry Caledonian forest
Pinus sylvestris var. *scotica* forests with a heath-like ground cover of *Vaccinium myrtillus* and *V. vitis-idaea.*

42.513 Moss Caledonian forest
Pinus sylvestris var. *scotica* forests with a closed canopy and an understorey formed mostly by mosses, in particular *Scapania gracilis, Diplophyllum albicans, Thuidium tamariscinum* and the hepatic *Anastrepta orcadensis.*

42.514 Woodrush Caledonian forest
Pinus sylvestris var. *scotica* forests with a ground cover rich in grass-like species, in particular *Luzula pilosa, Anthoxanthum odoratum, Agrostis capillaris, A. canina, Festuca ovina,* together with *Vaccinium spp.* and bryophytes .

42.515 Peatmoss Caledonian forest
Pinus sylvestris var. *scotica* forests of damp hollows, with carpets of *Sphagnum spp., Molinia caerulea* and *Erica tetralix.*

42.52 MIDDLE EUROPEAN SCOTS PINE FORESTS
Indigenous *Pinus sylvestris* forests of the lowlands of northern and middle Europe and of the montane level of the central European Hercynian ranges.

42.521 **Subcontinental Scots pine forests**
Dicrano-Pinion: Leucobryo-Pinetum (Dicrano-Pinetum, Cladonio-Pinetum)
Forests dominated by *Pinus sylvestris* of acid, often podsolized, sands of the plains and hills of middle Europe. Associated trees include *Quercus robur, Q. petraea, Betula pendula, Fagus sylvatica; Vaccinium myrtillus, Calluna vulgaris, Dicranum undulatum* are usually prominent in the ground layer, *Molinia caerulea* may be abundant in humid stands.
(Oberdorfer, 1967, 1990; Ozenda *et al.*, 1979; Polunin and Walters, 1985; Ozenda, 1985; Noirfalise, 1986, 1987; Ellenberg, 1988)

42.5211 **North-eastern Scots pine forests**
Pinus sylvestris forests of sands of the north-eastern plains and hills of middle Europe, south-west to the High Palatinate.
(Oberdorfer, 1967, 1990; Polunin and Walters, 1985; Ozenda, 1985; Noirfalise, 1987; Ellenberg, 1988)

42.5212 **Western lowland Scots pine forests**
Relict woods of indigenous *Pinus sylvestris* of coarse sands in enclaves of cold subcontinental climate west of the main range of the subcontinental pine and pine-oak woodland, as in the Pays de Bitche basin.
(S. Muller, 1984, 1985; Y. Muller, 1985)

42.522 **Hercynian Scots pine forests**
Montane acidophilous woods of indigenous *Pinus sylvestris* forming local, edaphic or microclimatic enclaves in the beech belt of the Hercynian ranges and their periphery, usually with *Vaccinium myrtillus* or lichens.
(Becker *et al.*, 1981; Jacamon, 1983; S. Muller, 1985; Ozenda, 1985)

42.5221 **Eastern Hercynian Scots pine forests**
Indigenous *Pinus sylvestris* formations of the Erz, Fichtelgebirge, Riesengebirge, Bayerischer Wald, Thüringer Wald.

42.5222 **Black Forest Scots pine forests**
Indigenous *Pinus sylvestris* formations of the Black Forest.

42.5223 **Vosges Scots pine forests**
Indigenous *Pinus sylvestris* formations of the mostly dry, acid sandstones of the Vosges, and of sandstone slabs capping rocky outcrops of the Pays de Bitche and adjacent Rhine Palatinate.

42.5224 **Luxembourg sandstone Scots pine forests**
Indigenous *Pinus sylvestris* formations of Luxembourg sandstone outcrops.

42.523 **Lowland steppe Scots pine forests**
Cytiso ruthenici-Pinion: Pyrolo-Pinetum
Pinus sylvestris woods of areas with extreme continental local climates of middle Europe outside of the Alps, in particular formations with *Pinus sylvestris* var. *haguenensis* of the Rhine Valley.
(Oberdorfer, 1990)

42.53 INNER-ALPINE RESTHARROW STEPPE FORESTS
Ononido-Pinion
Xerophile, often calcicolous, open *Pinus sylvestris* or *P. sylvestris* and *P. uncinata* forests of the montane level of inner Alpine valleys submitted to extreme continental climate (upper Durance, Ubaye, upper Tinée, Val di Susa, Maurienne, Val d'Aoste, Alto Adige (Val Venosta)), rich in leguminous plants such as *Ononis rotundifolia, O. cenisia, Astragalus austriacus, A. purpurea, Coronilla minima, Onobrychis saxatilis* and with a shrub layer comprising *Juniperus communis, J. sabina, Berberis vulgaris, Amelanchier ovalis.*
(Braun-Blanquet, 1959; Ellenberg, 1963, 1988; Ozenda, 1981, 1985; Guinochet and Vilmorin, 1973; Noirfalise, 1986, 1987; Oberdorfer, 1990)

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42.54 SPRING HEATH SCOTS PINE FORESTS

Erico-Pinion

Mesophile, mostly calcicolous, *Pinus sylvestris* forests of the intermediate Alps, and, locally, of the inner Alps, the northern outer Alps, the south-eastern outer Alps, the Bavarian plateau, the serpentines of northern Bavaria, the Lake Constance area, the Baar plateau and the Jura, characterized by the presence of *Erica herbacea* and accompanied by *Juniperus communis, Berberis vulgaris, Sorbus aria, Amelanchier ovalis, Chamaecytisus nigricans, Polygala chamaebuxus, Goodyera repens, Pyrola chlorantha, Epipactis atrorubens, Melampyrum pratense, M. sylvaticum, Carex alba, C. ornithopoda, C. humilis, C. flacca, Molinia caerulea, Calamagrostis varia, Sesleria caerulea.*

(Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Ozenda, 1985; Noirfalise, 1986, 1987; Oberdorfer, 1990)

42.55 INNER ALPINE SANDWORT STEPPE FORESTS

Deschampsio-Pinion

Xerophile, acidophilous, *Pinus sylvestris* forests of the montane level of south-western inner Alpine valleys (Maurienne, Guisane, Dora-Riparia, Chisone) where they replace the formations of the *Ononido-Pinion* on strongly siliceous adrets, with *Deschampsia flexuosa* and *Minuartia laricifolia* dominant.

(Ozenda, 1985; Noirfalise, 1986, 1987)

42.56 PYRENEAN MESOPHILE SCOTS PINE FORESTS

Hepatico-Pinetum, Hylocomio-Pinetum, Polygalo-Pinetum

Montane, mossy *Pinus sylvestris* forests of the Pyrenees; characteristic of regions with a moderately dry, sunny climate, they occur, at all exposures but mostly on ubacs, in a wide belt on the south flank of the range, with limited outposts on the north flank. Characteristic is the abundance of wintergreens (*Pyrola chlorantha, P. minor, Moneses uniflora, Orthilia secunda*) and of mosses (*Hylocomium splendens, Rhytidiadelphus triquetrus, Pleurozium schreberi); Vaccinium myrtillus, Luzula nivea, Hepatica nobilis* are usually present.

(Gruber, 1978; Ozenda, 1985; Dupias, 1985; Noirfalise, 1986, 1987; Vigo and Ninot, 1987; Bolos y Capdevila, 1987)

42.561 **Pyrenean calcicolous mesophile Scots pine forests**

Polygalo-Pinetum

Calcicolous formations of *Pinus sylvestris* with *Sorbus aria, Amelanchier ovalis, Ribes alpinum, Prunus mahaleb, Cotoneaster integerrimus, Polygala calcarea, Helleborus foetidus, Valeriana montana, Festuca gautieri.*

42.562 **Pyrenean siliceous mesophile Scots pine forests**

Hylocomio-Pinetum

Silicicolous formations of *Pinus sylvestris* with *Sorbus aucuparia, Salix caprea, Calluna vulgaris, Galium rotundifolium, Melampyrum sylvaticum, M. pratense, Lathyrus linifolius (L. montanus), Potentilla erecta, Helleborus viridis, Deschampsia flexuosa.*

42.57 CENTRAL MASSIF SCOTS PINE FORESTS

Montane *Pinus sylvestris* forests of interior, relatively dry, regions of the Central Massif in the upper Loire basin (Velay and neighbouring regions) and the Causse Méjean.

(Ozenda, 1985)

42.58 SOUTH-WESTERN ALPINE MESOPHILE SCOTS PINE FORESTS

Mesophile montane forests with wintergreens occupying a broad belt on the south-western flank of the Alps from Dauphiné to the Maritime Alps, differentiated from 42.54 by the absence of *Erica herbacea*; the undergrowth usually comprises *Arctostaphylos uva-ursi, Centaurea scabiosa, Tolpis staticifolia, Calluna vulgaris, Polygala chamaebuxus, Monotropa hypopitys, Goodyera repens, Epipactis atrorubens, Neottia nidus-avis.*

(Archiloque *et al.*, 1969; Ozenda, 1981, 1985; Noirfalise, 1986, 1987)

42.59 SUPRA-MEDITERRANEAN SCOTS PINE FORESTS

Pinetum sylvestris, Buxo-Quercetum hylocomio-pinetosum

Pinus sylvestris-dominated facies of the thermophilous, supra-Mediterranean oak woods (41.7), alternated, mixed or imbricated with *Quercus pubescens* or *Q. faginea* woods in the south-western Alpine foothills, on the periphery of the Central Massif, along the southern flank of the Pyrenees and, locally, in the Ligurian and Insubrian Alps, in the western Alps of northern Dauphiné and Savoie, in the northern Apennines and on the northern flank of the Pyrenees. *Buxus sempervirens* is usually abundant in the undergrowth; other components of the shrub layer include *Corylus avellana, Sorbus aria, S. torminalis, Acer opalus, A. campestre, A. monspessulanum, Euonymus latifolius, Genista cinerea, Juniperus communis.*

(Archiloque *et al.*, 1969; Tosco, 1975; Ozenda, 1985; Dupias, 1985; Vigo and Ninot, 1987; Bassani, 1987; Bolos y Capdevila, 1987)

42.591 **Peri-Alpine box Scots pine forests**

Supra-Mediterranean *Pinus sylvestris* forests of the western, south-western and Insubrian Alps and their foothills, and of the Central Massif periphery.

42.592 **Pre-Pyrenean box Scots pine forests**

Supra-Mediterranean *Pinus sylvestris* forests, with abundant box, forming a broad belt on the southern flank of the Pyrenees, with outposts on the northern flank, in the eastern Pyrenees and the east of the Pays de Sault.

42.593 **Emilian Scots pine woods**

Isolated *Pinus sylvestris* woods of the base of the Emilian Apennines, mostly on limestones and serpentines, comprising *Quercus cerris* and *Q. pubescens* or *Carpinus betula, Corylus avellana, Acer campestre, Fraxinus ornus.*

42.5A IBERIAN CALCAREOUS SCOTS PINE WOODS

Pino-Juniperion sabinae i.a.

Montane and oro-Mediterranean, xerocline, calcicolous *Pinus sylvestris* forests of the Iberian Range, the Baetic ranges and the southern flank of the Pyrenees.

(Ozenda *et al.*, 1979; Noirfalise, 1986, 1987)

42.5A1 **Pyrenean hedgehog-heath Scots pine woods**

Woods or prewoods of adrets in the montane level of calcareous ranges of the southern flank of the central Pyrenees, with usually low and contorted *Pinus sylvestris* accompanied by a hedgehog-heath (see 31.71) of *Echinospartum horridum, Buxus sempervirens, Juniperus hemisphaerica.*

(Dupias, 1985; Vigo and Ninot, 1987)

42.5A2 **Savin Scots pine forests**

Pino-Juniperion sabinae

Oro-Mediterranean, calcicolous *Pinus sylvestris* forests of the Iberian Range and the Baetic ranges, often fairly open, and with a shrub layer that includes the prostrate *Juniperus sabina.*

42.5A21 **Iberian Range calcicolous Scots pine forests**

Junipero sabinae-Pinetum sylvestris

Oro-Mediterranean, calcicolous forests of *Pinus sylvestris* var. *iberica* of the southern Iberian Range (Maestrazgo: Gudar, Jabalambre, Penyagolosa; Serrania de Cuenca: Sierra de San Felipe, Montes Universales), with a shrub layer constituted mainly by *Juniperus sabina*; secondary calcicolous Scots pine formations of lower altitude in the Iberian Range.

(Lopez, 1976; Costa, 1987; Peinado Lorca and Martinez-Parras, 1987)

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42.5A22 **Baetic calcicolous Scots pine forests**
Daphno oleoidis-Pinetum sylvestris pinetosum sylvestris
Oro-Mediterranean forests of *Pinus sylvestris* var. *nevadensis* of the Baetic ranges, Sierra Magina, Sierra de Baza, Sierra Tejeda, Sierra del Trevenque (calcareous periphery of the Sierra Nevada), with a shrub layer of *Juniperus sabina* and *J. nana* accompanied by *Ononis aragonensis, Genista lobelii* ssp. *longipes, Daphne oleoides* and *Prunus prostrata*, on limestones and dolomites.
(Ciaran and Blanco, 1984; Peinado Lorca and Martinez-Parras, 1987; Martinez-Parras and Peinado Lorca, 1987; Molero-Mesa and Perez-Raya, 1987)

42.5B IBERIAN SILICICOLOUS SCOTS PINE FORESTS
Pino-Cytision purgantis i.a.
Montane and oro-Mediterranean, xerocline, silicicolous *Pinus sylvestris* forests of the Iberian Range, the Cordillera Central and the southern flank of the Pyrenees.
(Ozenda, *et al.*, 1979; Noirfalise, 1986, 1987)

42.5B1 **Pyrenean xerophile Scots pine forests**
Veronico-Pinetum sylvestris
Montane and lower subalpine *Pinus sylvestris* or *P. sylvestris* and *P. uncinata* forests of dry adrets of the southern flanks of the Pyrenees and of the Val d'Aran, with a shrub layer comprising *Juniperus hemisphaerica, Cytisus purgans, Buxus sempervirens* and a herb layer dominated by *Deschampsia flexuosa,* accompanied by, among others, *Veronica officinalis*.
(Dupias, 1985; Vigo and Ninot, 1987)

42.5B2 **Iberian Range silicicolous Scots pine forests**
Pinus sylvestris forests of siliceous ground in the oro- and supra-Mediterranean levels of the northern and southern Iberian Ranges.
(Lopez, 1976; Ciaran and Blanco, 1984; Navarro Andres and Valle Gutierrez, 1987)

42.5B21 **Upper Sorian silicicolous Scots pine forests**
Vaccinio myrtilli-Juniperetum nanae pinetosum p.
Oro-Mediterranean, acidophilous forests of *Pinus sylvestris* var. *iberica* of the northern Iberian Range (Soria), with *Juniperus nana, Cytisus purgans, Deschampsia flexuosa* ssp. *iberica*, and abundant *Vaccinium myrtillus*.

42.5B22 **Lower Iberian Range silicicolous Scots pine forests**
Luzulo-Quercetum pyrenaicae deschampsio-pinetosum sylvestris p. i.a.
Supra-Mediterranean, acidophilous *Pinus sylvestris* var. *iberica* woods of the Iberian Range, forming in particular as a substitution stage of *Quercus pyrenaica* woodland of which they largely retain the accompanying flora.

42.5B3 **Cordilleran silicicolous Scots pine forests**
Pinus sylvestris forests of siliceous ground in the oro- and supra-Mediterranean levels of the Cordillera Central.
(Rivas-Martinez, 1963; Ciaran and Blanco, 1984; Peinado Lorca and Martinez-Parras, 1987; Rivas-Martinez *et al.*, 1987)

42.5B31 **Summital Guadarraman silicicolous Scots pine forests**
Junipero nanae-Cytisetum purgantis pinetosum
Oro-Mediterranean, summital, silicicolous forests of *Pinus sylvestris* var. *iberica* of the Sierra de Guadarrama, with *Juniperus nana*.

42.5B32 **Lower Cordilleran silicicolous Scots pine forests**
Luzulo-Quercetum pyrenaicae deschampsio-pinetosum sylvestris p. i.a.
Supra-Mediterranean *Pinus sylvestris* var. *iberica* woods of the Cordillera Central (Guadarrama, Gredos), forming in particular as a substitution stage of *Quercus pyrenaica* woodland of which they largely retain the accompanying flora.

42.5B4 **Cantabrian Scots pine forests**
Isolated *Pinus sylvestris* forests of the Cantabrian mountain system, in the Cordillera Cantabrica, the Montes de Leon and the Serra do Geres.
(Lopez Gonzalez, 1982; Ciaran and Blanco, 1984; Da Costa, 1985)

42.5C GREEK SCOTS PINE FORESTS
Pinus sylvestris forests of the mountains of northern Greece (Pieria, Olympus, Vermion, Voras, Laïla, Elatia range), often with *Acer pseudoplatanus, Sorbus aucuparia*, and sometimes *Fagus sylvestris* or *Picea abies* in the tree layer and with *Vaccinium myrtillus* and *Rubus idaeus* in the shrub layer.
(Debazac and Mavrommatis, 1971; Horvat *et al.*, 1974)

42.5D PO TERRACE SCOTS PINE FORESTS
Forests of *Pinus sylvestris* of the fluvio-glacial terraces that constitute the high plains of the Po river system, with *Betula pendula, Quercus pubescens, Castanea sativa* and a ground layer with *Cytisus scoparia, Calluna vulgaris, Pteridium aquilinum, Deschampsia caespitosa, Molinia caerulea*.
(Fenaroli, 1970, 1984; Groppali *et al.*, 1980; Bassilana, 1984; Noirfalise, 1986; Ardito, 1989)

42.5E SCOTS PINE REFORESTATION
Pinus sylvestris plantations inside or near the present or recent natural range of the species. Other and very artificial *P. sylvestris* plantations should be listed under 83.

42.6 **BLACK PINE FORESTS**
Forests dominated by pines of the *Pinus nigra* group.

42.61 ITALIAN *PINUS NIGRA* FORESTS
Pinus nigra s.s. forests of the eastern Italian Alps and the Apennines.
(Fenaroli, 1970, 1984; Bonin, 1971; Pignatti, 1982; Ozenda, 1985; Bassani, 1987; Ferioli, 1989)

42.611 **Alpine *Pinus nigra* forests**
Pinus nigra ssp. *austriaca* forests of dry, sunny, rocky steep slopes and cliffs of the south-eastern pre-Alps (Carnian pre-Alps, Julian pre-Alps, Carso), between 200 and 1 200 m altitude, with *Cyclamen purpurascens* and *Aquilegia einseleana*.

42.612 **Apennine *Pinus nigra* forests**
Relict 'Villetta Barrea pine' (*Pinus nigra* ssp. *italica*) stations of the Abruzzi (Costa Camosciara, Villetta Barrea), the Campanian Apennines (Monti Picentini), the Pollino system (Orsomarso).

42.62 GREEK *PINUS NIGRA* FORESTS
Pinus nigra s.s. pine woods of north-western Greece.
(Mavrommatis, 1968; Horvat *et al.*, 1974)

42.63 SALZMANN'S PINE FORESTS
Pinus salzmannii forests of Spain and the Causses.
(Ortuno and Ceballos, 1977; Ozenda *et al.*, 1979; Lopez-Gonzalez, 1982; Noirfalise, 1986, 1987)

42.631 **Causses Salzmann's pine forests**
Isolated *P. salzmannii* var. *cebennensis* woods of the southern edge of the Causses, with an undergrowth typical of supra-Mediterranean white oak forests at the upper limit and of evergreen oak forests at lower altitudes; *Buxus sempervirens* is usually abundant.
(Braun-Blanquet, 1955b; Vanden Berghen, 1963)

42.632 **Pre-Pyrenean Salzmann's pine forests**
Meso- and supra-Mediterranean *P. salzmannii* var. *pyrenaica* forests of Pyrenean foothills; they are extensive in the south-eastern foothills, with outposts in the central foothills, in Catalonian ranges and, very locally, on the north side of the range (Valley of the Têt, Conflent). The understorey is formed by the cortège of *Quercus ilex (Juniperus oxycedrus, Rosmarinus officinalis, Quercus ilex)* at low altitudes, and by that of *Q. pubescens (Buxus sempervirens, Juniperus communis, Amelanchier ovalis, Cornus sanguinea, Lonicera etrusca)* at higher altitudes.
(Ortuno and Ceballos, 1977; Dupias, 1985; Vigo and Ninot, 1987)

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42.633 Northern-Iberian Salzmann's pine forests
Isolated *Pinus salzmannii* var. *pyrenaica* woods of the northern Iberian Range (Soria).
(Ortuno and Ceballos, 1977)

42.634 Cordilleran Salzmann's pine forests
Isolated silicicolous *Pinus salzmannii* var. *iberica* woods of the Cordillera Central, limited to small enclaves in the Sierra de Gredos and associated ranges, in the Rio Tietar-Rio Alberche area.
(Ortuno and Ceballos, 1977; Ciaran and Blanco, 1984)

42.635 Southern-Iberian Salzmann's pine forests
Supra- and, locally, oro-Mediterranean *Pinus salzmannii* var. *hispanica* forests of the southern Iberian Range, occupying extensive areas in the Serrania de Cuenca, the Maestrazgo and associated ranges, mostly on limestones.
(Ortuno and Ceballos, 1977; Ciaran and Blanco, 1984)

42.636 Baetic Salzmann's pine forests
Supra- and, locally, oro-Mediterranean *Pinus salzmannii* var. *hispanica* forests of the Baetic and sub-Baetic ranges, covering vast expanses, mostly on limestones, in the Sierras de Cazorla, Segura and Alcaraz, with outposts in the Sierra de Baza, the Sierra de Filabres and the calcareous periphery of the Sierra Nevada.
(Ortuno and Ceballos, 1977; Ciaran and Blanco, 1984; Herranz Sanz and Gomez Campo, 1986; Martinez Parras *et al.*, 1987; Peinado Lorca and Martinez-Parras, 1987; Martinez-Parras and Peinado Lorca, 1987)

42.6361 Supra-Mediterranean Baetic Salzmann's pine forests
Daphno latifoliae-Aceretum granatensis p., Salvio-Lavanduletum lanatae p.
Forests of *Pinus salzmannii* accompanied by a cortège similar to that of thermophilous oak forests, including *Quercus rotundifolia, Juniperus oxycedrus, Lavandula latifolia, Erinacea anthyllis, Rosmarinus officinalis, Genista scorpius, Crataegus monogyna, Berberis hispanica, Rosa pouzinii, Daphne laureola, Acer granatense, Paeonia officinalis*, of the Sierras de Cazorla, Segura and Alcaraz, the Sierra de Baza, the Sierra de Filabres and the calcareous periphery of the Sierra Nevada.

42.6362 Oro-Mediterranean Baetic Salzmann's pine forests
Daphno oleoidis-Pinetum sylvestris pinetosum salzmannii
Oro-Mediterranean woods of *Pinus salzmannii*, more open than those of 42.6361 and occupying very limited areas in the Sierras de Cazorla, Segura and Alcaraz, with a shrub layer of *Juniperus sabina* and *J. nana*, accompanied by *Ononis aragonensis, Genista lobelii* ssp. *longipes, Daphne oleoides* and *Prunus prostrata*.

42.64 CORSICAN LARICIO PINE FORESTS
Pinus laricio forests of the mountains of Corsica. The nuthatch *Sitta whiteheadi* is endemic to these forests.
(Lambinon *et al.*, 1978; Ozenda, *et al.*, 1979; Gamisans, 1985; Noirfalise, 1986)

42.641 Dense montane laricio forests
Galio-Pinetum luzuletosum
Pinus laricio forests of the montane level of Corsica, where they replace beech forests, either entirely in some ranges or mostly on adrets and as subclimax communities elsewhere. The undergrowth, fairly similar to that of beech forests, includes *Ilex aquifolium, Daphne laureola, Pteridium aquilinum, Allium pendulinum, Helleborus lividus* ssp. *corsicus, Galium odoratum*. Epiphytic lichens are often abundant, including *Cetraria glauca, Hypogymnia bitteriana*.

42.642 Open montane laricio forests
Galio-Pinetum anthyllidetosum
Open *Pinus laricio* forests of Corsica, growing at the upper forest limit or on steep rocky slopes, often with birches, *Betula pendula*.

42.643 Supra-Mediterranean laricio forests
Galio-Pinetum ericetosum
Pinus laricio forests of the supra-Mediterranean level of Corsica, with an often dense understorey of *Erica arborea* and *E. scoparia*.

42.65 CALABRIAN LARICIO PINE FORESTS
Pinus laricio var. *calabrica* forests of the Sila, the Aspromonte and Etna.
(Fenaroli, 1970, 1984; Bonin, 1971; Pignatti, 1982; Groppali *et al.*, 1983; Noirfalise, 1986; Bassani, 1987; Ferioli, 1989)

42.651 **Sila and Aspromonte laricio forests**
Pinus laricio forests of the Sila Greca, the Sila Grande, the Sila Piccola and the Aspramonte, where they replace beech forests in drier areas within the montane zone, forming at times, particularly in the Sila Grande, imposing expanses.

42.652 **Etna laricio forests**
Pinus laricio forests of the north flank of Mount Etna.

42.66 PALLAS'S PINE FORESTS
'Pino-Chamaecytision'
Montane forests of *Pinus pallasiana* of Greece.
(Horvat *et al.*, 1974; Mavrommatis, 1978; Gamisans and Hebrard, 1979)

42.67 BLACK PINE REFORESTATION
Plantations of pines of the *P. nigra* group, accompanied by semi-natural undergrowth formations. These are usually calciphilous communities when accompanying *P. nigra*, acidophilous ones when with *P. laricio*. In all cases they can be specified by codes borrowed from other units, used in conjunction with 42.67.

42.7 **HIGH ORO-MEDITERRANEAN PINE FORESTS**
Woods of *Pinus heldreichii, P. leucodermis* or *P. peuce*.

42.71 WHITE-BARKED PINE FORESTS
Local treeline formations of *Pinus heldreichii* or *P. leucodermis* restricted to northern Greece and southern Italy, usually open and with an undergrowth formed by stripped grasslands on dry, often stony or rocky soils.
(Fenaroli, 1970, 1984; Bonin, 1971; Debazac and Mavrommatis, 1971; Horvat *et al.*, 1974; Strid, 1980; Pignatti, 1982; Polunin and Walters, 1985; Bassani, 1987; Ferioli, 1989)

42.711 **Italian white-barked pine forests**
Rare white-barked pine formations of high southern Italian mountains, limited to the Abruzzian Appenines (Maiella), the Campanian Apennines (Monti Picentini) and the Lucano-Calabrian Apennines (Pollino, Monti Alpi di Latronico, Monte la Spina, Monti di Orsomarso, Monte Montea, Sierra delle Ciavole).

42.712 **Pindus white-barked pine forests**
White-barked pine formations of high elevations of the Pindus, mostly on ophiolites, at altitudes above 1 600 metres.

42.713 **Olympus white-barked pine forests**
White-barked pine formations of Mount Olympus, mostly on jurassic and triassic limestones at altitudes above 1 350 metres, with an undergrowth including *Juniperus nana, Daphne laureola, D. mezereum, D. oleoides, Genista radiata, Buxus sempervirens, Cotoneaster integerrimus*.

42.72 MACEDONIAN PINE WOODS
Pinion peucis
Pinus peuce formations, restricted to the subalpine zone of the high mountains of extreme northern Greece (Voras, Varnous).
(Horvat *et al.*, 1974; Mavrommatis, 1978; Kassioumis, 1988)

42.8 **MEDITERRANEAN PINE WOODS**
Mediterranean and thermo-Atlantic woods of thermophilous pines, mostly appearing as substitution or paraclimactic stages of forests of the *Quercetalia ilicis* or *Ceratonio-Rhamnetalia*. Long-established plantations of these pines, within their natural area of occurrence, and with an undergrowth basically similar to that of paraclimactic formations, are included.

42

42.81 MARITIME PINE FORESTS

Woods and plantations of *Pinus pinaster* ssp. *atlantica* of south-western France and the western Iberian peninsula.
(Becker *et al.*, 1981; Géhu and Géhu-Franck, 1984c; Ciaran and Blanco, 1984; Silveira da Costa, 1984, 1985)

42.811 **Charente pine-holm oak forests**

Pino pinastri-Quercetum ilicis
Pinus pinaster ssp. *atlantica* forests with a subcanopy of *Quercus ilex, Arbutus unedo* and sometimes *Quercus pubescens* or *Q. robur* and an undergrowth of *Rubia peregrina, Cistus salvifolius, Daphne gnidium* and, in the more acid stands, *Ulex europaeus, Cytisus scoparius, Erica scoparia* or, in more calcareous ones, *Hedera helix, Ruscus aculeatus,* developed on mostly calcareous inner dunes of the low-rainfall coasts of Vendée, Charente-maritime and northern Gironde, including the islands of Noirmoutier, Yeu, Ré and Oléron.

42.812 **Aquitanian pine-cork oak forests**

Pino pinastri-Quercetum suberis
Pinus pinaster ssp. *atlantica* forests with a subcanopy of *Quercus suber, Arbutus unedo* and sometimes *Quercus robur* and an undergrowth of *Erica cinerea, Pteridium aquilinum, Frangula alnus, Rubia peregrina* and, in the more open stands, *Cistus salvifolius, Cytisus scoparius, Erica scoparia, Calluna vulgaris* or, in more closed ones, *Hedera helix, Ruscus aculeatus, Ilex aquifolium*, developed on acidocline inner dunes of the warmer, more humid coasts of the Marensin, between the Eyre and the Adour river mouths.

42.813 **Landes maritime pine plantations**

Pinus pinaster ssp. *atlantica* woodland of south-western France other than the dunal formations listed in 42.811 and 42.812.

42.814 **Iberian maritime pine forests**

Pinus pinaster ssp. *atlantica* forests of Galicia, Portugal and neighbouring areas.

42.82 MESOGEAN PINE FORESTS

Forests of *Pinus pinaster* ssp. *pinaster (Pinus mesogeensis)* of the western Mediterranean, mostly in siliceous meso-Mediterranean, upper meso-Mediterranean and supra-Mediterranean situations of Spain, Corsica, south-eastern France, north-western Italy, Sardinia and Pantelleria.
(Braun-Blanquet, 1964; Archiloque *et al.*, 1969; Fenaroli, 1970; Ortuno and Ceballos, 1977; Lavagne and Moutte, 1977; Brullo, 1977; Ozenda, 1981, 1985; Pignatti, 1982; Guittonneau and Huon, 1983; Ciaran and Blanco, 1984; Gamisans, 1985; Herranz Sanz and Gomez Campo, 1986; Peinado Lorca and Martinez-Parras, 1987)

42.821 **Iberian mesogean pine forests**

Pinus pinaster forests of the Iberian peninsula, appearing mostly as substitution communities of *Quercus rotundifolia, Q. pyrenaica* or, locally, *Q. suber, Q. faginea* woodlands.

42.8211 **Northern-Iberian mesogean pine forests**

Very extensive *Pinus pinaster* forests of the northern Iberian Range and neighbouring areas, occupying siliceous, often sandy substrates.

42.8212 **Cordilleran mesogean pine forests**

Extensive *Pinus pinaster* forests of the Cordillera Central and neighbouring areas, particularly developed on the southern slope of the range, occupying siliceous substrates, mostly gneiss and granite.

42.8213 **Southern-Iberian mesogean pine forests**

Pinus pinaster forests of the southern Iberian Range and plateaux of eastern New Castile.

42.82131 **Siliceous southern-Iberian mesogean pine forests**

Widespread and extensive silicicolous *Pinus pinaster* forests, mostly occupying reddish sandy soils (rodenales).

42.832 **Balearic stone pine woods**
Pinus pinea formations of the Balearic Islands, native only on Ibiza and Formentera.

42.833 **Provence stone pine woods**
Pinus pinea formations of Provence, possibly spontaneous on coastal sands and in the Maures area.

42.8331 **Coastal Provence stone pine forests**
Pinus pinea woods of coastal sands, particularly of the Camargue, where it is associated with *Juniperus phoenicea* ssp. *lycia*.

42.8332 **Permian Provence stone pine forests**
Pinus pinea woods of the Permian depression encircling the Maures, and a few neighbouring localities, associated mostly with maquis of *Cistus monspeliensis, C. salvifolius, C. ladanifer, Erica scoparia*.

42.834 **Corsican stone pine woods**
Pinus pinea formations of the littoral of Corsica, some of which may be of natural origin, in particular on old dunes of the east coast.

42.835 **Sardinian stone pine forests**
Pinus pinea formations of Sardinia.

42.8351 **Iglesiente near-natural stone pine forests**
Pinus pinea forest of coastal dunes of Iglesiente, west of Monte Linas, comprising plurisecular trees and of undoubted indigenous origin.

42.8352 **Sardinian semi-natural stone pine forests**
Other *Pinus pinea* woods of Sardinia, some, particularly in the vicinity of Monte Linas, of possible native origin.

42.836 **Sicilian stone pine forests**
Pinus pinea formations of the Monti Peloritani, north-western Sicily, of probable native origin.

42.837 **Peninsular Italian stone pine forests**
Large, ancient, *Pinus pinea* plantations of the Tyrennian, and locally, Adriatic coasts of the Italian peninsula, in Liguria, Tuscany, Latium, Campania, Emilia-Romagna (Ravenna) and Friuli-Venetia Giulia (Grado).

42.838 **Greek stone pine forests**
Pinus pinea woods of the littoral and coastal hills of the Peloponnese, Chalcidice, Crete and Aegean islands, rather local but probably in part, at least, spontaneous; a splendid example exists, in particular, on Skiathos.

42.84 ALEPPO PINE FORESTS
Woods of *Pinus halepensis*, a frequent colonist of thermo- and calcicolous meso-Mediterranean scrubs. The distinction between spontaneous forests and long-established formations of artificial origin is often difficult. The latter are thus included here, while recent, obviously artificial groves are not.
(Rechinger, 1943, 1951; Loisel, 1971; Ortuno and Ceballos, 1977; Lavagne and Moutte, 1977; Sfikas, 1978; Molinier and Martin, 1980; Ozenda, 1981, 1985; Pignatti, 1982; Lopez Gonzalez, 1982; Ciaran and Blanco, 1984; Fenaroli, 1984; Polunin and Walters, 1985; Tassi, 1985; Dupias, 1985; Gamisans, 1985; Pratesi and Tassi, 1986; Herranz Sanz and Gomez Campo, 1986; Kassioumis, 1988; Ferioli, 1989; Bournérias *et al.*, 1990)

42.841 **Iberian Aleppo pine forests**
Pinus halepensis forests of Spain, considered native for at least two-thirds of their considerable expanse; they are mostly restricted to eastern regions on the Mediterranean slope of the Catalonian mountains, the Maestrazgo, the pre-Baetic ranges of the upper Guadalquivir basin, the southern Andalusian mountains; they penetrate farther inland in the Ebro basin and around the headwaters of the Tagus and Guadalquivir systems.

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42.842 **Balearic Aleppo pine forests**
Pinus halepensis formations of the Balearics, present and probably native on all the major islands.

42.843 **Provenço-Ligurian Aleppo pine forests**
Mostly lower meso-Mediterranean *Pinus halepensis* forests of Provence and of the lower slopes and coastlines of the Maritime and Ligurian Alps, extensive and undoubtedly native.

42.844 **Corsican Aleppo pine woods**
Rare and local *Pinus halepensis* woods of the Corsican coasts, some, at least, possibly natural.

42.845 **Sardinian Aleppo pine woods**
Pinus halepensis formations of Sardinia, where certainly native woods occur on Isola di San Pietro and the Sulcis coast of Iglesiente.

42.846 **Sicilian Aleppo pine woods**
Pinus halepensis formations of Sicily and peripheral islands.

42.8461 **Mainland Sicilian Aleppo pine forests**
Pinus halepensis woods of mainland Sicily, where native formations occur on the south-western slope of the Iblei massif (Vittoria).

42.8462 **Egadi Aleppo pine forests**
Pinus halepensis woods of the Egadi islands (Marettimo, Isla Grande, San Pantaleo).

42.8463 **Lampedusa Aleppo pine forests**
Pinus halepensis woods of the Pelagie (Lampedusa).

42.8464 **Pantelleria Aleppo pine forests**
Pino-Genistetum aspalathoidis pinetosum halepensis
Uncommon *Pinus halepensis*-dominated facies of the pine woods of Pantelleria.

42.847 **Peninsular Italian Aleppo pine forests**
Pinus halepensis formations of the Italian peninsula; extensive, probably at least partially native ones are individualized in the subdivisions below.

42.8471 **Gargano Aleppo pine forests**
Pinus halepensis forests of Monte Gargano and the Tremiti islands.

42.8472 **Metapontine Aleppo pine forests**
Pinus halepensis forests of the Gulf of Taranto area, in particular of the Metapontine littoral.

42.8473 **Umbrian Aleppo pine forests**
Pinus halepensis forests of southern Umbria, in the Narni and Spoleto-Terni areas.

42.8474 **Italian Aleppo pine reforestation**
Other *Pinus halepensis* formations of peninsular Italy.

42.844 **Greek Aleppo pine forests**
Pinus halepensis formations of Greece, where the species is relatively widespread, particularly in Attica, Thessaly, the coasts of the Peloponnese and of central continental Greece, the Ionian islands, Chalcidici, the northern Sporades, Euboea and Skiros.

42.85 AEGEAN PINE FORESTS
Pinus brutia forests of Crete and eastern Aegean islands. Eastern vicariants of Aleppo pine forests (42.84), they comprise, however, taller, more luxuriant, and often extensive, formations.
(Rechinger, 1943, 1951; Horvat *et al.*, 1974; Sfikas, 1987; Latridis, 1988)

42.851 **Aegean pine forests of Crete**
Pinus brutia-dominated forests of Crete and its satellite islands Gavdos and Gaidaronisi, pure or mixed with *Cupressus sempervirens*; they are widespread in particular in the White Mountains, the Psiloriti range, the Dikti range and, locally, in the Sitia mountains and the Asterousia mountains.

42.8511 **Cretan lentisc Aegean pine forests**
Pinus brutia forests with garrigue undergrowth of *Pistacia lentiscus, Cistus creticus*.

42.8512 **Cretan phrygana Aegean pine forests**
Pinus brutia forests with a phrygana undergrowth of *Sarcopoterium spinosum* or *Thymus capitatus*.

42.8513 **Cretan grassy Aegean pine forests**
Pinus brutia forests with sparse grassy undergrowth on stony ground.

42.852 **Aegean pine forests of Lesbos**
Extensive *Pinus brutia* forests of Lesbos, occupying Mount Olympus and surrounding hills in the south-eastern quadrant of the island, as well as parts of the Kuratsonas range in the north-west; these forests harbour the only European population of the nuthatch *Sitta krueperi* and the most significant one of the orchid *Comperia comperiana*.

42.8521 **Lesbian humid montane Aegean pine forests**
Humid montane *Pinus brutia* forests of Lesbos, with a high, fairly dense *Quercus coccifera*-dominated understorey and abundant lichen growth.

42.8522 **Lesbian cistus Aegean pine forests**
Dry collinar *Pinus brutia* forests of Lesbos, with low, sparse undergrowth formed mostly by *Cistus salvifolius*.

42.8523 **Lesbian heath Aegean pine forests**
Dry collinar *Pinus brutia* forests of Lesbos, with continuous ericaceous undergrowth.

42.853 **Aegean pine forests of Samos**
Pinus brutia forests covering large expanses of Samos, in particular in the Ambelos range, the Kerki mountains, the southern hills and the north-eastern peninsula.

42.8531 **Samian collinar Aegean pine forests**
Lower altitude *Pinus brutia* forests of Samos, with *Pistacia lentiscus, Cistus salvifolius, C. parviflorus, Sarcopoterium spinosum, Quercus coccifera*.

42.8532 **Samian montane Aegean pine forests**
Higher altitude *Pinus brutia* forests of Samos, sometimes including *Pinus pallasiana*, and with an undergrowth comprising *Quercus coccifera, Prunus cocomilia (P. pseudarmeniaca), Crataegus spp.*

42.854 **Aegean pine woods of Chios**
Remnant forests of Chios with a composition and stratification similar to those of the forests of Samos.

42.855 **Aegean pine forests of Thasos**
Broad *Pinus brutia* belt on the lower reaches of Thasos, up to about 400 to 500 m, mixed with *Pinus pallasiana* in the higher areas.

42.8551 **Thasian kermes Aegean pine forests**
Thasos *Pinus brutia* forests with a dense *Quercus coccifera* undergrowth.

42.8552 **Thasian bracken Aegean pine forests**
Thasos *Pinus brutia* forests with sparse undergrowth.

42.8553 **Thasian heath Aegean pine forests**
Thasos *Pinus brutia* forests with dense ericaceous undergrowth.

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42.856 **Aegean pine woods of Samothrace**
Mostly sparse *Pinus brutia* formations of the lowlands of Samothrace.

42.857 **Aegean pine forests of Rhodes**
Remnant *Pinus brutia* forests of Rhodes, still represented by some relatively natural formations with rich scrub undergrowth.

42.858 **Aegean pine forests of Karpathos**
Fairly extensive *Pinus brutia* forests of Karpathos, distributed, in particular, in the northern coastal area, the southern interior and the middle elevation of Kali Limni.

42.859 **Aegean pine forests of the Dodecanese**
Pinus brutia formations of the islands of Simi, Kos, Leros and Ikaria.

42.9 **CANARY ISLAND PINE FORESTS**
Cytiso-Pinetea canariensis: Cisto-Pinion canariensis
Forests of endemic *Pinus canariensis*, of the dry montane level at around 800 to 2 000 m (locally down to 500 and up to 2 500 m) in Tenerife, La Palma, Gran Canaria and Hierro, with *Chamaecytisus proliferus, Adenocarpus foliolosus, Cistus symphytifolius, Lotus campylocladus, L. hillebrandii, L. spartioides, Daphne gnidium, Juniperus cedrus, Micromeria spp.*; these forests, of which well-preserved examples have become rare, are the only habitat of *Fringilla teydea, Dendrocopos major canariensis* and *D. m. thanneri*.
(Bannerman, 1963; Ortuno and Ceballos, 1977; White, 1983; Bramwell and Bramwell, 1983; Ciaran and Blanco, 1984; Wildpret de la Torre and del Arco Aguilar, 1987; Serrada *et al.*, 1988; Machado, *in litt.*, 1989)

42.91 CANARY PINE-ROCKROSE FORESTS
Climax *Pinus canariensis* forests within the main zone of altitudinal occurrence, with an undergrowth characterized and often dominated by *Cistus symphytifolius* and comprising *Chamaecytisus proliferus, Lotus campylocladus, L. hillebrandii, L. spartioides, Juniperus cedrus, Bystropogon origanifolius, Argyranthemum adauctum*.

42.911 **Tenerife pine-rockrose forests**
Pine forests of Tenerife, with *Lotus campylocladus, Chamaecytisus proliferus (Cytiso proliferi-Pinetum canariensis cistetosum symphytifolii)*; they are the main habitat of the endangered *Dendrocopos major canariensis* and of *Fringilla teydea teydea*.

42.912 **La Palma pine-rockrose forests**
Pine forests of La Palma, with *Lotus hillebrandii (Loto hillebrandii-Pinetum canariensis cistetosum)*.

42.913 **Gran Canaria pine-rockrose forests**
Pine forests of Gran Canaria, with *Cistus symphytifolius* var. *leucophyllus* and *Lotus spartioides*; they are the main habitat of the threatened *Dendrocopos major thanneri* and *Fringilla teydea polatzeki*.

42.914 **Hierro pine-rockrose forests**
Pine forests of Hierro, with *Lotus hillebrandii*.

42.92 CANARY PINE-DRY SCRUB FORESTS
Formations of dry, south-facing slopes in the lower part of the *Pinus canariensis* belt, transitional towards juniper formations and their degradation scrubs, with an undergrowth often formed by *Cistus monspeliensis, Euphorbia obtusifolia* ssp. *regis-jubae, Salvia canariensis, Micromeria hyssopifolia, Echium aculeatum*.

42.921 **Tenerife pine-dry scrub woods**

42.922 **La Palma pine-dry scrub woods**

42.923 **Gran Canaria pine-dry scrub woods**

42.924 **Hierro pine-dry scrub woods**

42.93 CANARY PINE-HEATH FORESTS
Formations of humid, fogbound north- and north-west-facing slopes in the lower reaches of the *Pinus canariensis* belt, with an abundance of *Erica arborea* and *Myrica faya*, and occasionally with *Ilex canariensis* and *Arbutus canariensis*; epiphytic lichens are abundant, as are dense carpets of mosses, in particular, *Hypnum cupressiforme*. These woods are the main habitat of *Regulus teneriffae*.

42.931 **Tenerife pine-heath forests**

42.932 **La Palma pine-heath forests**

42.933 **Gran Canaria pine-heath forests**
Formations of Gran Canaria, harbouring the endemic *Micromeria pineolens*.

42.934 **Hierro pine-heath forests**
Formations of Hierro, harbouring the almost extinct *Adenocarpus ombriosus*.

42.94 CANARY PINE-BROOM WOODS
Formations of the highest altitudes of the *Pinus canariensis* belt, invaded by species of the supra-Canarian level, in particular *Adenocarpus viscosus*.

42.941 **Tenerife pine-broom woods**
Formations of Tenerife, with *Adenocarpus viscosus* var. *viscosus*.

42.942 **La Palma pine-broom woods**
Formations of La Palma, with *Adenocarpus viscosus* var. *spartioides*.

42.95 CANARY PINE-JUNIPER WOODS
Junipero cedri-Pinetum canariensis
Pinus canariensis and *Juniperus cedrus* formations of steep, rocky slopes of high altitudes of Tenerife and La Palma.

42.951 **Tenerife pine-juniper woods**
Formations of the edges of Las Canadas del Teide.

42.952 **La Palma pine-juniper woods**
Formations of the summits of La Palma.

42.A **CYPRESS, JUNIPER AND YEW FORESTS**
Woods dominated by *Cupressus sempervirens, Juniperus spp.* or *Taxus baccata*.

42.A1 CYPRESS FORESTS
Acero-Cupression
Montane forests of Crete and a few eastern Aegean islands, dominated by *Cupressus sempervirens*.
(Rechinger, 1943, 1951; Ozenda *et al.*, 1979; Noirfalise, 1987; Sfikas, 1987; Yatridis, 1988; Kassioumis, 1988)

42.A11 **Cypress forests of Crete**
Cupressus sempervirens and *C. sempervirens-Pinus brutia* forests of Crete occupying a wide altitudinal range, but a restricted geographical area, in the White Mountains (notably Samaria) with outposts in the Idi and Dikti mountains. Tall, closed, luxuriant forests exist, with cypresses up to 30 metres, as well as more open stands. Accompanying the cypress and *Pinus brutia* may be *Quercus coccifera, Acer sempervirens, Zelkova abelicea*.

42.A12 **Cypress forests of Rhodes**
Cupressus sempervirens and *C. sempervirens-Pinus brutia* forests of Rhodes, represented on most mountain ranges and locally at lower altitudes.

42.A13 **Cypress woodland of Syme**
Cupressus sempervirens formations of Syme, rather open and with impoverished undergrowth.

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42.A14 **Cypress woodland of Kos**
Cupressus sempervirens forest remnants of middle elevations of Kos.

42.A15 **Cypress woodland of Samothrace**
Cupressus sempervirens formations of steep slopes of the south-eastern side of Samothrace.

42.A2 SPANISH JUNIPER WOODS
Juniperion thuriferae
Forest formations dominated by *Juniperus thurifera* of Spain, southern France and Corsica. Many communities may be better described as arborescent matorrals, and listed under 32.136; geographical divisions can nevertheless be retained by appending the suffixes of 42.A2 to 32.136.
(Ozenda *et al.*, 1979; Ozenda, 1981, 1985; Dupias, 1985; Blanco Castro and Sainz Ollero, 1985; Gamisans, 1985; Noirfalise, 1986, 1987; Navarro Andres and Valle Gutierrez, 1987; Peinado Lorca and Martinez-Parras, 1987; Costa, 1987; Bolos and Capdevila, 1987; Rivas-Martinez *et al.*, 1987)

42.A21 **Iberian Spanish juniper forests**
Juniperetum hemisphaerico-thuriferae, Junipero thuriferae-Quercetum rotundifoliae p.
Juniperus thurifera forests on calcareous substrates in the supra-Mediterranean levels of the Iberian Range and neighbouring plateaux, dispersed throughout the entire system, in an arc extending from the province of Burgos to the Serrania de Cuenca and the mountains of Teruel; these constitute the main range of the species. *Pinus sylvestris* and *P. Salzmannii* may accompany the juniper; *Juniperus hemisphaerica* and *Berberis hispanica* may be common in the undergrowth.

42.A22 **Guadarraman Spanish juniper woods**
Juniperetum hemisphaerico-thuriferae p.
Relict *Juniperus thurifera* woods of enclaves on the periphery of and within the Sierra de Guadarrama, occurring both on rare local limestone deposits and in a few siliceous stations.

42.A221 **Guadarraman calciphilous Spanish juniper woods**
Formations of *Juniperus thurifera* linked to local limestone deposits of the Sierra de Guadarrama area.

42.4222 **Guadarraman silicicolous Spanish juniper woods**
Juniperetum hemisphaerico-thuriferae juniperetosum oxycedri
Anomalous silicicolous *Juniperus thurifera* formations, with *J. oxycedrus*.

42.A23 **Cantabrian Spanish juniper woods**
Juniperetum sabino-thuriferae
Relict, open *Juniperus thurifera* woodlands of dry, warm, rocky, calcareous southern slopes of the Cordillera Cantabrica, between the Rio Pisuerga and the Rio Luna, with *Juniperus nana, J. sabina, Berberis vulgaris* ssp. *cantabrica, Rhamnus alpinus, Viburnum lantana.*

42.A24 **Monegros Spanish juniper woods**
Juniperus thurifera woodlands on gypsiferous soils of the Ebro basin, with *Rhamnus lycioides.*

42.A25 **Manchegan Spanish juniper woods**
Junipero thuriferae-Quercetum rotundifoliae p.
Juniperus thurifera woods on La Mancha clay soils of the Campo de Montiel.

42.A26 **Baetic Spanish juniper woods**
Relict, open *Juniperus thurifera* formations of the pre-Baetic system in the Sierra Taibilla (Albacete, Murcia).

42.A27 **Pyrenean Spanish juniper woods**
Relict *Juniperus thurifera* wood of the supra-Mediterranean level of the Montagne de Rie, on the northern flank of the central Pyrenees.

42.A28 **Southern Alpine Spanish juniper woods**
Juniperus thurifera formations of warm calcareous supra-Mediterranean slopes of the south-western Alps, in Drôme, Hautes-Alpes and Alpes-de-Haute-Provence, between 700 and 1 200, occasionally 1 400, m.

42.A29 **Isère Spanish juniper woods**
Juniperus thurifera formations of warm calcareous supra-Mediterranean slopes of the Isère valley, in the western Alps, between 300 and 500 m.

42.A2A **Corsican Spanish juniper woods**
Open montane forests of *Juniperus thurifera*, sometimes mixed with *Pinus laricio*, restricted to a few valleys in the interior of Corsica with extreme temperature ranges (Pinnera, Rudda, Pruniccia).

42.A3 GRECIAN JUNIPER WOODS
Juniperetum excelsae
Forest formations dominated by *Juniperus excelsa*, of the *Ostryo-Carpinion* zone of the mountains of northern Greece (up to 900-1 000 m, around Lake Prespa). Arborescent matorrals, somewhat more widespread in Greece, have been listed under 32.1331.
(Horvat *et al.*, 1974)

42.A4 STINKING JUNIPER WOODS
Forest formations dominated by *Juniperus foetidissima* on adrets of the upper supra-Mediterranean level in Greece. Arborescent matorrals, somewhat more widespread in Greece, including the Aegean archipelagoes (Samos), have been listed under 32.1332.
(Rechinger, 1951; Noirfalise, 1986, 1987)

42.A5 SYRIAN JUNIPER WOODS
Juniperus drupacea woods of the northern slopes of Mount Parnon, Greece. Part of the formation takes the appearance of an arborescent matorral, listed under 32.135.
(Polunin, 1980; Kassioumis, 1988)

42.A6 ARBOR-VITAE FORESTS
Xero-thermophile forests of *Tetraclinis articulata,* restricted to extreme south-eastern Spain, are extinct in forest form. The relict formations dominated by this species, of exceptional bio-geographical and historical importance, constitute arborescent matorrals and have been listed under 32.15.
(Templado, 1974; Tomaselli, 1981b)

42.A7 YEW WOODS
Woods dominated by *Taxus baccata*, often with *Ilex aquifolium*, of very local occurrence.
(Fenaroli, 1970; Brun *et al.*, 1975; Groppali, *et al.*, 1983; Sobron Garcia, 1984; Gamisans, 1985; Pratesi and Tassi, 1986; Noirfalise, 1986, 1987; Ferioli, 1989; Rodwell 1991)

42.A71 **British yew woods**
Taxus baccata woods with *Sorbus aria* or *Mercurialis perennis* of dry valleys and scarps of the chalk of south-east England and, very locally, of the Durham magnesium limestone.

42.A72 **Corsican yew woods**
Formations of *Taxus baccata, Ilex aquifolium, Buxus sempervirens*, restricted to cool, montane areas in the Tenda range, the San Pedrone range and the Cap Corse mountains.

42.A73 **Sardinian yew woods**
Taxus baccata and *Ilex aquifolium* woods of the Catena del Marghine and the Mount Limbara system.

42.A74 **Peninsular Italian yew woods**
Taxus baccata and *Ilex aquifolium* of the Macerata region.

42.A75 **Iberian yew woods**
Occasional pure *Taxus baccata* formations of Spanish mountains, most often on steep shady slopes.

42

42.A76 **Provence yew woods**
Taxus baccata formations of southern France, similar to 42.A75.

42.A8 MACARONESIAN JUNIPER WOODS
Juniper-dominated formations of the Atlantic islands. All such formations are listed here whether wood-like or scrub-like in physiognomy; ericoid-dominated facies of the same formations have been listed under 31.3.
(Géhu, 1984; Blanco Castro and Sainz Ollero, 1985; Wildpret de la Torre and Arco Aguilar, 1987; Serrada *et al.*, 1988; Machado *in litt.*, 1989)

42.A81 **Canarian juniper woods**
Juniperus cedrus formations of the high altitudes of Tenerife, La Palma, Gomera, Gran Canaria, restricted to steep rocky slopes.

42.A82 **Azorean juniper woods**
Juniperion brevifoliae p.
Endemic *Juniperus brevifolia* formations of the Azores.

42.A83 **Macaronesian Phoenician juniper woods**
Maytenio-Juniperion phoeniceae p.
Juniperus phoenicea formations of Tenerife, La Palma, Hierro, Gran Canaria, Gomera.

42.A9 PRICKLY JUNIPER WOODS
Woods dominated by *Juniperus oxycedrus*. Most *J. oxycedrus* formations are at most arborescent matorral listed under 32.131. A few may, however, qualify as woodland, as, for instance, those of the Limbara in Sardinia.
(Veri and Pacioni, 1985)

42.AA PHOENICIAN JUNIPER WOODS
Mediterranean formations dominated by *Juniperus phoenicea* are mostly arborescent matorrals and have been covered under 32.132. Exceptional, tall and dense formations, however, may be more appropriately characterized as woodland and listed in this unit.

43 Mixed woodland

Forest and woodland of mixed deciduous and coniferous trees. Detailed habitats can be coded by transposing subdivisions of division 41, simply replacing prefix 41 by prefix 43. Mixed coniferous and broad-leaved evergreen woodland should not be listed under 43, but under 42 or 45, depending on dominance.

44 Alluvial and very wet forests and brush

Tree and shrub vegetation of flood plains, marshes, fens and bogs.

44.1 RIPARIAN WILLOW FORMATIONS

Salicetea purpureae; Populetalia albae p.

Salix spp. brush or arborescent formations, lining flowing water and submitted to periodic flooding.

44.11 PRE-ALPINE WILLOW BRUSH

Salicetea purpureae: Salicion elaeagni

Willow brush of fast, pebbly, summer-high rivers in Alpine and peri-Alpine valleys with *Salix eleagnos, S. purpurea* ssp. *gracilis, S. daphnoides, S. nigricans, Myricaria germanica and Hippophae rhamnoides.*

(Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Yon and Tendron, 1981; Ozenda, 1985; Oberdorfer, 1990)

44.111 Willow-tamarisk brush

Salici-Myricarietum

Low, prostrate *Myricaria germanica* and *Salix spp.* formations of low, silty shoals.

44.112 Willow and sea-buckthorn brush

Salicetum elaeagno-daphnoidis

Formations of *Salix spp.* and *Hippophae rhamnoides* of higher gravel shoals.

44.12 LOWLAND, COLLINAR AND MEDITERRANEO-MONTANE WILLOW BRUSH

Salicion triandro-viminalis, Salicenion angustifolii, Salicion salvifoliae (Salicion albae p)

Linear shrubby willow formations of river banks in plains, hills and low mountains of middle Europe and the Mediterranean region, with *Salix triandra, S. viminalis, S. purpurea.*

(Ellenberg, 1963, 1988; Westhoff and den Held, 1975; Yon and Tendron, 1981; Géhu, 1984; Noirfalise, 1984; Rivas-Martinez *et al.*, 1984; Oberdorfer, 1990)

44.121 Almond willow-osier scrub

Salicetum triandro-viminalis

Willow scrub, often dense, lining water courses of medio-European and Atlantic lowlands and hills, with *Salix purpurea* ssp. *lambertiana, S. triandra, S. viminalis.*

(Noirfalise and Sougnez, 1961; Westhoff and den Held, 1975; Noirfalise, 1984; Bournérias, 1984; Ellenberg, 1988; Oberdorfer, 1990; Rodwell, 1991)

44.122 Mediterranean purple willow scrub

Saponario officinalis-Salicetum pupureae

Willow scrub dominated by *Salix purpurea* ssp. *lambertiana* and *S. eleagnos* ssp. *angustifolia* of water courses of southern France, Mediterranean eastern Spain south to the Rio Segura basin, Italy.

(Archiloque *et al.*, 1969; Bolos, 1979; Perdigo, 1979; Folch i Guillen, 1979; Francalancia and Orsomando, 1980; Molinier and Martin, 1980; Rivas-Martinez *et al.*, 1984; Alcaraz Ariza and Peinado Lorca, 1987)

44.123 Balkanic purple willow scrub

Tamarici-Salicetum purpureae, Nerio-Salicetum purpureae, Salicetum triandrae balcanicum, Alneto-Salicetum amplexicaulis i. a.

Willow-dominated scrub of banks and shoals of Greek rivers, with *Salix purpurea, S. amplexicaulis, S. elaeagnos, S. triandra, S. viminalis.*

(Oberdorfer, 1953; Horvat *et al.*, 1974; Strid, 1980; Sfikas, 1984)

44.124 **Ibero-montane willow scrub**
Salicetum triandro-elaeagni
Willow scrub, up to 2-3 m tall, lining water courses of the Pyrenees, the Iberian Range, the Sierra Nevada, formed by *Salix purpurea, S. elaeagnos* ssp. *angustifolia, S. triandra.*
(Lopez, 1976; Rivas-Martinez *et al.*, 1984; Dupias, 1985; Martinez Parras *et al.*, 1987; Vigo and Ninot, 1987)

44.125 **Cantabrian willow scrub**
Salicetum cantabricae
Willow scrub of montane rivers and arroyos of the Cordillera Cantabrica, with the endemic *Salix cantabrica* and with *S. elaeagnos* ssp. *angustifolia, S. purpurea* ssp. *lambertiana, S. triandra* ssp. *discolor.*
(Rivas-Martinez *et al.*, 1984; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987)

44.126 **Iberian sage-leaved willow scrub**
Salicetum purpureo-salvifoliae (Salicetum lambertiano-salvifoliae)
Small or medium-sized willow scrub of meso-Mediterranean and, locally, supra-Mediterranean, zones of central Iberia (Castellano-Leonese sectors, Extremadura), characterized by the presence of the Iberian endemic *Salix salvifolia* and *S. x secalliana*, together with *S. atrocinerea, S. x matritensis, S. neotricha, S. purpurea* ssp. *lambertiana, S. triandra* ssp. *discolor*; they line, mostly on siliceous sandy soils, small oligotrophic rivers with strong seasonal amplitude, or form behind the taller curtain of the *Populo nigrae-Salicetum neotrichae* along large water courses of argilous base-rich soils.
(Rivas-Martinez, 1975; Rivas-Martinez *et al.*, 1984; Navarro Andres and Valle Gutierrez, 1987; Rivas-Martinez *et al.*, 1987; Ladero Alvarez, 1987)

44.127 **Pedicellated willow scrub**
Willow scrub of stream courses of extreme southern Europe, characterized by the presence of the south-western Mediterranean and North African *Salix pedicellata.*
(Pignatti, 1982; Chiappini, 1985b; Rivas-Martinez *et al.*, 1987; Asensi Marfil and Diez Garretas, 1987)

44.1271 **Andalusian willow scrub**
Equiseto telmateiae-Salicetum pedicellatae (Salicetum pedicellatae)
Willow scrub of south-western Iberian stream courses, fringing, in particular, humid *Quercus canariensis* forests in conjunction with rhododendron-alder galleries (44.52), dominated by *Salix pedicellata* and *Salix salvifolia* ssp. *australis.*

44.1272 **Sardinian pedicellated willow scrub**

44.1273 **Sicilian pedicellated willow scrub**

44.1274 **Calabrian pedicellated willow scrub**

44.13 WHITE WILLOW GALLERY FORESTS
Salicion albae: Salicetum albae, Salicetum fragilis
Arborescent galleries of tall *Salix alba, S. fragilis* and *S. x rubens*, sometimes including *Populus nigra*, along medio-European lowland, hill or sub-montane rivers, submitted to a regular regime of inundation.
(Ellenberg, 1963, 1988; Westhoff and den Held, 1975; Bournérias, 1979; Yon and Tendron, 1981; Géhu, 1984; Oberdorfer, 1990; Rodwell, 1991)

44.14 MEDITERRANEAN TALL WILLOW GALLERIES
Populetalia albae p.
Arborescent willow formations bordering Mediterranean watercourses, willow-dominated belt or facies of the poplar-ash-elm forests.

44.141 **Mediterranean white willow galleries**
Riparian forests of Iberia and the Mediterranean basin dominated by *Salix alba* or its relatives.

44.1411 **Iberian tall willow galleries**
Populo nigrae-Salicetum neotrichae
Arborescent willow galleries dominated by *Salix neotricha* accompanied by *Salix alba, S. fragilis, Populus nigra* and sometimes *P. alba, Fraxinus angustifolia, Frangula alnus, Sambucus nigra, Ulmus spp.*, forming as the ligneous vegetation closest to the water along the middle and lower course of large rivers of little seasonal amplitude in the meso- and supra-Mediterranean foothills of the Cantabrian Cordillera, the Iberian Range and neighbouring regions.
(Lopez, 1976; Navarro Andres and Valle Gutierrez, 1987)

44.1412 **Mediterranean *Salix alba* galleries**
Populion albae: Rubo caesi-Populetum albae i. a.
Other Mediterranean riparian forests formed by white willows, *Salix alba, S. fragilis-* or *S. x rubens*-dominated facies of poplar-ash-elm forests developed along lowland Iberian, southern French, Italian, Greek rivers; the accompanying cortège does not differ from that of poplar or ash-dominated facies.
(Horvat *et al.*, 1974; Francalancia and Orsomando, 1980; Pedrotti, 1980; Pignatti, 1982; Diaz Gonzalez and Fernandez Prieto, 1987)

44.142 **Olive-leaved and ashy willow riparian woods**
Rubo corylifolii-Salicetum atrocinereae, Viti viniferae- Salicetum atrocinereae
Woods of arborescent willows, physiognomically dominated by *Salix atrocinerea* or *S. cinerea*, forming, in thermo-, meso- or supra-Mediterranean areas, on the banks of slow water courses; similar woods occupy soggy depressions (44.92).
(Rivas-Martinez, 1975; Sfikas, 1978; Bolos, 1979; Rivas-Martinez *et al.*, 1980; Pignatti, 1982; Chiappini, 1985b; Navarro Andres and Valle Gutierrez, 1987; Asensi Marfil and Diez Garretas, 1987; Rivas-Martinez *et al.*, 1987; Ladero Alvarez, 1987; Rallo and Pandolfi, 1988)

44.1421 **Iberian olive-leaved willow woods**
Rubo corylifolii-Salicetum atrocinereae
Riparian woods of *Salix atrocinerea* of central and eastern Iberia, with *Salix neotricha, S. salvifolia, Frangula alnus, Populus tremula, Fraxinus angustifolia* and many lianas and brambles (*Rubus spp.*).

44.1422 **Andalusian olive-leaved willow woods**
Viti viniferae-Salicetum atrocinereae
Riparian woods formed almost exclusively by *Salix atrocinerea*, with a few *Fraxinus angustifolia,* numerous lianas and brambles (*Rubus spp.*) and an abundance of *Thelypteris palustris* in the undergrowth, characteristic of the south-western Iberian peninsula.

44.1423 **Sardinian olive-leaved willow woods**
Riparian woods of *Salix atrocinerea* of Sardinia.

44.1424 **Ashy willow riparian woods**
Frangulo-Salicetum cinereae i.a.
Riparian woods of *Salix cinerea* of Italy and Greece.

44.15 CANARIAN WILLOW GALLERIES
Rubo-Salicetum canariensis
Riparian communities forming mostly in ravines and gullies within the laurel forest belt of the Canary Islands and characterized by the presence of the tall endemic, *Salix canariensis*. The best preserved are found in the barranco de Los Cernicalos of Gran Canaria, in the caldera de Taburiente of La Palma and in the barranco del Infierne of Tenerife.
(Wildpret de la Torre and Arco Aguilar, 1987; Serrada *et al.*, 1988)

44.2 **GREY ALDER GALLERIES**
Alnion incanae (Alnetum incanae s.l)
Riparian woods of *Alnus incana* of montane and sub-montane rivers of the Alps, the northern Apennines and neighbouring regions.
(Ellenberg, 1963, 1988; Braun-Blanquet, 1975; Ozenda, 1981; Yon and Tendron, 1981; Noirfalise, 1986; Ferioli, 1989; Oberdorfer, 1990)

44.21 MONTANE GREY ALDER GALLERIES

Calamagrosti variae-Alnetum incanae

Alnus incanus formations of the upper reaches of Alpine, particularly inner Alpine, valleys, replacing, colonizing or fringing the pioneer willow scrubs of the *Salicion elaeagni* (44.11).

44.22 SUB-MONTANE GREY ALDER GALLERIES

Equiseto hyemalis-Alnetum incanae

Alder formations of the middle course of rivers flowing from the Alps, in particular on the Bavarian plateau, the Rhine and Rhône systems.

44.3 **MEDIO-EUROPEAN STREAM ASH-ALDER WOODS**

Alno-Padion p. (Fraxino-Alnion glutinosae)

Riparian forests of *Fraxinus excelsior* and *Alnus glutinosa*, sometimes *Alnus incana*, of middle European and northern Iberian lowland or hill watercourses, on soils periodically inundated by the annual rise of the river level, but otherwise well-drained and aerated during low-water; they differ from riparian alder woods within 44.9 by the strong representation in the dominated layers of forest species not able to grow in permanently waterlogged soils. (Oberdorfer, 1953, 1990; Noirfalise and Sougnez, 1961; Westhoff and den Held, 1975; Yon and Tendron, 1981; Bournérias, 1984; Noirfalise, 1984; Ellenberg, 1988)

44.31 ASH-ALDER WOODS OF RIVULETS AND SPRINGS

Carici remotae-Fraxinetum, Equiseto telmateiae-Fraxinetum, Ribeso sylvestris-Fraxinetum

Fraxinus excelsior-Alnus glutinosa formations of springs and small streams of Atlantic, sub-Atlantic and subcontinental middle Europe, usually dominated by ashes, with *Carex remota, C. pendula, C. strigosa, Equisetum telmateia, Rumex sanguineus, Lysimachia nemorum, Cardamine amara, Chrysosplenium oppositifolium, C. alternifolium, Impatiens noli-tangere, Ribes rubrum.*

(Noirfalise, 1952, 1984; Oberdorfer, 1953, 1990; Tüxen and Oberdorfer, 1958; Duvigneaud and Mullenders, 1961; Ellenberg, 1963, 1988; Westhoff and den Held, 1975; Bournérias, 1979, 1984; Yon and Tendron, 1981; Rodwell, 1991)

44.311 **Sedge ash-alder woods**

Carici remotae-Fraxinetum caricetosum

Formations of *Fraxinus excelsior* and *Alnus glutinosa* with an abundance of *Carex remota, C. strigosa, C. pendula, C. sylvatica.*

44.312 **Fontinal ash-alder woods**

Carici remotae-Fraxinetum chrysosplenietosum

Fraxinus excelsior-Alnus glutinosa woods with a wetter soil occupied by *Cardamine amara* and *Chrysosplenium spp.*, and often by *Impatiens noli-tangere.*

44.313 **Cabbage thistle ash-alder woods**

Carici remotae-Fraxinetum cirsietosum

Fraxinus excelsior-Alnus glutinosa woods with the tall *Cirsium oleraceum* and *Eupatorium cannabinum* and usually *Carex acutiformis*; these constitute a transition towards 44.332.

44.314 **Hillside spring ash-alder woods**

Ribeso sylvestris-Fraxinetum

Fraxinus excelsior-Alnus glutinosa woods of seeping hillside depressions and of moist peaty ground, with *Ribes rubrum.*

44.315 **Great horsetail ash-alder woods**

Equiseto telmateiae-Fraxinetum

Fraxinus excelsior-Alnus glutinosa woods of calcareous tuffs.

44.32 ASH-ALDER WOODS OF FAST-FLOWING RIVERS

Stellario-Alnetum glutinosae

Alder or ash-alder galleries of the banks of fast-flowing rivers and large brooks replacing the peri-Alpine *Alnus incana* galleries in hills of northern and western Europe. They are usually co-dominated by *Alnus glutinosa, Fraxinus excelsior* and *Acer pseudoplatanus*, accompanied by *Acer platanoides, Ulmus glabra, U. laevis. Prunus padus* is frequent in the undergrowth, shrubs include *Ribes rubrum, R. uva-crispa, Corylus avellana;* the herb layer comprises *Stellaria nemorum, Impatiens noli-tangere, Aconitum vulparia, Allium ursinum,*

Geum rivale, Athyrium filix-femina, Dryopteris carthusiana, Matteuccia struthiopteris, Ranunculus platanifolius, Urtica dioica, Ranunculus ficaria, Primula elatior, Lamium galeobdolon or *Filipendula ulmaria, Luzula sylvatica*. The gallery may be enclosed within other forests or reduced to a thin line of alders along rivers traversing pastureland.
(Oberdorfer, 1953, 1990; Noirfalise and Sougnez, 1961; Yon and Tendron, 1981; Noirfalise, 1984; Ellenberg, 1988)

44.33 ASH-ALDER WOODS OF SLOW RIVERS

Pruno-Fraxinetum, Ulmo-Fraxinetum

Central, and locally western, European woods of large valleys of lowland slow and even-flowing rivers, with *Fraxinus excelsior, Alnus glutinosa, Prunus padus, Ulmus laevis, Quercus robur, Humulus lupulus, Rubus idaeus, R. caesius, Ribes nigrum, R. rubrum, Sambucus nigra, Aegopodium podagraria, Peucedanum palustre, Glyceria maxima, Iris pseudacorus, Carex acutiformis, C. riparia, Phalaris arundinacea, Filipendula ulmaria, Cirsium oleraceum, C. palustre.*
(Oberdorfer, 1953, 1990; Noirfalise and Sougnez, 1961; Ellenberg, 1963, 1988; Westhoff and den Held, 1975; Bournérias, 1979, 1984; Yon and Tendron, 1981; Carbiener, 1983; Noirfalise, 1984; Noirfalise *et al.*, 1985; Rodwell, 1991)

44.331 **Central European slow river ash-alder woods**

Pruno-Fraxinetum

Alnus glutinosa-Fraxinus excelsior forests with *Prunus padus*, often extensive, and capable of occupying floodplains well beyond the riparian gallery, progressively richer in *Quercus robur* and *Carpinion* species towards the exterior.

44.332 **West European tall herb ash-alder woods**

Macrophorbio-Alnetum (Ulmo-Fraxinetum = Aegopodio-Fraxinetum, Alno-Macrophorbietum)

Alnus glutinosa or *Fraxinus excelsior-Alnus glutinosa-Ulmus* riparian woods on eutrophic, moist soils of alluvial terraces, levees and flood-plains of the lower courses of rivers of Atlantic and sub-Atlantic regions of the British Isles and the western seaboard of the European mainland, with *Salix cinerea* and *Urtica dioica,* often rich in tall herbs, in particular *Cirsium oleraceum, Eupatorium cannabinum, Epilobium hirsutum, Dipsacus pilosus, Symphytum officinale. Aconitum napellus,* and in creepers, *Humulus lupulus, Solanum dulcamara, Calystegia sepium. Ribes rubrum, Iris pseudacorus, Equisetum telmateia, E. fluviatile* are locally characteristic; tall sedges, in particular *Carex acutiformis* and *C. paniculata,* dominate some of the wettest communities. Typical sub-communities of British *Alnus glutinosa-Urtica dioica* woodland are included, as are drier *Sambucus nigra* sub-communities in situations where they are adjacent. Formations of this unit are now rare, having for the most part been replaced by poplar plantations.

44.34 NORTHERN IBERIAN ALDER GALLERIES

Hyperico androsaemi-Alnetum, Valeriano pyrenaicae-Alnetum, Scrophulario alpestris-Alnetum (Alnetum catalaunicum), Carici pendulae-Alnetum, Lamio flexuosi-Alnetum

Riparian alder or ash-alder woods of collinar and montane streams of the northern Iberian peninsula, with a pronounced medio-European influence marked in particular by the presence of *Fraxinus excelsior* (and not *F. angustifolia*). They are characteristic of streams originating in the Pyrenees, the Cantabrian Cordillera, the northern Galician mountains and the Catalonian ranges. The canopy may include *Ulmus glabra, Quercus robur* and tall willows; the undergrowth contains *Sambucus nigra, Corylus avellana, Cornus sanguinea, Rubus caesius, Carex pendula, C. remota, Festuca gigantea, Bromus ramosus, Lathraea clandestina, Circaea lutetiana, Hypericum androsaemum, Solanum dulcamara, Valeriana pyrenaica, Lysimachia nemorum, Saxifraga hirsuta, Galanthus nivalis, Athyrium filix-femina, Dryopteris dilatata, Osmunda regalis, Equisetum telmateia.*
(Oberdorfer, 1953; Bolos, 1979, 1980; Dierschke, 1980; Rivas-Martinez *et al.*, 1984; Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Vigo and Ninot, 1987; Izco Sevillano, 1987)

44.341 **Galicio-Cantabrian alder galleries**

Valeriano pyrenaicae-Alnetum

Northern Galician and western Cantabrian *Alnus glutinosa* galleries, with *Carex acuta* ssp. *broteriana.*

44.3411 **Eume near-natural alder galleries**
Relict near-natural-Alnus glutinosa galleries of the Eume basin, with the rare ferns *Trichomanes (Vandenboschia) speciosum* and *Culcita macrocarpa*.

44.3412 **Semi-natural Galicio-Cantabrian alder galleries**
Other formations.

44.342 **Pyreneo-Cantabrian alder galleries**
Hyperico androsaemi-Alnetum
Eastern Cantabrian and western Pyrenean *Alnus glutinosa* galleries.

44.343 **Pyreneo-Catalonian alder galleries**
Scrophulario alpestris-Alnetum (Alnetum catalaunicum), Carici pendulae-Alnetum, Lamio flexuosi-Alnetum
Eastern Pyrenean and Catalonian *Alnus glutinosa* galleries.

44.4 MIXED OAK-ELM-ASH FORESTS OF GREAT RIVERS

Ulmenion minoris
Diverse riparian forests of the middle courses of great rivers, inundated only by large floods.
(Ellenberg, 1963, 1988; Yon and Tendron, 1981; Oberdorfer, 1990)

44.41 GREAT MEDIO-EUROPEAN FLUVIAL FORESTS

Querco-Ulmetum minoris
Fully developed, very tall, multilayered, highly diverse riparian forests of oaks, ashes, elms, limes, maples, alders, poplars, cherries, apple, willows of the middle and lower courses of large medio-European river systems, in particular, the Rhine, the Danube, the Emst, the Elbe, the Saale, the Weser, the Loire, the Rhône-Saône systems. Their highly complex structure is formed of eight strata to which participate up to 50 species of trees and shrubs. The upper arborescent stratum includes *Quercus robur, Fraxinus excelsior, Ulmus minor, U. laevis, U. glabra, Populus alba, P. tremula, P. canescens, P. nigra, Acer pseudoplatanus, A. platanoides, Salix alba, Alnus glutinosa, Prunus avium*, the lower arborescent stratum *Malus sylvestris, Tilia cordata,* the sub-arborescent shrub layer *Alnus incana, Prunus padus* and *Crataegus monogyna*. There are very varied high and low shrub layers and numerous lianas, *Clematis vitalba, Tamus communis, Humulus lupulus, Hedera helix* and *Vitis vinifera* ssp. *sylvestris*. Most diverse, structurally, floristically and faunistically, of all European ecosystems, and closest in that respect to tropical communities and to the warm temperate forests of the Pleistocene, the great fluvial forests of Europe are reduced to a few highly vulnerable examples, located mainly within the Rhine, Danube and Elbe systems.
(Oberdorfer, 1953, 1990; Ellenberg, 1963, 1988; Carbiener, 1970, 1983; Yon and Tendron, 1981)

44.42 RESIDUAL MEDIO-EUROPEAN FLUVIAL FORESTS

Fragments of oak-elm-ash forests of large medio-European river systems, very altered and with greatly reduced species richness.

44.43 BALKANIC ASH-OAK-ALDER FORESTS

Quercus robur and *Fraxinus angustifolia* riparian forests of sub-Mediterranean regions of south-eastern Europe.
(Horvat *et al.*, 1974; Pedrotti, 1980; Dierschke, 1980; Yon and Tendron, 1981; Kassioumis, 1988)

44.431 **Illyrian ash-oak-alder forests**
Leucojo-Fraxinetum angustifoliae
Riparian forests of the karst region of north-eastern Italy, composed of *Fraxinus angustifolia, Quercus robur, Ulmus minor, Alnus glutinosa* and with an abundance of *Leucojum aestivum*.

44.432 **Hellenic ash-oak-alder forests**
Rare mixed riparian forests of northern Greece, dominated by *Quercus robur* and *Fraxinus angustifolia,* represented, in particular, by the remarkable Mouries forest in the Kilkis prefectorate.

44.44 PO OAK-ASH-ALDER FORESTS

Polygonato multiflorae-Quercetum roboris i.a.

Relict forests of the alluvial plain of the Po and its main tributaries, remnants of the greatest fluviatile system of Europe. They are formed by meso-hygrophile, mesotrophic, multilayered, oak-ash-hornbeam-dominated communities (*Carpinion betuli: Poligonato multiflorae – Quercetum roboris*), with facies richer in ashes, willows and, mostly, alders, in the wettest areas (*Alno-Padion*). Constituent trees include *Quercus robur, Q. cerris, Fraxinus excelsior, F. ornus, Carpinus betulus, Ulmus minor, Populus alba, P. nigra, Acer campestre, A. pseudoplatanus, Prunus padus, P. avium, Alnus glutinosa, Salix alba, Corylus avellana, Sorbus torminalis, S. domestica,* the shrub layers are formed, in particular, by *Ruscus aculeatus, Cornus mas, C. sanguinea, Crataegus laevigata, C. monogyna, Pyracantha coccinea, Rubus fruticosus, R. ulmifolius, R. caesius, Ribes uva-crispi, Sambucus nigra, Daphne mezereum, Viburnum lantana, Mespilus germanica, Lonicera xylosteum, Ligustrum vulgare, Prunus spinosa, Rosa canina, Euonymus europaeus, Rhamnus catharticus*; lianas are abundant, in particular, *Hedera helix, Tamus communis, Rubia peregrina, Bryonia cretica*; in the herb layer occur, in particular, *Equisetum hyemale, Symphytum officinale, Polygonatum multiflorum, Pulmonaria officinalis, Lathyrus vernus, Mercurialis perennis, Primula acaulis, Asarum europaeum, Euphorbia dulcis, Melittis melisophyllum, Erythronium dens-canis, Leucojum vernum, Brachypodium sylvaticum, Carex pilosa.* These forests are the habitat of the endangered endemic frog *Rana latastei.*

(Fenaroli, 1970; Tomaselli, 1970; Tosco, 1975; Ozenda *et al.*, 1979; Ozenda, 1985; Noirfalise, 1986, 1987)

44.5 **SOUTHERN ALDER AND BIRCH GALLERIES**

Osmundo-Alnion

Riparian formations of *Alnus glutinosa*, locally of *A. cordata* or *Betula spp.* of the Mediterranean basin and of western Iberia, often with *Fraxinus angustifolia* and *Osmunda regalis.*

(Bolos, 1979; Dierschke, 1980; Yon and Tendron, 1981; Rivas-Martinez *et al.*, 1984)

44.51 SOUTHERN BLACK ALDER GALLERIES

Riparian *Alnus glutinosa*-dominated multilayered formations of the meso- and supra-Mediterranean levels of Italy, the Cévennes, the Iberian peninsula and Greece.

44.511 **Iberian meso-Mediterranean alder galleries**

Senecio bayonensis-Alnetum glutinosae (Scrophularia scorodoniae-Alnetum, Alneto-Scrophularietum)

Meso-Mediterranean *Alnus glutinosa* riparian galleries of southern Galicia, Portugal, Extremadura, the western Cordillera Central, western Castilla, with *Betula celtiberica, Salix atrocinerea, Frangula alnus, Fraxinus angustifolia, Celtis australis*, many lianas, *Clematis campaniflora, Humulus lupulus, Vitis vinifera* ssp. *sylvestris* and a herb layer comprising *Senecio bayonensis, Galium broterianum, Scrophularia scorodonia, Osmunda regalis, Carex acuta* ssp. *broteriana.*

(Braun-Blanquet *et al.*, 1956; Rivas-Martinez, 1975; Izco, 1987; Ladero, 1987; Rivas-Martinez *et al.*, 1987; Navarro Andres and Valle Gutierrez, 1987)

44.512 **Iberian supra-Mediterranean alder galleries**

Galio broteriani-Alnetum

Supra-Mediterranean *Alnus glutinosa* riparian galleries of water courses with moderate seasonal fluctuations, of western Iberia, with *Betula celtiberica, Ilex aquifolium, Populus tremula* and *Luzula sylvatica* ssp. *henriquesii, Paris quadrifolia, Galium broterianum, Paradisea lusitanicum, Carex acuta* ssp. *broteriana.*

(Peinado Lorca *et al.*, 1984; Rivas-Martinez *et al.*, 1987; Ladero, 1987; Navarro Andres and Valle Gutierrez, 1987)

44.513 **Western Mediterranean alder galleries**

Alno-Fraxinetum oxycarpae

Alnus glutinosa riparian galleries of southern France and northern Italy, in particular, the Cevennes, the coasts of Liguria and northern Tuscany, the Triestine karst, often with *Fraxinus angustifolia.*

(Ozenda, 1953; Dirschke, 1980; Pedrotti, 1980)

44.514 **Greek alder galleries**
Alnus glutinosa riparian galleries along permanent water courses of non-calcareous regions of Greece, in particular, of Thessaly, the sea-facing slopes of the Pelion, the Ossa, the Pierria, the Pindus, Macedonia, Thrace, northern Euboea and the northern Peloponnese.
(Debazac and Mavrommatis, 1971; Horvat *et al.*, 1974)

44.52 RHODODENDRON-ALDER GALLERIES
Frangulo baetici-Rhododentretum baetici
Highly remarkable, relict thermo- and meso-Mediterranean alder galleries of deep, steep-sided valleys of the Sierras of the Campo de Gibraltar and of southern Portugal, with *Rhododendron ponticum* ssp. *baeticum, Frangula alnus* ssp. *baetica, Arisarum proboscideum* and a rich fern community including *Pteris incompleta, Diplazium caudatum, Culcita macrocarpa*. They are often in contact with humid to hyper-humid *Quercus canariensis* forests (41.773) and with *Salix pedicellata* formations (44.1271).
(Yon and Tendron, 1981; Asensi and Diez Garretas, 1987)

44.53 CORSICAN BLACK AND CORDATE ALDER GALLERIES
Hyperico hircini-Alnenion
Collinar and montane riparian alder galleries of Corsica, dominated by *Alnus cordata*, with *Alnus glutinosa.*
(Yon and Tendon, 1981; Gamisans, 1985)

44.531 **Collinar Corsican alder galleries**
Upper meso- and lower supra-Mediterranean alder galleries, with *Hypericum hircinum* and *Erica terminalis.*

44.532 **Montane Corsican alder galleries**
Upper supra-Mediterranean and montane alder galleries, with *Athyrium filix-femina* and *Gentiana asclepiadea.*

44.54 ORETANIAN BIRCH GALLERIES
Galio broteriani-Betuletum parvibracteatae
Relict *Betula parvibracteata* riparian galleries limited to two stations of the Montes de Toledo (Cordillera Oretana), one in the Sierra de Rio Frio where a unique gallery of about 20 km in length survives, the other at the spring of the Estena. The dominant species, an extremely narrow endemic, is accompanied by *Myrica gale, Frangula alnus, Salix atrocinerea, Galium broterianum, Scilla ramburei.*
(Peinado *et al.*, 1983; Ladero, 1987)

44.6 **MEDITERRANEAN POPLAR-ELM-ASH FORESTS**
Populion albae
Mediterranean multi-layered alluvial forests with *Populus alba, Fraxinus angustifolia, Ulmus minor, Salix alba, Salix spp., Alnus spp.*, lianas and often species of the *Quercetalia ilicis. Populus alba*, usually dominant in height, may be absent or sparse in some associations which are then dominated by *Fraxinus angustifolia, Ulmus minor* and/or *Salix spp.*
(Oberdorfer, 1953; Horvat *et al.*, 1974; Dierschke, 1980; Molinier and Martin, 1980; Yon and Tendron, 1981; Guinochet and Vilmorin, 1983)

44.61 MEDITERRANEAN RIPARIAN POPLAR FORESTS

Populenion albae

Riparian forests of base-rich soils submitted to seasonal, prolonged inundation with slow drainage, physiognomically dominated by tall *Populus alba* and/or *P. nigra. Fraxinus angustifolia* and *Salix alba* habitually accompany the poplars and may locally be quantitatively strongly dominant; such areas may, depending on their size, be treated as a local manifestation of a complex poplar ensemble, or listed under 44.63 or 44.141. The poplar forests are usually the tall ligneous vegetation belt closest to the water in riverside catenas. (Braun-Blanquet and de Bolos, 1957; Debazac and Mavrommatis, 1971; Gaussen, 1972; Horvat *et al.*, 1974; Rivas-Martinez, 1975; Molinier *et al.*, 1976; Lavagne and Moutte, 1977; Girerd, 1978; Dierschke, 1980; Molinier and Martin, 1980; Ozenda, 1981; Harant and Jarry, 1982; Devaux *et al.*, 1983; Peinado Lorca *et al.*, 1984; Darracq *et al.*, 1984; Gamisans, 1985; Dupias, 1985; Chiappini, 1985b; Fernandes Gonzalez, 1986; Asensi Marfil and Diez Garretas, 1987; Navarro Andres and Valle Gutierrez, 1987; Alcaraz Ariza and Peinado Lorca, 1987; Vigo and Ninot, 1987; Martinez Parras *et al.*, 1987; Aparicio Martinez and Silvestre Domingo, 1987; Baudière *et al.*, 1988; Rallo and Pandolfi, 1988)

44.611 Iberian poplar galleries

Rubio tinctori-Populetum albae, Rubo caesi-Populetum albae; Salici atrocinereae-Populetum albae, Nerio oleandri-Populetum albae

Riparian poplar galleries on inundatable eutrophic soils with permanent hydromorphy of the Iberian range, the Castilian plateau, the Ebro basin, the Mediterranean Iberian east, the great Baetic rivers, with *Populus alba, P. nigra*, arborescent willows (*Salix neotricha, S. alba, S. fragilis, S. atrocinerea), Fraxinus angustifolia, Ulmus minor* and *Celtis australis*. The naturalized madder, *Rubia tinctorum*, grows in the shade of the eastern and central formations, the Atlantic *Salix atrocinerea* is an important component of the formations of the central Meseta, the Montes de Toledo and western Andalusia, and *Nerium oleander* penetrates the most thermophilous western Andalusian formations.

44.612 Provença-Languedocian poplar galleries

Populetum albae p.

Riparian gallery forests lining water courses and other water bodies of Provence and Languedoc, in particular the rivers of the Mediterranean periphery of the Pyrenees, the Languedocian rivers draining the Causses and the southern Central Massif, the Rhône and Durance systems, especially the Camargue, the Verdon, the Var, with *Populus alba, P. nigra, Ulmus minor, Fraxinus angustifolia* (locally accompanied by *F. excelsior*), *Acer negundo, A. campestre, A. platanoides, Celtis australis, Quercus pubescens, Alnus glutinosa*, and an undergrowth with *Cornus sanguinea, Rubus caesius, Sambucus nigra, Vitis vinifera, Bryonia cretica, Humulus lupulus, Rubia peregrina, Solanum dulcamara, Alliaria petiolata, Cucubalus baccifer, Saponaria officinalis, Iris foetidissima, Arum italicum, Brachypodium sylvaticum, Carex pendula; Celtis australis* may form facies locally (e.g. Estérel).

44.613 Cyrno-Sardian poplar galleries

Populetum albae p.

Riparian woods of lower water courses of Corsica and Sardinia, with *Populus alba, P. nigra, Fraxinus ornus, F. angustifolia, Alnus glutinosa, A. cordata* and arborescent willows.

44.614 Italian poplar galleries

Populetum albae p.

Riparian poplar galleries of Italian rivers and other water bodies, with *Populus alba, P. nigra, Alnus glutinosa, Ulmus minor, Acer campestre, Viburnum lantana, V. opulus, Rhamnus catharticus, Crataegus monogyna, Rubus caesius, Humulus lupulus, Clematis vitalba.*

44.615 Greek poplar galleries

Populetum albae balcanicum

Riparian poplar galleries of Greek rivers and other water bodies, with *Populus alba, P. nigra, Ulmus minor, Alnus glutinosa, Platanus orientalis, Salix spp., Periploca graeca, Pyracantha coccinea, Vitex agnus-castus, Cornus sanguinea, Brachypodium sylvaticum.*

44.6151 Nestos riparian forests

Hodja Orman forest of the Nestos, dominated by *Populus alba*, formerly one of the most extensive riparian complexes in the Balkans.

44.6152 **Greek white poplar riparian forests**
Other *Populus alba* riparian galleries.

44.6153 **Northern Greek black poplar riparian forests**
Populus nigra s.s.-dominated riparian galleries of northern Greece, in particular, in the Vertiskos massifs and the regions north of Drama.

44.6154 **Greek downy poplar riparian forests**
Populus nigra var. *pubescens* of, notably, Epirus and Thessaly.

44.62 MEDITERRANEAN RIPARIAN ELM FORESTS
Fraxino angustifoliae-Ulmenion minoris p.: Aro italici-Ulmetum, Acantho mollis-Ulmetum minoris
Ulmus minor-dominated woodlands, usually forming, on eutrophic soils, at the outer, drier, edge of the Mediterranean riparian or lacustrine galleries. *Populus alba* and *Fraxinus angustifolia* often participate in the tree-layer; *Arum italicum, Ranunculus ficaria, Acanthus mollis, Brachypodium sylvaticum, Elymus caninus, Rubus ulmifolius* are characteristic of the undergrowth. Dense and dark in natural form, these woods have been extremely reduced and degraded by human action. The most characteristic examples to remain are probably those of the Iberian peninsula, although fragments are still recorded in France, Italy and Greece.
(Horvat *et al.*, 1974; Rivas-Martinez, 1975; Lopez, 1976; Lavagne and Moutte, 1977; Molinier and Martin, 1980; Devaux *et al.*, 1983; Peinado Lorca *et al.*, 1984; Fernandes Gonzalez, 1986; Loidi Arregui, 1987; Asensi Marfil and Diez Garretas, 1987; Navarro Andres and Valle Gutierrez, 1987; Vigo and Ninot, 1987; Ladero Alvarez, 1987; Martinez Parras *et al.*, 1987; Aparicio Martinez and Silvestre Domingo, 1987; Baudière *et al.*, 1988; Kassioumis, 1988; Rallo and Pandolfi, 1988)

44.63 MEDITERRANEAN RIPARIAN ASH WOODS
Fraxino angustifoliae-Ulmetum minoris p., Fraxinion angustifoliae
Riparian galleries dominated by tall *Fraxinus angustifolia*, mostly characteristic of less eutrophic soils than the elm and poplar galleries, and of drier stations, with shorter inundation periods, than those occupied by poplar woods.
(Debazac and Mavrommatis, 1971; Horvat *et al.*, 1974; Rivas-Martinez, 1975; Lopez, 1976; Rivas-Martinez *et al.*, 1980; Dierschke, 1980; Pedrotti, 1980; Peinado Lorca *et al.*, 1984; Fernandes Gonzalez, 1986; Asensi Marfil and Diez Garretas, 1987; Navarro Andres and Valle Gutierrez, 1987; Rivas-Martinez *et al.*, 1987; Ladero Alvarez, 1987; Martinez Parras *et al.*, 1987; Aparicio Martinez and Silvestre Domingo, 1987)

44.631 **Iberian supra-Mediterranean ash galleries**
Querco pyrenaicae-Fraxinetum angustifoliae
Fraxinus angustifolia and *Quercus pyrenaica*-dominated galleries of supra-Mediterranean watercourses of the Cordillera Central, the Leonese mountains and the Iberian Range, developed on siliceous, sandy soils with temporary hydromorphy (pseudogleys).

44.632 **Iberian meso-Mediterranean ash galleries**
Ficario ranunculoidis-Fraxinetum angustifoliae
Fraxinus angustifolia-dominated galleries of western Iberia, developed in meso- and thermo-Mediterranean areas on siliceous sandy, rarely inundated soils; *Populus alba, P. nigra, Salix atrocinerea, Rubus ulmifolius, Osmunda regalis, Ranunculus ficaria, Arum italicum* frequently accompany the ashes.

44.633 **Baetic ash-maple galleries**
Aceri granatensis-Fraxinetum angustifoliae
Meso- and supra-Mediterranean riparian galleries of the siliceous Sierra Nevada formed by *Fraxinus angustifolia* and *Acer granatense*.

44.634 **Tyrrhenian ash-alder galleries**
Alno-Fraxinetum angustifoliae p.
Fraxinus angustifolia-dominated galleries, usually with *Alnus glutinosa*, of southern France and Tyrrhenian northern and central Italy.

44.635 **Italian ash galleries**
Carici-Fraxinetum angustifoliae
Fraxinus angustifolia-dominated galleries of the Adriatic slope of the Italian peninsula, the lower Po basin, the plain of Foggia, the Gulf of Taranto and Sicily, with *Ulmus campestris, Salix alba, Populus nigra, Equisetum telmateia, Brachypodium sylvaticum, Carex pendula, Ligustrum vulgare, Rubus ulmifolius.*

44.636 **Greek ash galleries**
Uncommon *Fraxinus angustifolia*-dominated galleries of continental Greece, reported in particular from the lower Achelos and Pinios.

44.64 HOP-HORNBEAM GALLERIES
Melico uniflorae-Ostryetum
Ostrya carpinifolia-dominated alluvial galleries of the Var, in south-eastern France, with *Ulmus minor, Populus alba, Salix elaeagnos, Alnus glutinosa, Fraxinus ornus, Acer campestre, A. opalus, Quercus pubescens, Cornus sanguinea, Ligustrum vulgare, Laurus nobilis, Tamus communis, Hedera helix, Viola reichenbachiana, Euphorbia dulcis, Brachypodium sylvaticum, Melica uniflora, Carex pendula, C. digitata* and the rare *Carex grioletii.*
(Lapraz, 1981)

44.7 **ORIENTAL PLANE AND SWEET GUM WOODS**
Forests and woods, for the most part riparian, dominated by *Platanus orientalis* or *Liquidambar orientalis.*

44.71 ORIENTAL PLANE WOODS
Platanion orientalis
Forests of *Platanus orientalis.*
(Rechinger, 1951; Debazac and Mavrommatis, 1971; Horvat *et al.*, 1974; Dierschke, 1980; Yon and Tendron, 1981; Groppali *et al.*, 1983; Pratesi and Tassi, 1985)

44.711 **Greek riparian plane forests**
Platanus orientalis gallery forests of Greek watercourses, temporary rivers and gorges; they are distributed throughout the mainland and archipelagoes, colonizing poorly stabilized alluvions of large rivers, gravel or boulder deposits of permanent or temporary torrents, spring basins, and particularly, the bottom of steep, shady gorges, where they constitute species-rich communities. The accompanying flora may include *Salix alba, S. elaeagnos, S. purpurea, Alnus glutinosa, Cercis siliquastrum, Celtis australis, Populus alba, P. nigra, Juglans regia, Fraxinus ornus, Alnus glutinosa, Crataegus monogyna, Cornus sanguinea, Ruscus aculeatus, Vitex agnus-castus, Nerium oleander, Rubus spp., Rosa sempervirens, Hedera helix, Clematis vitalba, Vitis vinifera, Ranunculus ficaria, Anemone blanda, Aristolochia rotunda, Saponaria officinalis, Symphytum bulbosum, Hypericum hircinum, Calamintha grandiflora, Melissa officinalis, Helleborus cyclophyllus, Cyclamen hederifolium, C. repandum, C. creticum, Galanthus nivalis* ssp. *reginae-olgae, Dracunculus vulgaris, Arum italicum, Biarum tenuifolium, Brachypodium sylvaticum, Dactylis glomerata* and may be rich in mosses, lichens and ferns, among which *Pteridium aquilinum* is often abundant. Various associations have been described, reflecting regional and ecological variation in the composition of the undergrowth. The plane tree galleries are particularly well represented along the Ionian coast and in the Pindus; other important local complexes exist in Macedonia, in Thrace, around the Olympus massif, in the Pelion, in the Peloponnese, particularly in the Taygetos, where luxuriant gorge forests reach 1 300 m, in Euboea and in Crete; local, distinctive, representatives occur in other Aegean islands, such as Rhodes, Samos, Samothrace, Thasos. Restriction to gorges is increasingly pronounced towards the south.
(Rechinger, 1951; Debazac and Mavrommatis, 1971; Horvat *et al.*, 1974; Dierschke, 1980; Strid, 1980; Sfikas, 1984)

44.712 **Greek slope plane woods**
Platanus orientalis woods on colluvions, detritus cones, ravine sides or other poorly stabilized substrates.
(Debazac and Mavrommatis, 1971)

44.713 **Sicilian plane tree canyons**

Relict *Platanus orientalis*-dominated or -rich galleries of the Cassabile, the Anapo, the Irminio and the Carbo rivers, in the Iblei range of south-eastern Sicily, of the gorge of the Sirmeto, in the vicinity of the Nebrodi. Some of these formations, in particular, in the gorges of the Cassabile and of the Anapo, are true plane tree woods. Others, such as on the Sirmeto, are *Populus alba, Fraxinus angustifolia, Salix spp.* formations with *Platanus orientalis*; as they grade into each other, and because of the very isolated occurrence, and great biogeographical and historical interest of *Platanus orientalis* in Sicily, they are all listed here. Plane tree woods have had a much greater extension in Sicily and probably in Calabria. A large forest has, in particular, existed on the Alcantara, where the species is now extinct.
(Groppali *et al.*, 1983; Pratesi and Tassi, 1985)

44.72 SWEET GUM WOODS

Liquidambar orientalis gallery of the Petaloudhes Valley, on Rhodes.
(Rechinger, 1951; Sfikas, 1984)

44.8 **SOUTHERN RIPARIAN GALLERIES AND THICKETS**

Low ligneous formations of wetlands of the thermo-Mediterranean zone and of south-western Iberia.

44.81 OLEANDER, CHASTE TREE AND TAMARIX GALLERIES

Nerio-Tamaricetea
Thickets and galleries of *Nerium oleander, Vitex agnus-castus* or *Tamarix spp.*, mostly of the thermo-Mediterranean zone.
(Rechinger, 1951; Debazac and Mavrommatis, 1971; Lavagne and Moutte, 1971; Horvat *et al.*, 1974; Yon and Tendron, 1981; Géhu, 1984; Izco *et al.*, 1984; Veri and Pacioni, 1985; Chiappini, 1985a, b)

44.811 **Oleander galleries**

Nerion oleandri p.
Nerium oleander cordons and screens, often with *Tamarix spp., Vitex agnus-castus, Dittrichia viscosa, Saccharum ravennae, Arundo donax, Rubus ulmifolius*, most typical of temporary water courses, but also lining small and sometimes large rivers, marking springs and areas of high water table in southern and eastern Iberia, very locally in eastern Provence, Liguria and Corsica (Saint-Florent), in southern Italy, Sardinia and Sicily, in southern and western Greece, the Aegean and Ionian archipelagoes, and Crete. They are particularly abundant in the south and east of Iberia, in Sicily and in the Aegean region.
(Rechinger, 1951; Debazac and Mavrommatis, 1971; Lavagne and Moutte, 1971; Horvat *et al.*, 1974; Pignatti, 1982; Lopez Gonzalez, 1982; Sfikas, 1984; Izco *et al.*, 1984; Fenaroli, 1984; Gamisans, 1985; Pratesi and Tassi, 1985; Veri and Pacioni, 1985; Chiappini, 1985a, b; Costa, 1987; Alcaraz Ariza and Peinado Lorca, 1987; Ferioli, 1989)

44.812 **Chaste tree thickets**

Nerion oleandri p.: Vinco majoris-Viticetum agni-casti i.a.
Vitex agnus-castus formations of temporary water courses and other humid sites within, mostly, the thermo-Mediterranean zone. They occur, though uncommonly, in the Mediterranean south and east of Spain and in the Balearics; they are local and rare in eastern Provence, the Tyrrhenian coast of Italy, Puglia, the gulf of Taranto, Corsica, Sardinia and Sicily. They are frequent in Greece, particularly along the Ionian coasts, where they can constitute dense thickets, uncommon again in the Aegean archipelagoes and Crete.
(Rechinger, 1951; Debazac and Mavrommatis, 1971; Lavagne and Moutte, 1971; Horvat *et al.*, 1974; Pignatti, 1982; Lopez Gonzalez, 1982; Izco *et al.*, 1984; Sfikas, 1984; Gamisans, 1985; Chiappini, 1985a, b)

44.813 **Tamarisk thickets**

Formations, mostly of Mediterranean and thermo-Atlantic coasts and lowlands, dominated by *Tamarix spp.*

44.8131 **West Mediterranean tamarisk thickets**
Tamaricion africanae: Tamaricetum gallicae, Polygono equisetiformis-Tamaricetum africanae, Glycirrhizo glabrae-Tamaricetum canariensis i.a.
Tamarix gallica, T. africana or *T. canariensis* thickets of water-course galleries, humid depressions and slightly saline coastal flats in Iberia, southern and western France, peninsular Italy, the Balearics, Corsica, Sardinia and Sicily. The accompanying flora comprises *Scirpus holoschoenus, Saccharum ravennae, Arundo donax, Brachypodium phoenicoidis, Piptatherum miliaceum, Asparagus acutifolius, Equisetum ramosissimum, Rubia peregrina, R. longifolia, R. angustifolia, Dittrichia viscosa.*
(Pignatti, 1982; Lopez Gonzalez, 1982; Izco *et al.*, 1984; Fenaroli, 1984; Gamisans, 1985; Pratesi and Tassi, 1985; Veri and Pacioni, 1985; Chiappini, 1985a, b; Fernandez Gonzalez, 1986; Alcaraz Ariza and Peinado Lorca, 1987; Ferioli, 1989)

44.8132 **Macaronesian tamarisk thickets**
Tamarix spp.-dominated formations of the Canary Islands and Madeira.

44.81321 **Canarian tamarisk thickets**
Tamarix canariensis and *T. africana* galleries and thickets of the lower zone of the Canary Islands, lining the low part of barrancos and occupying the deltas of greater water courses. They are particularly abundant in the eastern desert islands, Lanzarote and, mostly, Fuenteventura, where they constitute one of the principal ligneous habitats for the fauna. They have also important representatives along the north coast of Tenerife and on Gran Canaria (Charca de Maspalomas, La Aldea).
(Wilpret de la Torre and del Arco Aguilar, 1987; Serrada *et al.*, 1988)

44.81322 **Madeiran tamarisk thickets**
Tamarix gallica thickets of the lowlands of Madeira.
(Duvigneaud, 1977)

44.8133 **East Mediterranean tamarisk thickets**
Tamaricetum parviflorae, Tamaricetum tetrandrae i.a.
Tamarix parviflora, T. tetrandra, T. dalmatica, T. smyrnensis and *T. hampeana* thickets of lowland water-course galleries, humid depressions and slightly saline coastal flats of Greece and its islands.
(Rechinger, 1951; Debazac and Mavrommatis, 1971; Horvat *et al.*, 1974; Sfikas, 1984; Izco *et al.*, 1984; Yatridis, 1988)

44.8134 **Hyper-saline tamarisk stands**
Tamaricion boveana-canariensis
Thickets of *Tamarix boveana, T. canariensis* or, sometimes, *T. gallica*, accompanied by typical salt marsh flora, in particular, *Arthrocnemum fruticosum, A. glaucum, Suaeda brevifolia, Halimione portulacoides, Atriplex halimus, A. hastata, Limonium lactibracteatum, L. eugeniae, L. cossonianum, L. angustibracteanum, L. sinuosum, Inula crithmoides.*
(Horvat *et al.*, 1974; Polunin, 1980; Izco *et al.*, 1984; Fernandez Gonzalez, 1986; Costa, 1987; Alcaraz Ariza and Peinado Lorca, 1987)

44.81341 ***Tamarix boveana* stands**
Inulo crithmoidis-Tamaricetum boveanae
Rare and vulnerable formations of the Ibero-African *Tamarix boveana*, alone or associated with *T. canariensis*, characteristic of arid areas of eastern Iberia, limited to a few stations in the arid South-east (Murcia, Almeria, Alicante), the Ebro depression (Salada de Chiprana), the Ebro delta and Majorca (Alcudia).

44.81342 **Saline *Tamarix canariensis* stands**
Agrosto stoloniferae-Tamaricetum canariensis, Lycio intricati-Tamaricetum canariensis
Formations of *Tamarix canariensis*, sometimes with *T. gallica*, characteristic of strongly saline sites, in particular, of Iberian interior saline depressions (La Mancha) and of arid south-east coastal areas.

44.81343 **Saline eastern tamarisk stands**
Tamarix smyrnensis, T. hampeana, T. dalmatica stands of the strongly saline part of Greek coastal marshes.

44.82 SOUTH-WESTERN IBERIAN TAMUJARES
Securinegion tinctoriae: Pyro bourgaeanae-Securinegetum tinctoriae
Low, spiny, almost monospecific fringes formed by the Ibero-African shrubby spurge *Securinega tinctoria* on the outer edge of temporary or permanent water courses of great seasonal amplitude in the south-western quadrant of the Iberian peninsula (Montes de Toledo, Sierra Morena, Extremadura, south-western Andalusia, southern Portugal). Among the few associated plants, are the lianas *Bryonia cretica, Tamus communis* and the endemic *Clematis campaniflora. Pyrus bourgaeana* may transgress from neighbouring communities.
(Delvosalle and Duvigneaud, 1962; Rivas Martinez, 1974; Lopez Gonzalez, 1982; Géhu, 1984; Ladero, 1987)

44.83 ORETANIAN LAURIPHYLLOUS GALLERIES
Viburno tini-Prunetum lusitanicae
Supra- and upper meso-Mediterranean riparian galleries of the Montes de Toledo (Cordillera Oretana), constituted by the lauriphyllous *Prunus lusitanica* and *Viburnum tinus*; they line water courses on the inner edge of alder galleries of 44.551 and 44.552, which they sometimes entirely replace.
(Ladero, 1987)

44.84 ORETANIAN BOG-MYRTLE WILLOW SCRUB
Frangulo-Myricaetum galeae
Tall scrub of Montes de Toledo streams, with *Frangula alnus, Salix atrocinerea, S. salvifolia* and *Myrica gale.*
(Peinado *et al.*, 1983; Ladero, 1987)

44.9 **ALDER, WILLOW AND BOG-MYRTLE SWAMP WOODS**
Alnetea glutinosae
Woods and scrubs of marshy ground, waterlogged for most of the year, colonizing fens and marshy or permanently inundated alluvial terraces of rivers.

44.91 ALDER SWAMP WOODS
Alnion glutinosae
Marshy *Alnus glutinosa*-dominated formations, usually with shrubby willows in the undergrowth.
(Noirfalise and Sougnez, 1961; Ellenberg, 1963, 1988; Horvat *et al.*, 1974; Westhoff and den Held, 1975; Bournérias, 1979, 1984; Yon and Tendron, 1981; Noirfalise, 1984; Noirfalise *et al.*, 1985; Izco Sevillano, 1987; Oberdorfer, 1990; Rodwell, 1991)

44.911 **Meso-eutrophic swamp alder woods**
Carici elongatae-Alnetum (Irido-Alnenion)
Mesotrophic and meso-eutrophic *Alnus glutinosa* swamp woods of marshy depressions, with *Carex elongata, Thelypteris palustris, Dryopteris cristata, Osmunda regalis, Solanum dulcamara, Calystegia sepium, Ribes nigrum,* and often, in acidocline variants, *Betula pubescens.* The constancy of *Carex elongata* is characteristic on the continent, less so in Britain. Tall sedges, *Carex paniculata, C. acutiformis, C. elata,* often dominate the herb layer in the most humid types.

44.9111 **Atlantic greater tussock-sedge alder woods**
Alnus glutinosa-Carex paniculata formations of the British Isles, poor in *Carex elongata,* and harbouring, in particular, *Oenanthe crocata* and abundant *Osmunda regalis.*

44.9112 **Elongated-sedge swamp alder woods**
Carici elongatae-Alnetum
Formations of sub-Atlantic and subcontinental regions of the continent characterized in particular by the constant presence of *Carex elongata.*

44.912 **Oligotrophic swamp alder woods**
Carici laevigatae-Alnetum (Blechno-Alnenion: Blechno-Alnetum, Sphagno-Alnetum)
Oligotrophic or meso-oligotrophic, acidocline *Alnus glutinosa* woods of fens and poorly drained banks of brooks or small rivers, mostly characteristic of siliceous regions and Atlantic climates, south to Galicia. *Betula pubescens* and *Frangula alnus* often accompany the alders. The ground layer is usually rich in *Sphagnum spp.* and includes *Carex laevigata, Equisetum sylvaticum* and many ferns, including *Oreopteris limbosperma, Blechnum spicant, Athyrium filix-femina, Dryopteris cristata* and *D. carthusiana.*

44.913 **Mediterranean swamp alder woods**
Rare swamp woods of the Mediterranean evergreen oak zone, such as the Athos peninsula swamp wood with *Arundo donax, Equisetum telmateia, Carex pendula, C. remota, Humulus lupulus, Osmunda regalis.*

44.92 MIRE WILLOW SCRUB
Salicion cinereae (Frangulo-Salicion auritae)
Willow-dominated formations with *Salix aurita, S. cinerea, S. atrocinerea, S. pentandra, Frangula alnus, Betula humilis*, of fens, marshy floodplains and fringes of lakes and ponds.
(Noirfalise, 1964; Westhoff and den Held, 1975; Bournérias, 1979, 1984; Ellenberg, 1988; Oberdorfer, 1990; Rodwell, 1991)

44.921 **Grey willow scrub**
Mesotrophic or eutrophic *Salix cinerea* or *S. aurita* and *Alnus glutinosa* scrubs of mires, fens, and water fringes.

44.922 **Sphagnum willow scrub**
Oligotrophic *Salix aurita* or *or B. carpatica* scrubs, rich in sphagnum, of bog edges and acid fens.

44.923 **Bay willow scrub**
Tall *Salix pentandra* formations.

44.924 **Dwarf mire willow scrub**
Dwarf *Salix repens, S. rosmarinifolia* and *Betula humilis* scrubs of bogs and fens.

44.93 SWAMP BOG-MYRTLE SCRUB
Salicion cinereae p.: Myricetum gale
Myrica gale thickets of fringes of fens, drying fens and nascent or regenerating bogs of middle Europe, mostly characteristic of the Atlantic sector.
(Lebrun *et al.*, 1949; Westhoff and den Held, 1975; Ellenberg, 1988; Oberdorfer, 1990)

44.A **BIRCH AND CONIFER SWAMP WOODS**
Vaccinio-Piceetea: Piceo-Vaccinienion uliginosi (Betulion pubescentis, Ledo-Pinion) i.a.
Woods of *Betula pubescens, Pinus spp.* or *Picea abies* colonizing bogs and acid fens.

44.A1 SPHAGNUM BIRCH WOODS
Betuletum pubescentis (Vaccinio uliginosi-Betuletum pubescentis); Sphagno palustris-Betuletum pubescentis i.a.
Forests of *Betula pubescens* or *B. carpatica* on peaty, humid and very acid soils, colonizing bogs of reduced peat building activity and acid fens, with *Molinia caerulea, Vaccinium uliginosum, V. myrtillus, Empetrum nigrum, Trientalis europaea* and many sphagnums, mosses and liverworts.
(Ellenberg, 1963, 1988; Noirfalise *et al.*, 1971; Westhoff and den Held, 1975; Mériaux *et al.*, 1978; Bournérias, 1979, 1984; Noirfalise, 1984; Oberdorfer, 1990)

44.A11 **Cottongrass sphagnum birch woods**
Sphagno-Betuletum eriophoretosum vaginati, Erico-Sphagnetum betuletosum
Sphagnum-rich *Betula pubescens* or *B. carpatica* woods in which bog species, in particular *Eriophorum vaginatum* and *Vaccinium oxycoccos*, are prominent.

44.A12 **Sedge sphagnum birch woods**
Sphagno-Betuletum agrostido-caricetosum nigrae
Sphagnum-rich *Betula pubescens* or *B. carpatica* woods in which *Molinia caerulea* is accompanied by a cortège of acid fen species, in particular, *Carex rostrata, C. nigra, C. echinata, Juncus acutiflorus, Agrostis canina, Narthecium ossifragum, Calamagrostis canescens.*

44.A13 **Meso-acidophilous sphagnum birch woods**
Sphagnum-rich *Betula pubescens* or *B. carpatica* woods in which the presence of species characteristic of sub-humid mineral soils indicate a transition towards acidophilous birch and oak woods; *Salix cinerea, Alnus glutinosa, Lysimachia vulgaris, Luzula sylvatica, Oxalis acetosella, Deschampsia flexuosa* may be prominent, next to *Molinia caerulea.*

44.A2 SCOTS PINE BOG WOODS
Ledo-Pinetum (Vaccinio uliginosae-Pinetum sylvestris) i.a.
Pinus sylvestris formations of bogs and transition mires with *Eriophorum vaginatum, Ledum palustre, Vaccinium uliginosum, Calluna vulgaris, Andromeda polifolia* restricted to the plains of northern and eastern Germany and to isolated stations in the Hercynian arc.
(Ellenberg, 1963, 1988; Petermann and Seibert, 1979; Muller, 1985; Oberdorfer, 1990)

44.A3 MOUNTAIN PINE BOG WOODS
Vaccinio uliginosae-Pinetum rotundatae (Sphagno-Mugetum, Pino rotundatae-Sphagnetum p)
Pinus rotundata (P. uncinata s.l., P. mugo) woods (var. *arborea*) or scrubs (var. *pseudopumilio*) of bogs in the Alps and peri-Alpine areas, the Jura and the higher Hercynian ranges, with *Eriophorum vaginatum, Vaccinium oxycoccos, V. uliginosum, V. myrtillus, Sphagnum spp.* and sometimes *Betula nana.*
(Ellenberg, 1963, 1988; Oberdorfer, 1967, 1990; Ozenda, 1975; Delvosalle, 1977; Petermann and Seibert, 1979)

44.A4 SPHAGNUM SPRUCE WOODS
Picea abies woods with a sphagnum-rich ground layer.
(Ellenberg, 1963, 1988; Oberdorfer, 1967, 1990; Ozenda, 1975; Delvosalle, 1977; Petermann and Seibert, 1979)

44.A41 **Montane sphagnum spruce woods**
Sphagno-Piceetum, Soldanello-Piceetum bazzanietosum i.a.
Often dense *Picea abies* forests on peaty soils carpeted with sphagnum and mosses, accompanied by an understorey of *Maianthemum bifolium, Vaccinium myrtillus, V. vitis-idaea, Deschampsia flexuosa, Calamagrostis villosa, Blechnum spicant* and *Listera cordata.*

44.A42 **Bog spruce woods**
Picea abies formations colonizing raised bogs, with *Betula pubescens, B. carpatica, Vaccinium uliginosum, V. vitis-idaea, V. myrtillus, V. oxycoccos, Eriophorum vaginatum, Sphagnum magellanicum* and other sphagnums.

45 Broad-leaved evergreen woodland

Mediterranean forests dominated by broad-leaved evergreen trees. Laurel forests of the Atlantic islands. Holly woods.

45.1 OLIVE-CAROB FORESTS

Oleo-Ceratonion, Ceratonio-Rhamnion, Kleinio-Euphorbietea canariensis p.

Thermo-Mediterranean or thermo-Canarian woodland dominated by arborescent *Olea europaea* ssp. *sylvestris, Ceratonia siliqua, Pistacia lentiscus, Myrtus communis* or, in the Canary Islands, by *Olea europaea* ssp. *cerasiformis* and *Pistacia atlantica*. Most formations will be listed as arborescent matorral (35.12), but a few stands may have a sufficiently tall, closed canopy to qualify for this unit.

(Fenaroli, 1970; Lapraz, 1970; Horvat *et al.*, 1974; Ozenda *et al.*, 1979; Quézel, 1981; Tomaselli, 1981b; Groppali *et al.*, 1983; Noirfalise, 1986; Fernandez Gonzalez, 1986; Asensi and Diez Garrretas, 1987; Rivas-Martinez and Costa, 1987; Serrada *et al.*, 1988)

45.11 WILD OLIVE WOODLAND

Olea europaea ssp. *sylvestris*-dominated formations. The most developed examples are found in southern Andalusia (*Tamo communis-Oleetum sylvestris*: extinct?), in Menorca (*Prasio majoris-Oleetum sylvestris*), Sardinia, Sicily, Calabria, Crete.

45.12 CAROB WOODLAND

Ceratonia siliqua-dominated formations, often with *Olea europaea* ssp. *sylvestris* and *Pistacia lentiscus*. The most developed examples, some truly forest-like, are to be found in Majorca (*Cneoro tricocci-Ceratonietum siliquae*), eastern Sardinia, south-eastern Sicily, Puglia, Crete.

45.13 CANARIAN OLIVE WOODLAND

Olea europaea ssp. *cerasiformis* and *Pistacia atlantica* formations of the Canary Islands.

45.2 CORK-OAK FORESTS

West-Mediterranean silicicolous forests dominated by *Quercus suber*, usually more thermophile and hygrophile than 45.3.

(Fenaroli, 1970, 1985; Tomaselli, 1970; Rivas-Martinez, 1974; Ortuno and Ceballos, 1977; Lambinon *et al.*, 1978; Ozenda *et al.*, 1979; Rivas-Martinez *et al.*, 1980; Quézel, 1981; Groppali *et al.*, 1981, 1983; Ozenda, 1981; Géhu and Géhu-Franck, 1984c; Gamisans, 1985; Chiappini, 1985a, b; Pratesi and Tassi, 1985; Veri and Pacioni, 1985; Noirfalise, 1986, 1987; Fernandez Gonzalez, 1986; Peinado Lorca and Rivas-Martinez, 1987; Barneschi, 1988)

45.21 TYRRHENIAN CORK-OAK FORESTS

Quercion suberis

Mostly meso-Mediterranean *Quercus suber* forests of Italy, Sicily, Sardinia, Corsica, France and north-eastern Spain. They are most often degraded to arborescent matorral (32.11).

45.211 Provençal cork-oak woodland

Formations of crystalline Provence (Maures, Esterel), no longer represented by fully developed, mature stands.

45.212 Corsican cork-oak woodland

Formations of the lower meso-Mediterranean level of Corsica, developed on deep siliceous soils, mostly of the south-eastern part of the island; better preserved than on the continent, they are nevertheless almost never represented by fully developed, extensive forest.

45.213 Sardinian cork-oak forests

Extensive, widespread and varied forests of Sardinia, extending from sea level to about 900 m in non-calcareous mountains. *Q. suber* is sometimes associated with *Q. ilex* or *Q. pubescens*. These forests include luxuriant, fully developed, mature formations, by far the best-preserved cork-oak forests in the central Mediterranean basin.

45.214 **Central Italian cork-oak forests**
Very local, relict coastal forests of Tuscany and Latium in which *Q. ilex* often accompanies *Q. suber*.

45.215 **Southern Italian cork-oak forests**
Very local formations of Calabria, Puglia and of northern and south-eastern Sicily (Monte Scorace; Bosco di San Pietro, western Iblei), for the most part very degraded.

45.216 **Catalan cork-oak woodland**
Quercus suber-dominated facies appearing on the more oligotrophic soils within the meso-Mediterranean *Q. ilex* zone of Catalonia and the Pyrenean foothills.

45.217 **Valencian cork-oak woodland**
Asplenio onopteridis-Quercetum suberis
Isolated, relict formations of the Sierra Espadan, Valencia.

45.218 **Balearic cork-oak woodland**
Quercus suber-dominated facies appearing on deep siliceous soils of the thermo-Mediterranean *Q. rotundifolia* formations of Menorca.

45.22 SOUTH-WESTERN IBERIAN CORK-OAK FORESTS
Quercion fagineo-suberis
Quercus suber forests, often with *Q. faginea* or *Q. canariensis*, of the south-western quadrant of the Iberian peninsula.

45.221 **Thermo-Mediterranean cork-oak woodland**
Oleo sylvestris-Quercetum suberis
Subhumid thermo-Mediterranean forests and woodlands of the south-western Iberian peninsula, occurring in sandy coastal areas of western Andalusia and the Algarve, as well as at lower elevations of the Sierras of the Campo de Gibraltar, immediately below the following formation, and characterized by the presence of *Olea europaea* ssp. *sylvestris* and other thermo-Mediterranean elements.

45.222 **Aljibian cork-oak forests**
Teucrio baetici-Quercetum suberis
Luxuriant, fully developed, humid and hyperhumid meso- to thermo-Mediterranean forests occupying, with the more exiguous and even more umbrophilous *Q. canariensis* formations, the higher elevations of the Sierras of the Campo de Gibraltar and a few enclaves of the Sierra de Ronda, with elements of north African oak forests such as *Teucrium scorodonia* ssp. *baeticum* and *Ruscus hypophyllum*; they are best represented in the Sierra de Aljibe, and are, next to those of Sardinia, the best-preserved cork-oak forests of the Community.

45.223 **Eastern Andalusian cork-oak woodland**
Adenocarpo-Quercetum suberis
Isolated, relict meso-Mediterranean forest of the Sierra de la Contraviesa, eastern Andalusia.

45.224 **Extremaduran cork-oak woodland**
Sanguisorbo agrimonioidis-Quercetum suberis
Meso-Mediterranean forests of the Sierra Morena, the Montes de Toledo system and lower southern slopes of the Cordillera Central (Extremadura and surrounding regions), only locally well developed, with lauriphyllous undergrowth or mantle.

45.23 NORTH-WESTERN IBERIAN CORK-OAK WOODLAND
Holco-Qercetum pyrenaicae p.
Very local, exiguous *Q. suber* enclaves in the *Q. pyrenaica* forest area of the valleys of the Sil and of the Mino (Galicia).

45.24 AQUITANIAN CORK-OAK WOODLAND
Isolated *Q. suber*-dominated stands occurring either as a facies of dunal pine-cork oak forests or in a very limited area of the eastern Landes.

45.3 MESO- AND SUPRA-MEDITERRANEAN HOLM-OAK FORESTS

Quercion ilicis

Forests dominated by *Quercus ilex* or *Q. rotundifolia*, often, but not necessarily, calcicolous.

(Rechinger, 1951; Ocana-Garcia, 1958; Kornas, 1959; Bolos and Molinier, 1960; Jasiewicz, 1963; Amaral Franco, 1965; Archiloque, *et al.*, 1969; Fenaroli, 1970; Tomaselli, 1970; Horvat *et al.*, 1974; Lapraz, 1975; Ozenda, 1975; Margot and Romain, 1976; Ortuno and Ceballos, 1977; Brullo *et al.*, 1977; Lambinon *et al.*, 1978; Sfikas, 1978; Ozenda *et al.*, 1979; Polunin, 1980; Groppali *et al.*, 1980, 1981, 1983; Ozenda, 1981; Quézel, 1981; Géhu and Géhu-Franck, 1984c; Chiappini, 1985a, b; Dupias, 1985; Veri and Pacioni, 1985; Fenaroli, 1985; Gamisans, 1985; Noirfalise, 1986, 1987; Fernandez Gonzalez, 1986; Peinado-Lorca and Rivas-Martinez, 1987; Barneschi, 1988; Baudière *et al.*, 1988)

45.31 MESO-MEDITERRANEAN HOLM-OAK FORESTS

Rich meso-Mediterranean formations, penetrating locally, mostly in ravines, into the thermo-Mediterranean zone. They are often degraded to arborescent matorral (32.11), and some of the types listed below no longer exist in the fully developed forest state relevant to category 45; they have nevertheless been included, both to provide appropriate codes for use in 32.11, and because restoration may be possible.

45.311 North-western Iberian holm-oak forests

Lauro nobilis-Quercetum ilicis

Quercus ilex forests with exuberant undergrowth of Mediterranean, often lauriphyllous, small trees, shrubs, and lianas, including *Laurus nobilis, Rhamnus alaternus, Arbutus unedo, Phillyrea media, Rosa sempervirens, Rubia peregrina, Smilax aspera, Hedera helix*, often well-preserved on steep slopes of the calcareous mountains rising above the southern coast of the Bay of Biscay.

45.312 Catalo-Provençal lowland holm-oak woodland

Viburno tini-Quercetum ilicis = Quercetum galloprovinciale

Lower meso-Mediterranean *Quercus ilex* formations of Catalonia, Languedoc and Provence rich in lauriphyllous and sclerophyllous shrubs and lianas, in particular *Viburnum tinus, Arbutus unedo, Smilax aspera, Phillyrea latifolia, Ruscus aculeatus, Rubia peregrina*; they are mostly degraded to arborescent matorral, the few remaining groves of holm oaks with a forest-like canopy being generally heavily modified by intensive human use.

45.313 Catalo-Provençal hill holm-oak forest

Asplenio onopteridis-Quercetum ilicis = Quercetum mediterraneo-montanum

Humid upper meso-Mediterranean *Quercus ilex* formations of Montseny, Valles, Montserrat, Prades, Ports de Beseit, eastern Pyrenees, high Languedoc, Cévennes, upper Provence and south-western Alps with an undergrowth poorer in shrubs, especially those of eu-Mediterranean affinities, and richer in often acidocline herbaceous species characteristic of supra-Mediterranean deciduous oak woods. Well-developed stands with full forest characteristics exist in several locations on the slopes of well-watered hills, in particular the tall, dense canopy of Montseny. Sparser, lower formations colonize many rocky hillsides in the entire upper meso-Mediterranean arc of the Gulf of Lions basin, locally ascending into the supra-Mediterranean level.

45.314 Balearic holm-oak forests

Cyclamino balearici-Quercetum ilicis

Humid *Quercus ilex* formations, often well developed, of the higher mountains of northern Majorca, in which the thermo-Mediterranean elements of the *Q. rotundifolia* formations of lower altitude have given way to more hygrophilous elements such as *Viburnum tinus, Viola dehnhardtii, Monotropa hypopitys, Neottia nidus-avis, Cephalanthera spp.*; they are rich in endemics, among which *Cyclamen balearicum, Smilax aspera* var. *balearica, Rhamnus ludovici-salvatoris, Paeonia cambessedesii*.

45.315 Corsican lowland holm-oak woodland

Quercus ilex formations of the lower meso-Mediterranean level of Corsica with *Viburnum tinus, Erica arborea, Lonicera implexa, Phillyrea angustifolia, Clematis flammula, Smilax aspera, Rubia peregrina*; generally degraded to arborescent matorral or dense coppice, they still include, mostly above 400 m of altitude, a few better-preserved woodland fragments.

45.316 Corsican hill holm-oak woodland

Quercus ilex formations of the upper meso-Mediterranean level (500-600 m to 1 100-1 200 m) of Corsica with *Arbutus unedo, Erica arborea, Viburnum tinus, Ilex aquifolium, Daphne laureola, Teucrium scorodonia, Helleborus lividus, Cyclamen repandum, Sanicula europaea, Melica uniflora*; often installed on steep slopes, they include rather more stands with forest characteristics than the lowland formations.

45.317 Sardinian holm-oak forests

Lower and upper meso-Mediterranean *Q. ilex* forests of Sardinia with *Viburnum tinus, Phillyrea angustifolia, P. latifolia, Rhamnus alaternus, Arbutus unedo, Erica arborea, Ruscus aculeatus, Crataegus monogyna, Rubia peregrina, Smilax aspera, Clematis flammula, C. cirrhosa, C. vitalba, Rosa sempervirens, Tamus communis, Rubus ulmifolius, Cyclamen repandum, Carex halleriana, C. distachya, Luzula forsteri, Hedera helix, Lonicera implexa* and *Pistacia lentiscus* in more thermo-Mediterranean areas. Extensive, fully developed, mature stands survive in particular in the hinterland of the Golfo di Orosei, around Mount Gennargentu, in the Barbagia, the Iglesiente, the Sarrabus, the Catena di Margine, on Monte Albo. They occupy a wide altitudinal range, grading at the upper limit into the more sub-Mediterranean formations of 45.32.

45.318 Northern and central Italian holm-oak forests

Quercus ilex-dominated formations of Tyrrhenian and Adriatic coastal areas of the northern half of the Italian peninsula with *Phillyrea media, P. angustifolia, Viburnum tinus, Ruscus aculeatus, Daphne gnidium, Fraxinus ornus, Rosa sempervirens, Lonicera implexa, Rubia peregrina, Smilax aspera, Myrtus communis, Clematis flammula, Tamus communis, Carex olbiensis, Luzula forsteri, Cyclamen repandum* and often an admixture of *Quercus suber* or of the deciduous *Q. pubescens* and *Q. cerris*; at higher altitude they take on a more montane character with a greater prevalence of sub-Mediterranean elements. Although these formations are, like most other continental holm-oak communities, mostly degraded to arborescent matorral or coppice, fully developed forests subsist very locally, in particular in Tuscany and Latium and, to a lesser extent, in Veneto and Emilia-Romagna.

45.319 Illyrian holm-oak woodland

Orno-Quercetum ilicis

Quercus ilex-dominated formations, restricted in the Community to steep slopes of the Riviera Triestina, similar in composition to those of the eastern Adriatic coast, with *Pistacia terebinthus, Fraxinus ornus, Coronilla emerus, Ostrya carpinifolia, Carpinus orientalis, Laurus nobilis, Lonicera etrusca, Clematis flammula, Rubia peregrina, Smilax aspera, Vitis vinifera, Cyclamen purpurascens, Prunus mahaleb.*

45.31A Southern Italian holm-oak forests

Querco-Teucrietum siculi

Mostly upper meso-Mediterranean *Quercus ilex*-dominated formations of southern Italy and Sicily with *Viola alba* ssp. *dehnhardtii, Teucrium siculum, Carex distachya, Cyclamen repandum, Pyrus amygdaliformis, Ruscus aculeatus, Cytisus villosus, Asparagus acutifolius, Rubia peregrina, Asplenium onopteris, Luzula forsteri, Lonicera etrusca, Smilax aspera, Rosa sempervirens* and, in some facies, *Chamaerops humilis, Pistacia lentiscus, Phillyrea media, Arbutus unedo*; like the preceding formations, they are usually degraded to arborescent matorral or coppice, but fine stands survive locally, particularly in Sicily, Puglia (e.g. Bosco delle Pianelle) and Calabria (e.g. Boschi di Badolato).

45.31B Pantellerian holm-oak woodland

Viburno-Quercetum ilicis p., Erico Quercetum ilicis p.

Relictual, mostly degraded pockets of acidophilous *Q. ilex* woodland of Pantelleria.

45.31C Greek holm-oak woodland

Andrachno-Quercetum ilicis

Quercus ilex-dominated formations of peninsular Greece and the Ionian and Aegean archipelagoes, with the exception of those of Crete; associated with *Q. ilex* are *Quercus coccifera, Arbutus andrachne, A. unedo, Phillyrea latifolia, Pistacia terebinthus, P. lentiscus, Olea europaea, Juniperus oxycedrus*; arborescent matorrals (32.1) occur throughout the area, though much less commonly than in the western Mediterranean; reasonably extensive, fully developed, mature forest stands do not appear to remain.

45.31D **Cretan holm-oak woodland**
Cyclamino-Quercetum ilicis
Uncommon *Quercus ilex* formations of Crete; small stands of arborescent matorral (32.1), in which *Q. ilex* may be associated with *Q. coccifera* or *Q. brachyphylla*, occur sporadically, particularly on rocky slopes; orchard-like groves of old *Q. ilex, Q. brachyphylla* and cultivated *Olea europaea* exist in the extreme west of the island; heavily grazed, they may be more akin to dehesa (84.5) than to forest.

45.32 SUPRA-MEDITERRANEAN HOLM-OAK FORESTS
Formations of the supra-Mediterranean levels, often mixed with deciduous oaks, *Acer spp.* or *Ostrya carpinifolia*.

45.321 **French supra-Mediterranean holm-oak forests**
Quercus ilex formations colonizing, with a very reduced cortège of Mediterranean undergrowth species, localized, mostly rocky, stations in the supra-Mediterranean levels of the Pyrenees, Central Massif and Alps.

45.322 **Corsican supra-Mediterranean holm-oak forests**
Ilici-Quercetum ilicis
Quercus ilex formations of the supra-Mediterranean (*Pinus laricio*) level of Corsica with an undergrowth rich in mesophilous species and practically devoid of meso-Mediterranean elements.

45.323 **Sardinian supra-Mediterranean holm-oak forests**
Uppermost levels of the *Quercus ilex* forests of the Gennargentu and Marghine regions of Sardinia with *Quercus pubescens, Taxus baccata, Ilex aquifolium, Acer monspessulanum, Ostrya carpinifolia, Amelanchier ovalis.* The separation between these formations and those of 45.31 is not as well-marked as in more northern locations; only the stations most impoverished in meso-Mediterranean elements should be listed here.

45.324 **Italian supra-Mediterranean holm-oak forests**
Quercus ilex-dominated formations colonizing enclaves within the supra-Mediterranean deciduous forest belt of northern and central Italy, in particular on sunny slopes of the southern Alps, of the Egadean hills and of the Bolognese Apennines, along the great Insubrian lakes, on sea-facing slopes of the Apennines of Tuscany, Latium, Marche and Abruzzi and in a few central valleys of the Apennines of Umbria and Latium, accompanied by an undergrowth typical of the *Ostryo-Carpinion*. Very well preserved, fully developed examples survive, in particular at Monte Subasio (Umbria).

45.33 AQUITANIAN HOLM-OAK WOODLAND
Isolated *Quercus ilex*-dominated stands occurring as a facies of dunal pine-holm oak forests.

45.34 *QUERCUS ROTUNDIFOLIA* WOODLAND
Iberian forest communities formed by *Q. rotundifolia*. Generally, even in mature state, less tall, less luxuriant and drier than the fully developed forests that can be constituted by the closely related *Q. ilex*, they are, moreover, most often degraded into open woodland or even arborescent matorral. Species characteristic of the undergrowth are *Arbutus unedo, Phillyrea angustifolia, Rhamnus alaternus, Pistacia terebinthus, Rubia peregrina, Jasminum fruticans, Smilax aspera, Lonicera etrusca, L. implexa.*
(Rivas-Martinez, Diaz *et al.*, 1984; Fernandez-Gonzalez, 1986; Peinado Lorca and Rivas-Martinez, 1987; Martinez Parras *et al.*, 1987)

45.341 **Continental *Quercus rotundifolia* woodland**
Forests and woodland of *Q. rotundifolia* occupying mostly base-rich soils of the meso- and supra-Mediterranean areas of the central and eastern Meseta, of the edges of the Ebro basin and of their bordering northern and eastern mountain ranges, under fairly continental, dry climates.

45.3411 **Meso-Mediterranean formations**
Bupleuro rigidi-Quercetum rotundifoliae
Q. rotundifolia formations distributed over a large potential range on the Meseta and its margins, from the upper Ebro to the Valencian hinterland and the cold, dry plateaux of north-eastern Andalusia. Well-preserved examples are rare, most of the forests on good soils having been replaced by cultivation.

45.3412 **Supra-Mediterranean Iberian formations**
Junipero thuriferae-Quercetum rotundifoliae
Basophilous, dry to sub-humid woodland widespread in the supra-Mediterranean levels of the Castilian Duero basin, and of the north-eastern mountains and plateaux associated with the Iberian Range. They are often rich in *Juniperus thurifera* and associate or alternate with juniper woodland and *Q. faginea* or *Q. pyrenaica* deciduous woodland.

45.3413 **Northern supra-Mediterranean formations**
Spiraeo obovatae-Quercetum rotundifoliae
Q. rotundifolia woods of superficial calcareous soils of crests, spurs and upper adret slopes of the upper Ebro basin and southern slopes of the Cordillera Cantabrica, locally entering also Euro-Siberian Cantabrian areas, with *Amelanchier ovalis, Rosa agrestis, Lonicera etrusca, Spiraea hypericifolia* ssp. *obovata, Juniperus communis, J. oxycedrus, J. phoenicea.*

45.3414 **Oro-Cantabrian formations**
Cephalanthero longifoliae-Quercetum rotundifoliae
Relict, xerophile collinar-montane *Q. rotundifolia* and *Q. rotundifolia* x *Q. ilex* forests developed on mostly calcareous, well-drained shallow soils of steep slopes and gorges in the Cordillera Cantabrica and a very few areas of Galicia, rich in *Cephalanthera* and *Epipactis* orchids.

45.342 **Western *Quercus rotundifolia* woodland**
Forests and woodland of *Q. rotundifolia* occupying mostly siliceous soils of the meso- and supra-Mediterranean areas of the western Meseta and neighbouring regions under more Atlantic, though generally dry, climates. Well-preserved examples are rare, most of the remaining wooded areas being under dehesa (84.5) regime.

45.3421 **Luso-Extremaduran formations**
Pyro bourgaenae-Quercetum rotundifoliae
Meso-Mediterranean *Q. rotundifolia* formations widespread on the plains and plateaux of Extremadura, Alentejo and neighbouring regions, and in the Sierra Morena and the Montes de Toledo. It is almost entirely transformed into dehesa.

45.3422 **Castilian formations**
Genisto hystricis-Quercetum rotundifoliae
More northern, upper meso-Mediterranean and lower supra-Mediterranean *Q. rotundifolia* formations, poorer in Mediterranean species, of the western plateaux of Old Castile and adjacent southern Leon and Galicia; *Genista hystrix* is a physiognomically striking element. Also essentially eliminated as forest formations, these woodlands constitute, together with the preceding unit, the basis for the western Iberian dehesa, one of the most characteristic landscapes of the peninsula and an important habitat of larger fauna.

45.3423 **Cordilleran formations**
Junipero oxycedri-Quercetum rotundifoliae
Q. rotundifolia formations of the Cordillera Central, characteristic of cool meso-Mediterranean and sunny supra-Mediterranean slopes of the Sierras de Guadarrama, de Gredos, de Bejar, de Ayllon and neighbouring areas; they extend east to siliceous enclaves of the Iberian Range. Adapted to a more continental climate than the two previous units, they are poorer in shrubs and lianas. They often constitute low, open woodland.

45.3424 **Villuercan formations**
Summital *Q. rotundifolia* elfin forests of the high elevations of the Montes de Toledo.

45.343 **Andalusian *Quercus rotundifolia* woodland**

Forests and woodland of *Q. rotundifolia* developed in the meso- and supra-Mediterranean levels of Baetic mountains and foothills, and neighbouring interior plains. Well-preserved examples are extremely rare.

45.3431 **Meso-Mediterranean basophilous formations**

Paeonio coriaceae-Quercetum rotundifoliae

Woodland dominated by *Q. rotundifolia* with *Juniperus oxycedrus, Daphne gnidium, Ruscus aculeatus, Asparagus acutifolius, Crataegus monogyna, Lonicera implexa, Rubia peregrina, Paeonia coriacea, P. broteroi, Endymion hispanicus* that represents the potential, mature vegetation of a great part of Andalusia, in the Guadalquivir basin, coastal areas and Baetic ranges, on base-rich and often silt-laden soils, under meso-Mediterranean conditions. They have been largely replaced by cultivation and, where they subsist, are often very degraded.

45.3432 **Supra-Mediterranean basophilous formations**

Berberido hispanicae-Quercetum rotundifoliae

Woodland dominated by *Q. rotundifolia,* with *Q. faginea, Acer monspessulanum, Sorbus aria, S. aucuparia, Taxus baccata, Berberis hispanica, Crataegus monogyna, Lonicera arborea, Daphne laureola, Rosa spp., Polygala boissieri, Helleborus foetidus* and many orchids, of the supra-Mediterranean level (1 400-1 900 m) of calcareous Baetic ranges.

45.3433 **Meso- and supra-Mediterranean silicicolous formations**

Adenocarpo-Quercetum rotundifoliae

Q. rotundifolia-dominated woodland characteristic of the meso- and supra-Mediterranean levels of the Sierra Nevada and of a few siliceous mountain ranges of the arid south-east. Totally destroyed in the Sierra Nevada, this community is still represented by well-preserved examples in the Sierras de Carrascoy and Alhamilla, and to a lesser extent, in the Sierra de Cabrera.

45.344 **South-western *Quercus rotundifolia* woodland**

Forests and woodland of *Q. rotundifolia* developed in the thermo-Mediterranean zone of Andalusia and neighbouring areas. Well-preserved examples are extremely rare.

45.3441 **Basophilous formations**

Oleo sylvestris-Quercetum rotundifoliae

Q. rotundifolia formations of thermo-Mediterranean calcareous slopes of the Quadalquivir basin and the coastal foothills of Baetic and arid south-eastern ranges, with *Olea europaea* ssp. *sylvestris, Chamaerops humilis, Pistacia lentiscus, Smilax aspera, Asparagus albus, Rhamnus oleoides, Quercus coccifera, Clematis cirrhosa, Aristolochia baetica, Bupleurum gibraltarium* and, locally, *Maytenus senegalensis* or *Buxus balearica*. They have almost disappeared in forest form except in a few ranges of the arid Iberian South-east.

45.3442 **Silicicolous formations**

Myrto communis-Quercetum rotundifoliae

Formations of *Q. rotundifolia* with *Myrtus communis, Pulicaria odora, Pistacia lentiscus, Phillyrea angustifolia* and *Arbutus unedo* occupying the siliceous soil of the thermo-Mediterranean levels of eastern Andalusia between the Sea of Alboran and the coastal Tejeda, Almijara, Alpujarra and Gador ranges, a few granitic outcroppings of the Sierra Morena and limited enclaves of the Badajos region. They have almost entirely disappeared.

45.345 **Valencian *Quercus rotundifolia* woodland**

Rubio longifoliae-Quercetum rotundifoliae

Thermo-Mediterranean, basophilous forests and woodland of *Q. rotundifolia* characteristic of the south-eastern maritime façade of the Iberian peninsula in Valencia and Levante, rich in shrubs and lianas, with *Rubia peregrina* ssp. *longifolia, Osyris quadripartita, Chamaerops humilis, Phillyrea angustifolia, Clematis flammula*. Well-preserved examples survived until recently in, among others, the Sierra del Ave y Cortes de Pallas, in the Pobla Tornesa, in Millares, in Montduver. This community now appears extinct in its full forest form.

45.346 **Balearic *Quercus rotundifolia* woodland**
Clematidi cirrhosae-Quercetum rotundifoliae
Forests or woodland of *Q. rotundifolia* occupying deep soils in the dry thermo-Mediterranean areas of the Balearic islands. Reasonably preserved examples are extremely rare.

45.4 **KERMES OAK FORESTS**
Forest or woodland formations dominated by arborescent *Quercus coccifera (Q. calliprinos, Q. pseudococcifera)*.
(Rechinger, 1951; Braun-Blanquet *et al.*, 1956; Polunin and Walters, 1985; Pratesi and Tassi, 1985)

45.41 GREEK KERMES OAK FORESTS
Arborescent *Quercus coccifera*-dominated formations of peninsular Greece, the Ionian and Aegean archipelagoes and of Crete. Extensive, fully-developed stands exist in several areas of Crete. The most representative forests occupy valleys in the 700-800 m range of the southern slopes of the Psiloriti mountains; *Acer orientale, Cephalanthera cucullata* and *Epipactis cretica* are associated. Other forests are found in the Lefka and Lassithi mountains; *Pyrus amygdaliformis, Prunus webbii, Pistacia terebinthus, Phillyrea latifolia, Styrax officinalis* are characteristic of various Cretan stands. Outside of Crete, forest stands are found sporadically, in particular on Ikaria, Samothrace and Mount Athos, where *Q. coccifera* is associated with *Q. ilex*, and at high elevations of Rhodes, where *Q. coccifera* forms woodland fragments with arborescent *Phillyrea media*. In many areas remnant tall *Q. coccifera* may form arborescent matorral; coppice-like formations of young trees also occur.

45.42 ITALIAN KERMES OAK WOODLAND
Very local *Quercus coccifera* formations of Puglia and southern Sicily.

45.43 PORTUGUESE KERMES OAK FOREST
Arisaro-Quercetum fagineae phillyretosum p.
Extremely isolated *Quercus coccifera*-dominated forest of Nazare, Monte de S. Bartolomeu, with *Phillyrea media, Pistacia lentiscus, P. angustifolia, Arbutus unedo, Viburnum tinus, Smilax aspera, Asplenium onopteris*.

45.5 **CONTINENTAL LAUREL-OAK WOODLAND**
Lauro nobilis-Quercetum ilicis p. i.a.
Laurus nobilis-dominated facies of evergreen oak forests, in particular, in coastal Asturias (see 45.311) and Andalusia.
(Polunin and Walters, 1985; Dias Gonzalez and Fernandez Prieto, 1987: 93)

45.6 **MACARONESIAN LAUREL FORESTS**
Pruno-Lauretalia
Humid to hyper-humid, mist-bound, luxuriant, evergreen, lauriphyllous forests of the cloud belt of the Macaronesian islands, extremely rich in floral and faunal species, among which many are restricted to these communities. Genera such as *Picconia, Semele, Gesnouinia, Lactucosonchus, Ixanthus* are entirely endemic to these communities, while others, such as *Isoplexis, Visnea* and *Phyllis* reach in them their maximum development; in addition, each of the formations of the various archipelagoes harbours distinctive endemic species. Laurel forests are the most complex and remarkable relict of the humid sub-tropical vegetation of the Mioceno-Pliocene late Tertiary of southern Europe. Areas of intact forests have been drastically reduced to a level below which the preservation of their elements could not be sustained.
(Ortuno and Ceballos, 1977; Duvigneaud, 1977; White, 1983; Wildpret de la Torre and Arco Aguilar, 1987; Serrada *et al.*, 1988; Santos, 1990)

45.61 AZOREAN LAURISILVAS

Ericetalia azoricae p.: Culcito-Juniperion brevifoliae p., Myrico-Pittosporion undulati p.

Lauriphyllous forests of the Azores, with *Laurus azorica, Myrica faya, Frangula azorica, Ilex perado* ssp. *azorica, Juniperus brevifolia, Picconia azorica, Prunus lusitanica* ssp. *azorica, Euphorbia stygiana, Viburnum tinus* ssp. *subcordatum, Vaccinium cylindraceum, Smilax divaricata*. The humid forests of the coastal areas (*Myrico-Pittosporietum undulati p.*) have been totally or almost totally degraded, largely invaded by the introduced Australian *Pittosporum undulatum*. A better representation survives of the hyper-humid forests (*Culcito-Juniperion brevifoliae p.*) of higher elevations.

(White, 1983; Santos, 1990)

45.62 MADEIRAN LAURISILVAS

Pruno-Lauretalia azoricae: Clethro-Laurion azoricae

Lauriphyllous forests of Madeira with *Laurus azorica, Persea indica, Ocotea foetens, Apollonias barbujana, Pittosporum coriaceum, Clethra arborea, Visnea mocanera, Picconia excelsa, Prunus lusitanica* ssp. *hixa, Heberdenia excelsa, Vaccinium padifolium, Ilex perado* ssp. *perado, I. canariensis, Myrica faya, Erica arborea, Hedera canariensis, Isolexis canariensis, Euphorbia mellifera, Sambucus lanceolata, Teline maderensis, Sonchus fruticosus, Senecio auritus, Ruscus streptophyllus, Rubus bollei, Semele androgyna, Smilax canariensis, Tamus edulis, Carex peregrina* and many ferns. These forests, which still occupy a relatively large surface, of the order of 10 000 ha (15% of their former surface), are the habitat of the threatened endemic Madeiran Pigeon, *Columba trocaz*.

(Duvigneaud, 1977; White, 1983; Santos, 1990)

45.63 CANARIAN LAURISILVAS

Ixantho-Laurion azoricae

Lauriphyllous forests of the Canary Islands, with *Laurus azorica, Picconia excelsa, Persea indica, Ocotea foetens, Apollonias barbujana, Visnea mocanera, Pleiomeris canariensis, Herberdenia excelsa, Prunus lusitanica, Sambucus palmensis, Euphorbia melifera, Ixanthus viscosus, Rubus bollei, Convolvulus canariensis, Geranium canariensis, Hedera canariensis, Smilax aspera, S. canariensis, Canarina canariensis, Semele androgyna, Sideritis macrostachys, S. canariensis, Cryptotaenia elegans, Rubia peregrina, Carex canariensis, Asparagus fallax* and many ferns. They are the habitat of the threatened endemic laurel pigeons *Columba junionae* and *C. bollei*, now limited to La Gomera, Tenerife and La Palma. The laurel forests of each island harbour a distinctive set of endemic plants and animals, as exemplified by the species of the composite genus *Pericallis*, the well-marked races of the chaffinch *Fringilla coelebs* or the carabid faunas. They are thus best listed separately. The total remnant surface of laurel forest for the four islands, La Gomera, Tenerife, La Palma and Hierro, does not exceed 5 000 ha.

(Delvosalle, 1964; Machado, 1976; Schmid, 1976; Bramwell, 1976; Follmann, 1976; Bacallado, 1976; Ortuno and Ceballos, 1977; White, 1983; Bramwell and Bramwell, 1983; Wildpret de la Torre and Arco Aguilar, 1987; Serrada *et al.*, 1988)

45.631 **Laurisilvas of La Gomera**

Laurel forests of La Gomera, best preserved and most extensive of the archipelago, with large areas of humid *Persea indica-Laurus azorica* forests (*Lauro-Perseetum indicae*), particularly in high areas, and good examples of *Ocotea foetens*-dominated forests, hyperhumid and very rich in ferns and epiphytes (*Athyrio-Ocoteetum foetentis*).

45.632 **Laurisilvas of Tenerife**

Laurel forests of Tenerife, mostly restricted to the Anaga range and Los Silos, with a few smaller patches in Guimar ravines and at a few north slope sites in the La Esperanza-Agua Garcia area and the Barranco de San Antonio-Icod area. There are good representations of til (*Ocotea foetens*) forests (Anaga), as well as of drier *Picconia excelsa-Apollonias barbujana* forests (Los Silos).

45.633 **Laurisilvas of La Palma**

Laurel forests of La Palma essentially restricted to a few large, deep ravines of the northern slope, particularly in the Las Sauces area, including both *Lauro-Perseetum* vinyatigo-laurel and *Athyrio-Ocoteetum* til stands.

45.634 **Laurisilvas of Hierro**

Laurel forests of Hierro, very small and limited to cliff sides in the Ensenada El Golfo area of the north coast.

45.635 **Laurisilvas of Gran Canaria**
Laurel forests of Gran Canaria, extinct. Very small, but fully expressed, fragments existed until very recently, notably at Los Tiles, but now appear to have been totally degraded.

45.7 **PALM GROVES**
Woods, often riparian, formed by the two endemic palm trees of the Community, *Phoenix theophrasti* of Crete, and *P. canariensis* of the Canary Islands.

45.71 CRETAN PALM GROVES
Relict *Phoenix theophrasti* woods of Crete, restricted to damp, sandy, coastal valleys; they include the extensive forest of Vai, where the luxuriant palm growth is accompanied by a thick shrubby undergrowth rich in *Nerium oleander*, and about four other smaller coastal groves, notably on the south coast of the prefectorate of Rethimnon.
(Polunin, 1983; Sfikas, 1984, 1987; Iatridis, 1988; Kassioumis, 1988)

45.72 CANARIAN PALM GROVES
Relict *Phoenix canariensis* woods of the Canary Islands, mostly characteristic of the bottom of barrancos and of alluvial soils, below 600 metres. Palm groves are now very rare, but still exist in all the islands, with particularly representative examples at Haria on Lanzarote, Vega del Rio Palmas on Fuerteventura, Fataga, Maspalomas and the Barranco de Tirajana in Gran Canaria, Valle Gran Rey in La Gomera, Masca in Tenerife and Brena Alta in La Palma.
(Bramwell and Bramwell, 1983; Wildpret de la Torre and Arco Aguilar, 1987; Serrada *et al.*, 1988)

45.8 **HOLLY WOODS**
Woods dominated by tall arborescent *Ilex aquifolium*, present in the supra-Mediterranean level of Sardinia and Corsica and in Atlantic mountains of north-western Spain; they usually constitute a facies of the relict yew-holly forests (42.A7).
(Fenaroli, 1970; Groppali *et al.*, 1983; Gamisans, 1985; Pratesi and Tassi, 1986; Noirfalise, 1986, 1987)

45.9 **CANARIAN HEATH FORESTS**
Fayo-Ericion arboreae
Very tall, forest-like, formations dominated by *Erica arborea, Myrica faya, Arbutus canariensis* or *Visnea mocanera*, occurring naturally in the most wind-exposed and the driest stations within the 'monte verde' of the Canary Island cloud belt; they also form extensively as degradation stages of the laurisilva or as secondary colonists.
(Delvosalle, 1964; Schmid, 1976; Machado, 1976; Kämmer, 1976; Bramwell and Bramwell, 1983; White, 1983; Wildpret de la Torre and Arco Aguilar, 1987; Serrada *et al.*, 1988)

45.91 CANARIAN FAYAL-BREZAL
Fayo-Ericetum arboreae i.a.
Tall *Erica arborea*-dominated formations of Tenerife, La Palma, La Gomera, Gran Canaria and Hierro, with *Myrica faya, Ilex canariensis, Rhamnus glandulosus, Viburnum tinus* ssp. *rigidum, Cedronella canariensis, Bystropogon canariensis, Isoplexis canariensis, Urtica morifolia, Teline canariensis, Sonchus abbreviatus, Hypericum glandulosum, Gesnouinia arborea* and many species of the genus *Pericallis*, including several island or local endemics that characterize several differentiated communities; among these are *Pericallis* (*Senecio*) *tussilaginis, P. webbii, P. cruenta, P. steetzii, P. murrayi.*

45.92 HIERRAN FAYAL
Senecio murrayi-Myricetum fayae p.
Tall *Myrica faya* formation of the southern slope of Hierro, almost devoid of *Erica arborea.*

45.93 *VISNEA-ARBUTUS* FORESTS
Formations characterized by the abundance of *Arbutus canariensis* and *Visnea mocanera* occurring, in particular, in the Valle de Guimar and Los Silos of Tenerife, and in the Ladera de Jinama of Hierro.