

Populus nigra in Europe: distribution, habitat, usage and threats

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Black poplar (*Populus nigra* L.) is a pioneer deciduous wind-pollinated tree species, widely distributed across Europe, Asia and northern Africa. In Europe it is considered as an important species of floodplain forests, but it is currently close to extinction in several parts of its range.

Black poplar is a large, fast growing deciduous tree, reaching heights of up to 40m tall and trunk diameters of up to 200cm¹. The bark is dark brown or black, with numerous fissures. The leaves are variable in size and shape, longer than wider, but they usually have a **cuneate** base and serrated margins². The flowers appear before the foliage develops³, from specialised buds containing preformed inflorescences⁴. The fruits consist of capsules grouped in catkins³. It can be propagated both in generative (by wind- and water-dispersed seeds) and vegetative ways (by cuttings)^{1,5}. There are a large number of clones, varieties and hybrids, making classification difficult⁶⁻⁸. Mature trees can live for 100, occasionally 300-400 years⁸.

Distribution

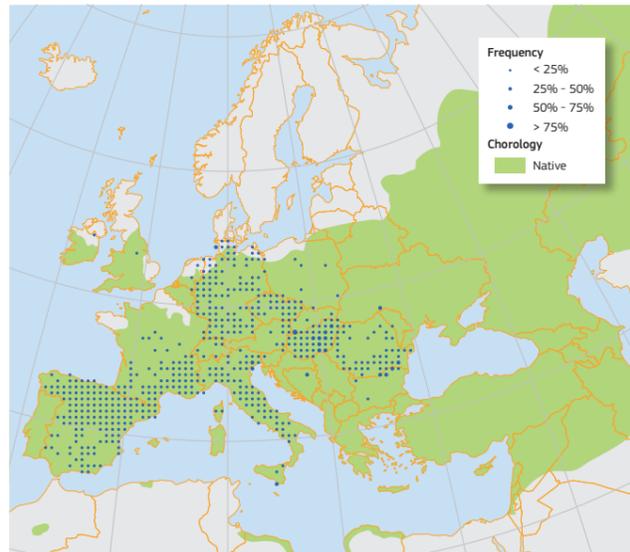
Black poplar has a wide natural distribution. In Europe, it can be found as far north as the British Isles and down to the Mediterranean coast. At the southern extreme of its range it can be found in parts of northern Africa and the Middle East. To the east its range extends as far as Kazakstan and China^{1,7,9}. It is also cultivated in India between 26 and 29°N latitude and is naturalised in both North and South America¹.

Habitat and Ecology

The black poplar is a tree species of floodplain forests⁵, growing in riparian mixed forests together with white poplar (*Populus alba* L.), willow (*Salix* spp.), alder (*Alnus* spp.), maple (*Acer* spp.), elm (*Ulmus* spp.), and sometimes oak (*Quercus* spp.)⁷. It is a pioneer tree species^{5,10}, and does not tolerate drought or shade¹. It is an opportunistic species able to colonise new sites after disturbances, and has a good tolerance to high water levels and high temperatures during summer⁸. It can be managed easily by coppicing¹.

Importance and Usage

Both tree breeders and conservationists are aware of the importance of black poplar⁸. It is a highly valuable tree species from an economic point of view: it is used as a parent pool for



Map 1: Plot distribution and simplified chorology map for *Populus nigra*. Frequency of *Populus nigra* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *P. nigra* is derived after EUFORGEN³².

several breeding programmes across Europe, especially for obtaining the hybrid *Populus x euramericana* (*P. deltoides* x *P. nigra*)^{7,10-12}. As other fast growing Salicaceae, this species may have a multifunctional role for pollution mitigation, microclimate regulation and improved structural and biological diversity in open agricultural landscapes¹³. The wide spatial distribution of black poplar overlaps with many areas in Europe subject to high erosion rates, including moist slopes with high drainage-area within the European mountain systems¹⁴. Here, this tree contributes to relevant forest ecosystem services such as soil stabilisation and watershed protection¹⁵. It has also high ecological value in riparian floodplain ecosystems, frequently used as a windbreak or to control erosion along riverbanks¹. In Mediterranean areas with high potential soil erosion¹⁶, silvoarable agroforestry with this species¹⁷ may be exploited even considering the

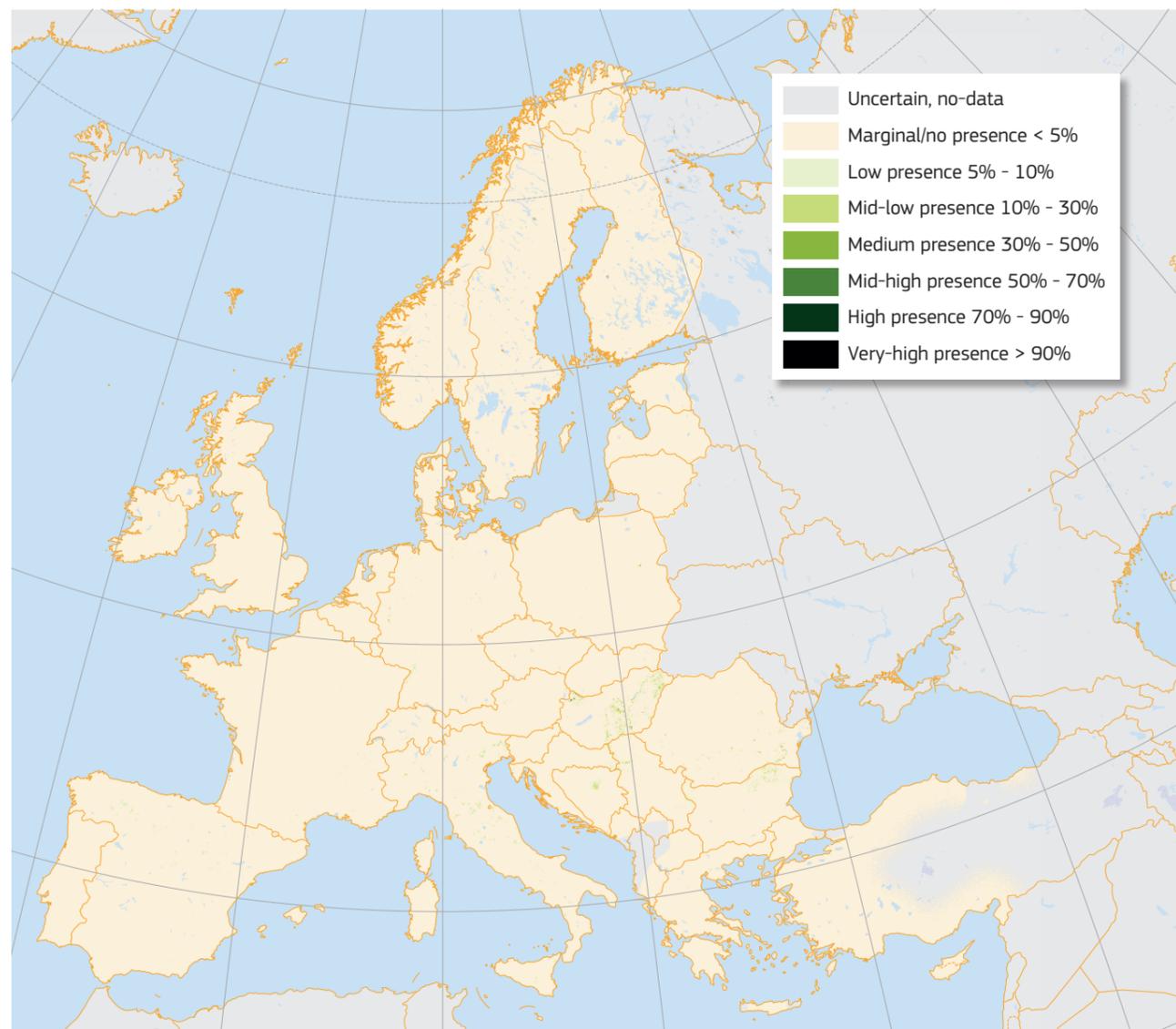
effectiveness of its cover-management on erosion rates¹⁸. It is often used as an ornamental tree, especially the narrow variety Lombardy poplar (*Populus nigra* cv. *Italica*)^{1,7}. The wood has many desirable qualities; although not particularly strong, it is relatively fire-resistant and shockproof, and it has a soft, fine texture. Traditionally it was used for clogs, carts, furniture and also flooring near to open fireplaces¹⁹. It is now used for pulp and paper production, and its fast growth rate makes it a suitable bioenergy crop^{8,13,20}. Extracts from the tree have been shown to have antioxidant and anti-inflammatory effects^{8,21}. Black poplar belongs to the group of plants that remarkably emit **isoprene**, which is one of the **biogenic volatile organic compounds** affecting a complex chain of feedbacks between the terrestrial biosphere and climate, with relevant although not yet completely understood implications under the ongoing climate warming²²⁻²⁴.



Columnar form of black poplar in a garden park of Békés (East Hungary). (Copyright László Szalai, commons.wikimedia.org: PD)



Male catkins with reddish anthers during pollination. (Copyright Aldo De Bastiani, www.actaplantarum.org: AP)



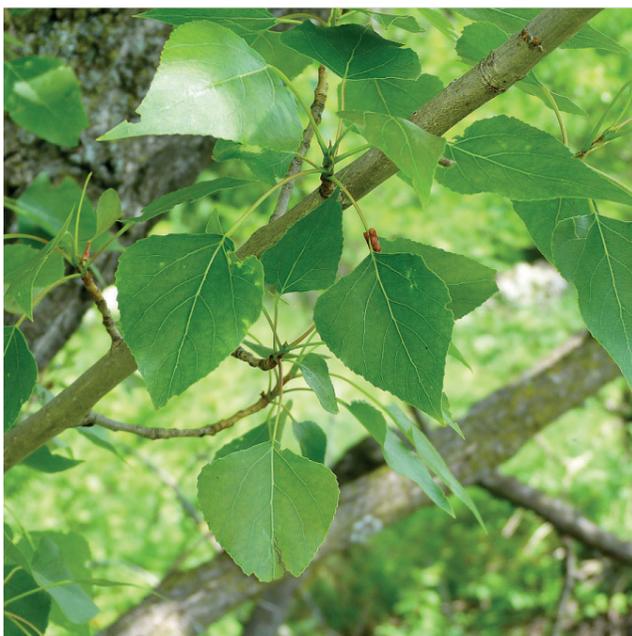
Map 2: High resolution distribution map estimating the relative probability of presence.



Deep fissured bark of a mature tree.
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Isolated poplars with autumn foliage in the rural area near Torrestío (León, North-West Spain).
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Triangular-shaped leaves with cuneate base and acuminate apex.
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Fluffy seeds ripening from the capsules dispersed by the wind.
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Female greenish flowers before pollination.
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Threats and Diseases

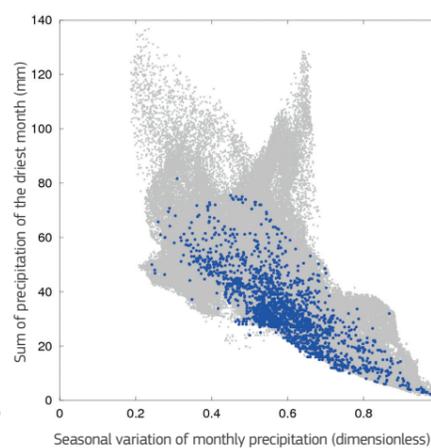
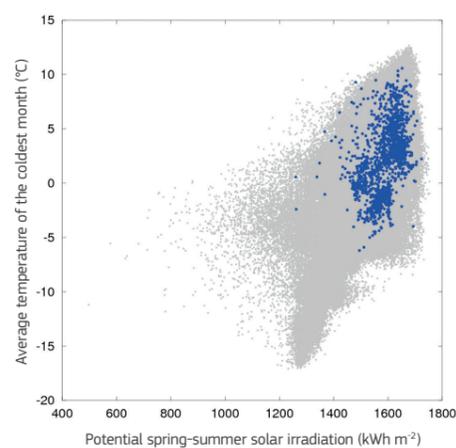
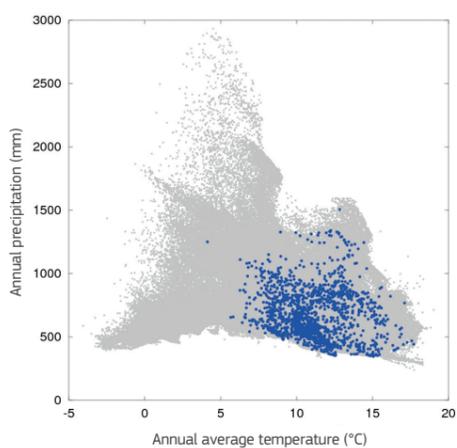
Black poplar is now one of the most threatened tree species in Europe⁵ and is close to extinction in a large part of western Europe⁷ because of several factors including habitat degradation, demographic pressure and lack of genetic diversity^{1, 6, 25}. Gene flow from cultivated poplar plantations into the wild populations is also a significant problem^{26, 27}. Black poplar is susceptible to the rust disease *Melampsora larici-populina*^{28, 29} which, while causing only moderate levels of mortality, results in significant reduction in growth volume. This tree is susceptible to attacks from the Asian longhorn beetle (*Anoplophora glabripennis*) and since it shows a remarkable resistance, it may potentially act as overwintering reservoir of the beetle^{30, 31}. *Porthetria obfuscat* and the larvae of *Trichiocampus viminalis* are damaging defoliators; *Phyllonorycter populifoliella* mines the leaves of black poplar while insects of the *Phyllocnistis* genus can skeletonise its leaves and those of the hybrid *P. deltoides x nigra*, on trees of all ages³¹. This poplar can be infested by *Leucoma salicis*, although in central Europe numerous natural enemies may mitigate outbreaks³¹.



Maturing fruits on catkins during leaf development.
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Field data in Europe (including absences) ● Observed presences in Europe ●

Autoecology diagrams based on harmonised field observations from forest plots.



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