

Acer platanoides in Europe: distribution, habitat, usage and threats

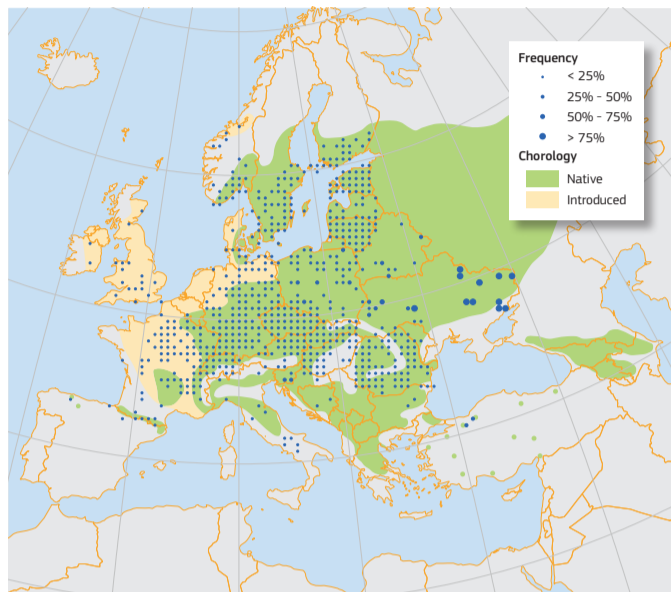
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Acer platanoides L., commonly known as Norway maple, is a large tree that is widespread in central Europe and reaching eastwards the Ural Mountains. It is a fast-growing species, able to grow in a wide range of soils and habitat conditions. In natural stands it occurs in fresh and humid sites in temperate mixed forests, both with conifers and broadleaves. It is a secondary species, growing in small groups or individually. It has been planted intensively as an ornamental and shade tree, appreciated for its colourful foliage and large, spreading crown, in combination with its tolerance of urban conditions. Its wood is also valued for its attractive flaming figures and is used for music instruments, furniture, marquetry and turned objects. This maple is generally free of serious diseases, except in urban areas, where it is more vulnerable to pathogens. In North America it has been widely planted and is now naturalised, becoming an invasive species.

The Norway maple (*Acer platanoides* L.) is a large and tall-domed tree, sometimes very broad, growing to 25-30m tall and 60-80cm in diameter, although exceptionally over 150cm. The stem is straight, short with perpendicular shoots and the crown is dense with foliage. The leaves are opposite, simple, 10-15cm long, very variable in dimension depending on the age and the vigour of the tree. They have five lobes with long and **acuminate** teeth and smooth margins. The colour is bright to shiny green turning yellow in autumn; the stalk is reddish, 10-20cm long. The Norway maple is a **monoecious hermaphrodite** species with **inflorescences** grouped in **panicles** of 30-40 flowers, each 6-8mm long with five yellow-green petals. In this species flowers appear from about 25-30 years and are insect pollinated. The fruit is a double **samara**, 3-5 cm each, greenish-yellow, dispersed by the wind. The two **samaras** are set at a wide angle approaching 180°. The bark of young trees is smooth and grey-brown; on older trees the bark becomes darker and shallowly furrowed with long narrow ridges in a network. The wood is dark reddish-brown; the grain is straight, with a fine, uniform texture. Many cultivars have been selected for their distinctive leaf shape and coloration and for crown shape¹⁻⁵.

Distribution

Norway maple is the most widespread native maple in Europe. Its natural distribution ranging from Greece, Balkans, North Italy and Pyrenees to southern **Fennoscandia**, and toward the East it arrives as far as Russia but not over the Ural Mountains. It grows from sea level up to 1400m in the Alps. In Europe it is not native of western France, British Isles, Netherlands and Denmark. The subspecies *Acer platanoides turkestanicum* occurs in mountain forests of Turkey, Caucasus and northern Iran on the southern coasts of the Black Sea and Caspian Sea, reaching 2400m in elevation. Norway maple is commonly found throughout mainland Europe, even in countries where it is non-native. It was also introduced in the United States in the 18th century and now it is naturalised in some areas of central-east United States



Map 1: Plot distribution and simplified chorology map for *Acer platanoides*. Frequency of *Acer platanoides* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native and introduced spatial range for *A. platanoides* is derived after several sources^{6, 28-31}.

and south-east Canada. It shares the ecological range of sugar maple (*Acer saccharum*), which is taxonomically close. Norway maple may be found all over the world in towns and villages as an ornamental and shade tree⁶⁻⁸.

Habitat and Ecology

The Norway maple is a fast-growing tree species, able to grow well across a wide range of soil conditions, shade, drought and pollution. However, it thrives best in deep, fertile, moist soils, which are adequately drained and with a sub-acid pH. Exposure and strong calcareous soils are well tolerated^{4, 5}. It is intolerant of low soil nitrogen conditions, high evapo-transpiration or prolonged drought and it is rare on acidic soils (pH near 4)⁸.



Flowers are insect pollinated and are produced when the tree is 25-30 years of age. (Copyright Maja Dumat, www.flickr.com: CC-BY)

It tends to be located at the base of hills where it receives a surface runoff and subsurface soil water flow. It also thrives at higher elevations with sufficient precipitation⁸. It germinates and grows quickly in shade, even under close canopy. When mature, it becomes more light-demanding^{9, 10}. The height increment is about 1 m/year in the first 10 years. With its wide crown it tends to shade and suppress other slow-growing competitor species⁴. Under optimal conditions Norway maple may live for more than 250 years¹. Over Europe it occurs in fresh and humid sites both in coniferous and deciduous forests. In natural stands Norway maple occurs as a secondary species with low frequency, thus not forming pure stands but generally found in small groups or as individual trees. In temperate continental mixed forests it can co-dominate with other broadleaves such as English oak (*Quercus robur*) and small-leaved lime (*Tilia cordata*)^{3, 8, 10-13}.

Importance and Usage

The Norway maple has been used extensively as an ornamental, shade and street-side tree because of its attractiveness, colourful foliage and large, spreading crown, in combination with its tolerance of urban conditions. Its ability to resprout vigorously after trimming makes it suitable to be used as a live fence⁴.

The Norway maple distribution range overlaps with many areas



The large five-lobed leaves appear after the flowers. (Copyright Free Photos, www.flickr.com: CC-BY)



This species is frequently planted as an ornamental for its attractive autumn colouration. (Copyright Nicholas A. Tonelli, www.flickr.com: CC-BY)



Leaves are generally 10-20cm in length, varying widely in size depending on the age and vigour of the tree.
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in Europe with high erosion rates such as the European mountain systems¹⁴. Its adventitious roots are suitable to be exploited for soil bioengineering to increase the stability of slopes and mitigate erosion¹⁵. The species shows a high efficacy against rockfall¹⁶.

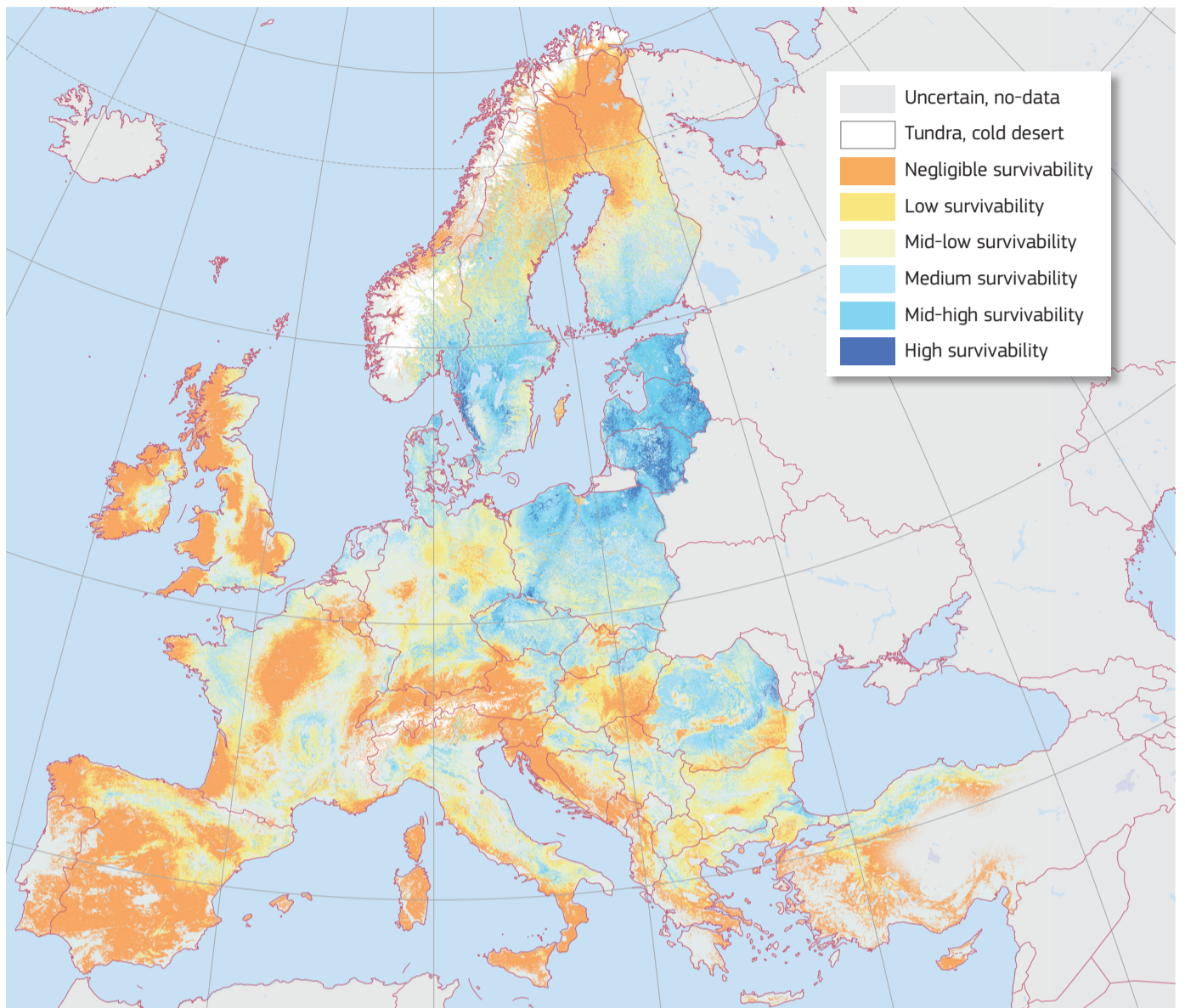
The wood of Norway maple is similar to other maple species in colour, grain and texture, bearing closest relation to field maple (*Acer campestre*) with an intermediate hardness⁵. Wavy-grained maple is in great demand for its attractive flaming figures, used principally for music instruments, such as guitars and violins⁴. The Italian violinmaker Stradivari in the 17th and early 18th centuries used spruce wood (*Picea abies*) for the top plates of their instruments and Norway maple wood for the rest¹⁷. The wood of this species is also used for furniture, marquetry, turned objects, and other small speciality wood items⁴.

Threats and Diseases

In its natural habitats Norway maple is generally free of serious diseases. However, in urban areas, along with other maple trees it can suffer from different diseases caused by a combination of stresses due to pollution, site alteration, soil compaction, etc.⁴. Sooty bark disease caused by *Cryptostroma corticale* is an important pathogen common in northern America and central Europe, affecting principally the sycamore maple (*Acer pseudoplatanus*), but also dangerous for the Norway maple, with serious damage after hot and dry summers. The Asian longhorn beetle *Anoplophora glabripennis* is a large wood-boring beetle native of Asian countries, such as Japan, Korea and China. Its larvae tunnel and feed on the cambium layer of bark, attacking healthy trees as well as trees under stress and eventually killing the host species. It is creating serious economic, ecological and aesthetic impacts on different hardwood tree species mainly in the United States and recently in Europe. Norway maple and other species of genus *Acer* are particularly vulnerable¹⁸ and one of the major hosts in urban areas¹⁹. Fungi of the genus *Rhytisma* infect the leaves of maples and cause black spots on upper leaf surfaces. The wilt fungi of genus *Verticillium* infect ornamental and nursery plants through the root system along water-



Bark on a mature tree showing network of long narrow ridges.
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Map 3: High resolution map estimating the maximum habitat suitability.



Fruit is a double samara; this shape enables it to be dispersed far from the parent tree by the wind.
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conducting tissues and resulting in blockage of water movement to the foliage^{4, 20, 21}. Although *Cameraria ohridella* (horse-chestnut leafminer) is mainly known for its impressive impact on the European horse-chestnut (*Aesculus hippocastanum* L.), it is also harmful to Norway maple which partly coexists with the natural niche of the horse-chestnut leafminer^{22, 23}. During the middle of the 20th century this species was widely planted in United States to replace American elm (*Ulmus americana*) that were lost due to Dutch elm disease. However, with its fast growth, dense shade, and shallow roots, the species has since demonstrated itself to be a proficiently invasive species, reducing abundance and diversity of native species and altering the natural forest community structures²⁴. It has invaded mixed-deciduous forests especially on disturbed sites in parts of eastern North America, requiring in some cases mechanical or chemical control measures^{7, 9, 25-27}.

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Caudullo, G., de Rigo, D., 2016. *Acer platanoides* in Europe: **distribution, habitat, usage and threats**. In: San-Miguel-Ayanz, J., de Rigo, D., Caudullo, G., Houston Durrant, T., Mauri, A. (Eds.), *European Atlas of Forest Tree Species*. Publ. Off. EU, Luxembourg, pp. e019159+

