

# **A simple guide**

## **to the genera of trees and shrubs mycorrhizal hosts of boletes**



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# ***Abies***

# **Fir**

## *Pinaceae*

Magnificent coniferous trees, some of them native to Europe, others introduced. Firs have single, needle-like flattened leaves usually with two distinct whitish lines on the lower side. The cones are peculiar, standing upright on the branches, quickly disintegrating at maturity and leaving only the cone axis on the branches, thus resembling the cones of cedar (*Cedrus*). Do not confuse with spruce (*Picea*), which has non flattened needle-like leaves without whitish lines and persistent hanging cones.



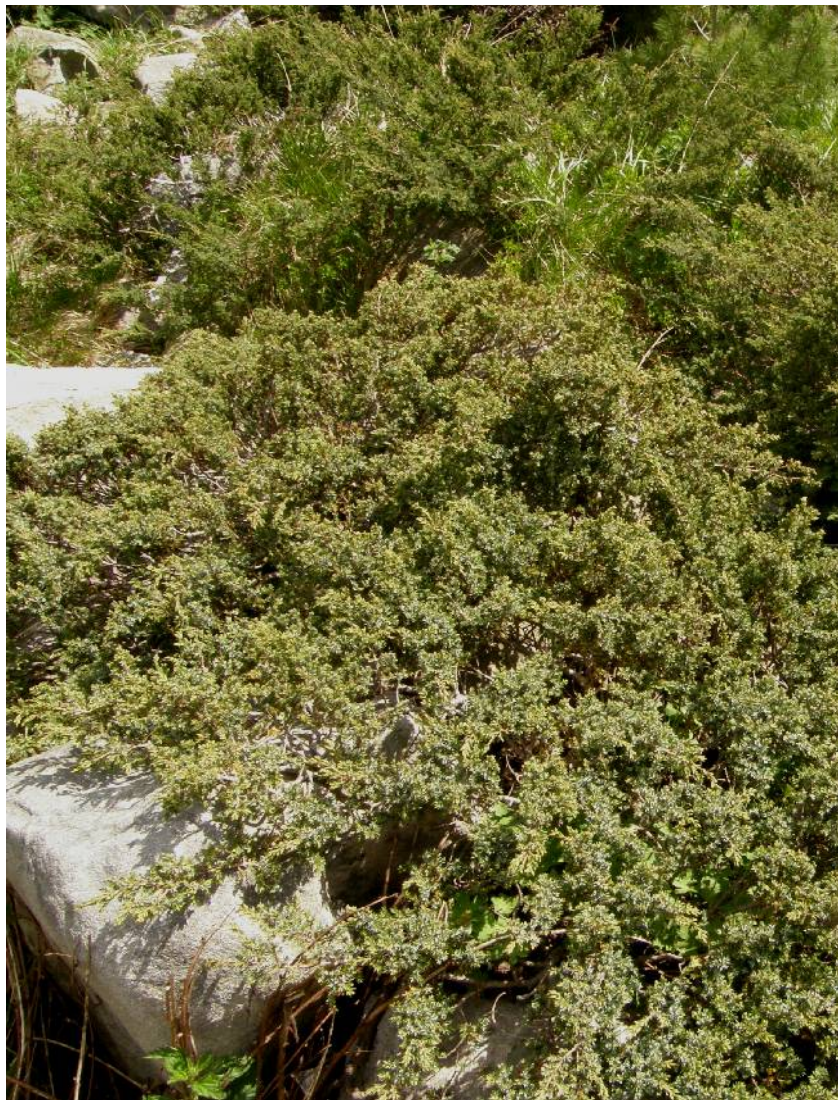
*Abies alba* – the most common native fir  
Pay attention to the disintegrating cones  
photo I. Cheshmedzhiev

# ***Juniperus***

# **Juniper**

*Cupressaceae*

Junipers are small to medium sized shrubs or small trees. A number of these are native to the European continent and some species are introduced in parks and gardens. The leaves are varied – either small scale-like and densely covering the branches, or needle-like and grouped by three along the branches. The cone in this genus is very special – it is small, bright coloured (red, blue or blackish) and resembles proper fruit. Nonetheless it is a cone (also called galbule) and not fruit.



*Juniperus sibirica* – a dwarf mountain shrub

photo B. Assyov



*Juniperus oxycedrus* – southern species, resembling very much the Common Juniper (*Juniperus communis*), but having red instead of blue cones  
photo B. Assyov



*Juniperus sabina* – one of the few junipers in Europe with scale-like leaves  
photo B. Assyov

## ***Larix***

## **Larch**

*Pinaceae*

Handsome coniferous trees, one of them native to Europe (*Larix decidua*), and some species introduced from North America and Asia. The European Larch is native to the mountains of Central Europe, but is widely planted elsewhere on the continent. Larch is probably the most peculiar European conifer. Its leaves are soft, needle-like, clustered by many on very short branches. Larch leaves are not overwintering, they go yellow in the autumn and fall completely leaving the tree leafless during the winter.



*Larix decidua*  
photo B. Assyov

## ***Picea***

## **Spruce**

### *Pinaceae*

Outstanding coniferous trees, four of them native to Europe, and a number of species introduced from North America and Asia. Spruce is recognized by its persistent cones and needle-like leaves, densely covering the branches but always single. Spruce is often mistaken for fir, but firs have disintegrating cones and mostly flattened leaves with two whitish lines on the lower surface. The spruce leaves are not flattened but almost square in cross section and do not have whitish lines, but are uniformly coloured.



*Picea abies*

photo B. Assyov



# ***Pinus***

# **Pine**

## *Pinaceae*

Diverse genus, with many species native to Europe, and a number of others introduced from North America and Asia. Among the other conifers the pines are recognized by their needle-like leaves which are paired or clustered. Most of the European species have paired leaves (*P. sylvestris*, *P. nigra*, *P. halepensis*, *P. pinaster*, etc.), but some have leaves clustered by five (*P. cembra*, *P. peuce*). Both two-needled and five-needled pines (e.g. *P. strobus*) are introduced from America and Asia, as well as some three-needled species. Most of the species are trees but there are also some mountain species with shrub-like appearance (*P. mugo*). Cones are very diverse and their shape varies from species to species, but in all of them, they are woody and persistent.



Scots Pine (*Pinus sylvestris*) – one of the most common 2-needled pines in Europe

photo B. Assyov



Molika Pine (*Pinus peuce*) – native to Europe  
5-needled pine found in the Balkans  
photo B. Assyov



Dwarf pines (*Pinus mugo*) cover extensive areas in the  
mountains  
photo B. Assyov

## ***Pseudotsuga***

## **Douglas Fir**

*Pinaceae*

Handsome coniferous trees, native to North America and Asia, in Europe introduced and widely planted. In some places it is well established and self-seeding. Douglas Fir is similar to proper firs and has single, needle-like flattened leaves usually with two distinct whitish lines on the lower side. The cones are peculiar, hanging and persistent. Do not confuse with proper fir (*Abies*), that has disintegrating at maturity cones. There are not many fungi known in Europe growing under Douglas Fir, but especially among the boletes there is one notable example – *Suillus lakei*, species strictly mycorrhizal with those trees and brought in Europe probably with the first seedlings transported from America.



*Pseudotsuga menziesii*

photo B. Assyov

## ***Alnus***

## **Alder**

### *Betulaceae*

Small-sized deciduous trees or shrubs, seen mostly in temperate areas of the Northern Hemisphere. Few are seen native in Europe and many exotic species are grown in gardens and parks. The leaves are of various shape and are serrated. All species have inconspicuous flowers collected in inflorescences – male or female catkins. The male catkins are pendulous and the female inflorescences are of peculiar cone-like shape that is easy to remember, as it does not occur in any other European tree. The fruits are small with two wings. There are not many boletes mycorrhizally connected with alders, but there are two very interesting, namely *Gyrodon lividus* and *Paxillus rubicundulus*.



Black Alder (*Alnus glutinosa*) with female catkins  
photo B. Assyov

## ***Arctostaphylos***

*Ericaceae*

## **Bearberry**

Dwarf shrub up to 20 cm high, mostly seen in the high mountains. It has shiny leaves with reticulate veins, by which character it is easily distinguished from the similar Cowberry (*Vaccinium vitis-idaea*). The fruits are red berries. Only one bolete is known to fruit with Bearberry – *Leccinum vulpinum*.



Bearberry (*Arctostaphylos uva-ursi*)

photo B. Assyov

# ***Betula***

# **Birch**

## *Betulaceae*

Deciduous small trees or shrubs, seen in temperate areas of the Northern Hemisphere. Few are seen native in Europe and many exotic species are grown in gardens and park. Most of the birches have very distinct shiny white bark, by which they are easily spotted and recognized. In more northern areas of Europe the small shrubby Dwarf Birch (*Betula nana*) is common. All species have inconspicuous flowers collected in inflorescences – pendulous or erect catkins. The fruits are small with two wings. There are many boletes mycorrhizally connected with birches and first of all some species of *Leccinum*.



Silver Birch (*Betula pendula*)

photo I. Assyova



Silver Birch (*Betula pendula*)  
photo I. Cheshmedzhiev



Wet woodland of *Betula pubescens*  
photo B. Assyov

## ***Carpinus***

## **Hornbeam**

*Betulaceae*

Deciduous trees, seen in temperate areas of the Northern Hemisphere. There are two native species in Europe – the European Hornbeam (*Carpinus betulus*) and Oriental Hornbeam (*Carpinus orientalis*) both known for their very hard wood. Few other American and Asian species are rarely seen as introduced in parks and gardens. Hornbeams are recognized by their finely serrated leaves and the peculiar fruits – a catkin of small nuts, each embraced by leafy bracts. Do not confuse with the Hop-hornbeam (*Ostrya*) that has fruits more resembling those of Hop (*Humulus lupulus*). Hornbeams typically have very smooth bark. The two European species are easy to distinguish – *Carpinus betulus* has larger leaves and 3-lobed bracts of the fruit; *Carpinus orientalis* has much smaller leaves and entire toothed bracts.



*Carpinus orientalis* – coppiced woodland

photo B. Assyov





*Carpinus betulus*  
photo B. Assyov



*Carpinus orientalis*  
photo B. Assyov

## ***Castanea***

## **Sweet chestnut**

*Fagaceae*

Handsome deciduous trees, seen in areas with mild climate. *Castanea sativa* is native to Europe, others species are occasionally seen as introduced. Sweet chestnut has peculiar and easy to remember long serrated leaves and spiny fruits.



*Castanea sativa* – branch with young fruits  
photo B. Assyov



*Castanea sativa* – mature fruit  
photo B. Assyov

## ***Cistus***

## **Rock rose**

*Cistaceae*

Small or large shrubs extensively present in the European Mediterranean and often planted elsewhere. They all have persistent leaves and large flowers with five petals, coloured from white to dark pink.



*Cistus incanus*

photo B. Assyov



*Cistus salviaefolius*

photo B. Assyov

## ***Coryllus***

## **Hazel**

### *Betulaceae*

Small trees or shrubs. Few species are known, of them only two are found in Europe. Beech is recognized by its double toothed leaves, the flowers and especially the fruits. The flowers are very small. Male flowers are collected in pendulous catkins. The female flowers are bundled in small groups concealed in the buds. The fruit is peculiar – a nut, surrounded by husks.



Nuts of *Coryllus avellana*  
photo B. Assyov



Leaves of *Coryllus avellana*  
photo B. Assyov



Nuts of *Coryllus colurna*  
photo B. Assyov

# ***Fagus***

# **Beech**

## *Fagaceae*

Trees of exceptional magnitude. Few species are known in the Northern Hemisphere, only two are found in Europe – *F. sylvatica* which is widespread and *F. orientalis*, confined to the south easternmost part of the continent. Beech is recognized by its sparsely toothed leaves with fine silky hairs on the edge and the veins. The fruit is peculiar – a nut, called acorn, embraced in a structure termed cupule.



An old beech forest. Note the bark  
photo B. Assyov



*Fagus sylvatica*. Note the fruit with tiny appendages  
photo B. Assyov



*Fagus orientalis*. Note the fruit with long and wide  
appendages  
photo B. Assyov

## ***Helianthemum***

## **Rock rose**

*Cistaceae*

Small perennials widespread in Europe, though rare in north. All of them have relatively small flowers with five petals, coloured white or more often yellow.



*Helianthemum nummularium*

photo B. Assyov



*Helianthemum alpestre*

photo B. Assyov



## ***Ostrya***

## **Hop-hornbeam**

*Betulaceae*

Small genus of fine trees. Only one species is known in Europe – *O. carpinifolia*, seen as native in the south of the continent. Few other species are rarely met in parks and gardens, introduced from Asia and America. As inferred from the English name the Hop-hornbeam is similar and easy to confuse with Hornbeam (*Carpinus*). Their leaves are both very similar and difficult to tell apart even for specialists. The fruits are however different. In *Ostrya* they resemble very much the fruits of Hop (*Humulus lupulus*) and that is why the tree is called Hop-hornbeam. In hornbeams the fruits are also pendulous but composed of many finely toothed scales.



*Ostrya carpinifolia*

photo B. Assyov

## ***Populus***

## **Aspen, Poplar**

*Salicaceae*

Medium sized or robust trees. Few species are known in Europe, and many sorts and hybrids are extensively planted. The leaves are of very different shape (see the photographs), but are always toothed or more or less divided. The flowers are inconspicuous and collected in male and female catkins.



White poplar (*Populus alba*) with white hairy leaves  
photo B. Assyov



Black poplar (*Populus nigra*) with almost triangular leaves  
photo B. Assyov



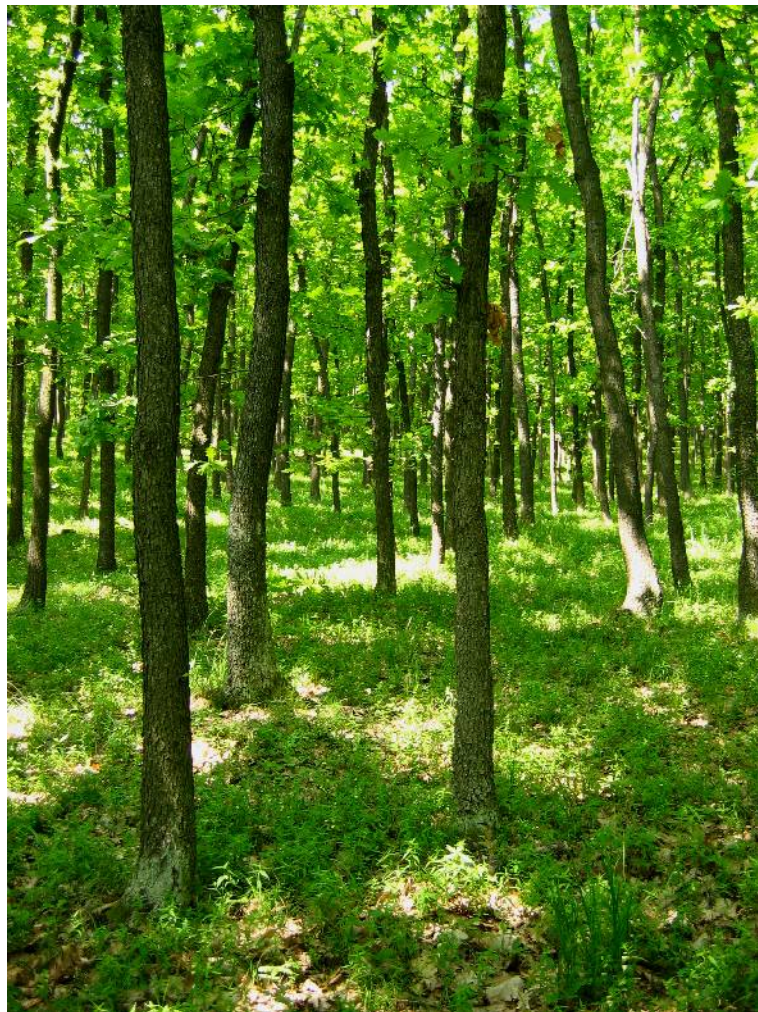
Aspen (*Populus tremula*) with peculiar and easily  
remembered shape of the leaves  
photo B. Assyov

# ***Quercus***

# **Oak**

*Fagaceae*

Large genus of handsome trees. A number of species is known in Europe, many others are introduced from Asia and America and some of them are extensively planted (e. g. *Quercus borealis*). The leaves are of very different shape, but are nearly always toothed or more or less deeply divided (rarely entire). Most widespread in Europe are the deciduous members of the genus, but in the Mediterranean area there are also evergreen species (e. g. the well known cork oak *Quercus suber*). The fruit is peculiar – a nut, called acorn, embraced in a structure termed cupule. The recognition of the species relies on both characters of the leaves and the fruits. Oaks are favored mycorrhizal hosts of many boletes



An oak woodland  
photo B. Assyov



*Quercus coccifera* – typical evergreen oak  
photo B. Assyov



*Quercus petraea* – common in Europe deciduous oak  
photo B. Assyov



*Quercus cerris* – species with hoary cupules  
photo B. Assyov



**Acorns with cupules of *Quercus polycarpa***  
photo B. Assyov

# ***Salix***

# **Willow**

## *Salicaceae*

Large genus of small trees or shrubs. A number of species is known in Europe. The leaves are of very different shape, but are nearly always toothed. Most spread in Europe are the trees and large sized shrubs of the genus, but in the northern areas and in the high mountains there is a number of dwarf willows. The flowers are inconspicuous and collected in male and female catkins.



*Salix caprea* with female catkins

photo B. Assyov



Female (left) and male (right) catkins

photo B. Assyov



*Salix lapponum* – a dwarf willow reaching 1 m height  
photo B. Assyov



*Salix reticulata* – a dwarf willow  
barely reaching 20 cm height  
photo B. Assyov



## ***Tilia***

## **Lime**

### *Tiliaceae*

Impressive robust trees. The leaves are always somewhat heart-shaped, densely toothed. The flowers are yellow and strongly aromatic, bundled in group of few and connected to a special leaf-like wing.



*Tilia cordata*

photo B. Assyov