

Alnus glutinosa in Europe: distribution, habitat, usage and threats

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Common or black alder (*Alnus glutinosa* (L.) Gaertn.) is a short-lived, rather small but fast growing broadleaved tree that can be found over most of Europe. It needs a high availability of moisture to grow well, and can often be found along river banks, lake shores and in marshy locations. It is able to fix nitrogen in symbiotic root nodules making it useful for improving soil condition. The timber is durable under water and is often used for jetties and underwater supports, for example in Venice. The most damaging pathogen of alder is the pathogen *Phytophthora alni*, which has been observed in several countries since the 1990s and is likely to become more of a problem in the future.

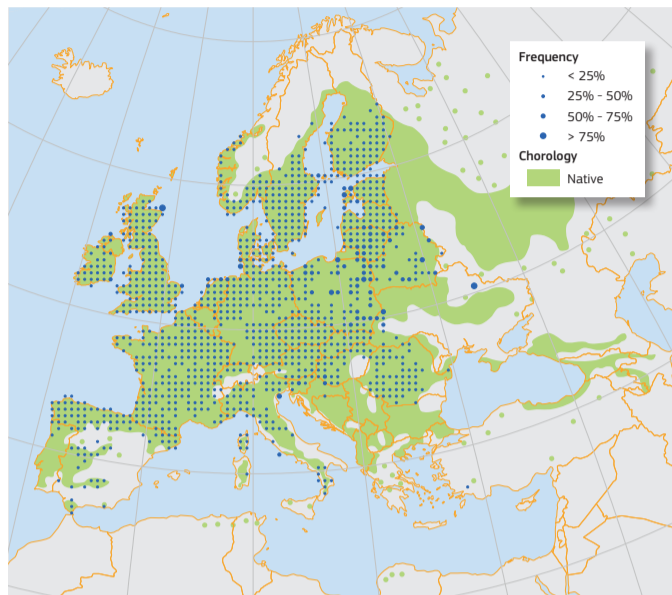
Alnus glutinosa (L.) Gaertn., known as common or black alder, is a broadleaved tree native to most of Europe. It is a relatively small, short-lived species: individuals normally live to around 60 years (with a maximum of up to 160 depending on the region) and normally grow to between 10 and 25 m tall, exceptionally 35-40m¹⁻³. The bark is brown and smooth at first, becoming darker, rough and fissured with age⁴. The dark green leaves are simple, **obovate** and measure 4-10cm⁵. Flowering starts before bud burst⁶. The young buds are sticky, giving rise to the name "glutinosa". Alder is **monoecious** and the male and female catkins develop in the autumn of the previous year, appearing early in the following spring. The fruits are woody and resemble small pine cones. After wind pollination the seeds, which float well owing to their corky float chambers and oily water-resistant outer coat, are mainly dispersed by water⁷.

Distribution

Alder can be found over most of Europe, from Scandinavia to the Mediterranean countries and parts of North Africa⁴. It normally grows below 1000m in elevation, although in the mountains of central Europe it can occasionally be found along watercourses up to 1800m⁸. Its current northern limit is around 65°, and its range is limited in the east by aridity^{3,9}. A warmer changing climate could result in its natural range extending further north into Scandinavia and Russia in future decades, although it is limited by the length and intensity of frosts, and in other parts of Europe it is likely to be negatively affected in areas where rainfall is predicted to fall¹⁰. Outside its native range, alder has been introduced into the Azores and is naturalised in north-eastern United States and maritime Canada^{6,11}.

Habitat and Ecology

Alder is adapted to a wide range of temperatures and is relatively frost-tolerant⁴. It can grow well in continental climates



Map 1: Plot distribution and simplified chorology map for *Alnus glutinosa*. Frequency of *Alnus glutinosa* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *A. glutinosa* is derived after EUFORGEN²².

but requires a high availability of water to thrive. It can be found on a wide range of soil types including poor soils and even coarse sands and gravels if the moisture is adequate, although it does not grow very well on calcareous soils^{11,12}. Atmospheric humidity must remain high during all phases of its reproductive cycle and the roots are well-adapted to growing on very wet soils: it can survive flooding better than most other forest tree species¹³. It tends to favour three main site types: marshy waterlogged sites; riverside and lake shore sites, and plateaux with high soil-moisture content¹⁴. Unusually among European tree species, it is able to fix nitrogen in symbiotic root nodules with the bacteria *Frankia alni*^{12,15}. It also retains relatively high levels of foliar nitrogen



Alder trees on the banks of the river Wey, England. (Forestry Commission, www.forestry.gov.uk © Crown Copyright)

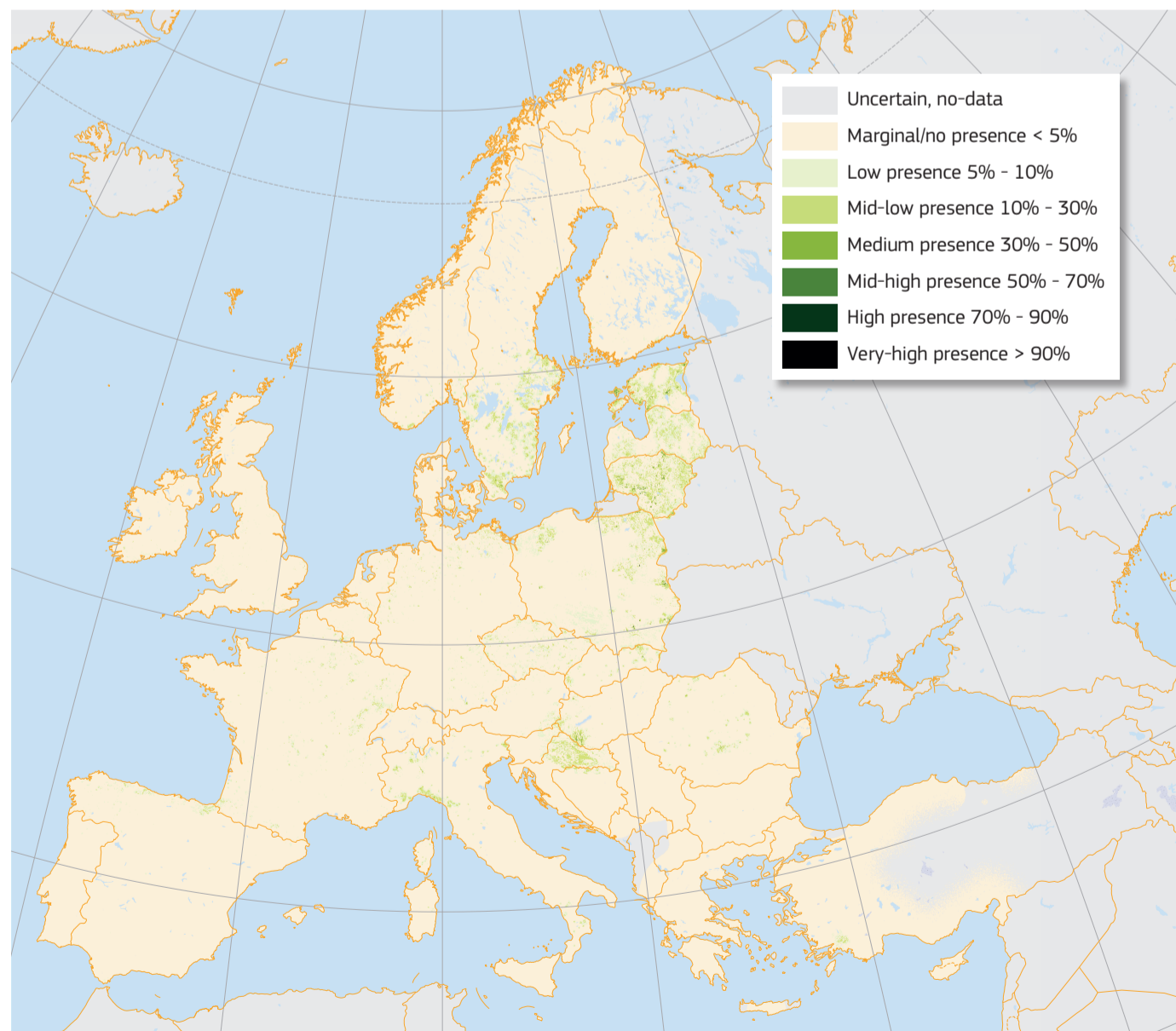
through the year until leaf-fall in autumn, resulting in a nitrogen-rich litter layer¹¹. This makes it a valuable pioneer species; it can colonise and grow quickly on disturbed sites, improving the soil condition for other species to take over later and minimising the need for nitrogen fertilisers³. It can also be used as a nurse species to improve the growth of neighbouring plants, although in common with other pioneers it is light-demanding and tends to be replaced by other species once the canopy closes, preventing seedling growth⁴. It is fast-growing when young, but growth generally slows significantly after canopy closure because of its inability to withstand competition from neighbours. As branches become shaded they die off (natural pruning) and the live crown size decreases relative to the size of the tree¹⁴. Although it is not particularly common (less than 1% of forest cover in most countries), it is an important component in open landscapes, especially along river banks and in marshy areas. The oldest and most productive stands are found in central Europe, where it can reach 35 m tall and may form up to 5% of the forest area¹⁴. It is often found together with ash (*Fraxinus* spp.), birch (*Betula* spp.), willow (*Salix* spp.) or oak (*Quercus* spp.)¹¹.

Importance and Usage

The wood of alder is soft and porous, but durable if kept under water. It is used for jetties and underwater supports, bridge piles and small boats (parts of Venice were built on alder wood piles^{16,17}). It is not generally strong enough for heavy construction uses but good quality wood is sought after in joinery and wood veneer. However, it becomes prone to heart rot after around 60 years of age, which reduces the timber quality and also means that very large logs are rare¹⁴.



Male inflorescence, Sierra Madrona, Spain. (Copyright Javier Martin, commons.wikimedia.org; PD)



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

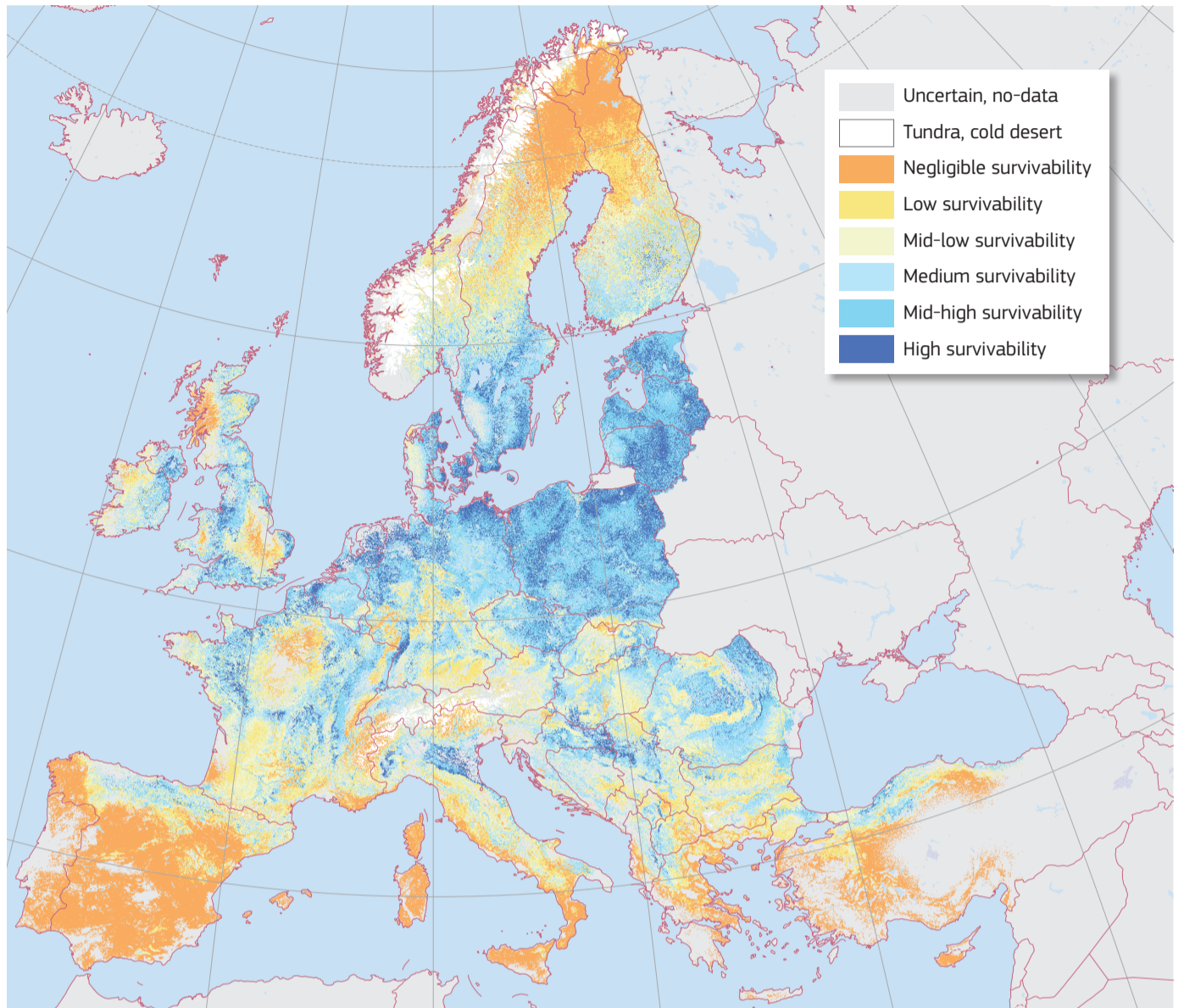


Female catkins, Arnhem, the Netherlands. (Copyright Bjschoenmakers, commons.wikimedia.org: CCO)

Alder yields high quality charcoal⁴. It can also be coppiced and provides material suitable for biomass production¹². Apart from its timber, alder also has a useful role to play in land reclamation, flood control, stabilisation of riverbanks and in the functioning of river ecosystems, and its nitrogen-fixing capabilities can improve soil fertility^{3, 18}. Alder stands are valuable for wildlife. The cones open gradually, releasing the seed and providing a reliable source of food throughout the winter^{11, 18}.

Threats and Diseases

In the 1990s a new disease caused by the oomycete *Phytophthora alni* was observed^{19,20}. The symptoms include tar-coloured spots at the base of the stem and small yellowing leaves which fall early. Over a period of years, first fine branches and then larger ones die, and in serious cases the whole tree is killed. This disease has since been spreading throughout the population of alders in Europe and has now been reported in ten countries. Although the amount of reported damage varies by region, it poses a serious threat to the species. Trees growing on riverbanks or flood plains are particularly vulnerable since the presence of water appears to facilitate the transport of the pathogen²¹.



Map 3: High resolution map estimating the maximum habitat suitability.



Alder forest in Spree, Germany. (Copyright Paul Schulze, www.flickr.com: CC-BY)



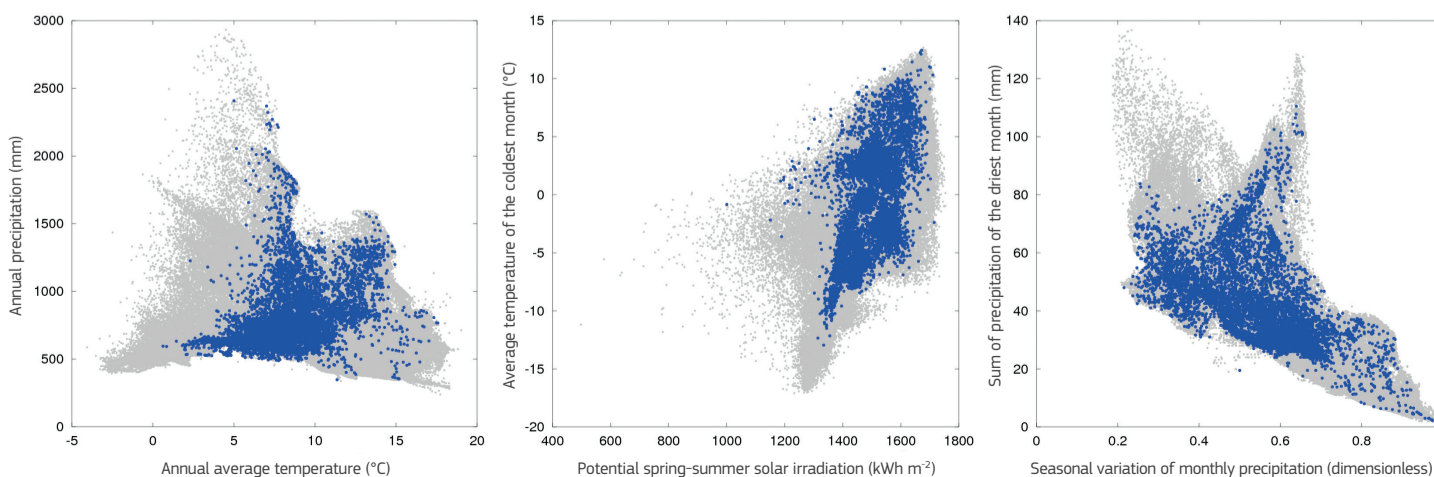
Foliage and mature cones, Ispra, Italy. (Copyright Daniele de Rigo: CC-BY)

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Field data in Europe (including absences) ● Observed presences in Europe ●

Autecology diagrams based on harmonised field observations from forest plots.



This is an extended summary of the chapter. The full version of this chapter (revised and peer-reviewed) will be published online at <https://w3id.org/mtv/FISE-Comm/v01/e01f3c0>. The purpose of this summary is to provide an accessible dissemination of the related main topics.

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