Frangula alnus

Frangula alnus in Europe: distribution, habitat, usage and threats

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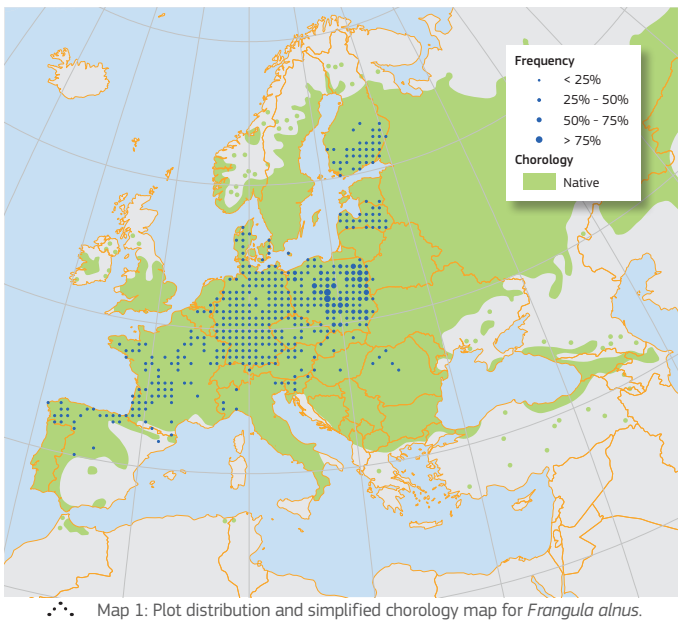
Alder buckthorn (*Frangula alnus* Mill.) is a shrub or small tree of 4-5 m, characterised by fleshy fruits. Its wide distribution covers most of the temperate forest zone of Europe up to the Urals and Caucasus, occurring even in the southern Boreal and cool Mediterranean forests. It is a light-demanding pioneer species, thriving on forest edges and fens in different habitats and vegetation communities. Its soft wood is used for gunpowder and its fruits are known for being a strong laxative and are used in dye making. Some varieties are used as ornamental shrubs and are planted outside its natural range. This species is classified as highly invasive in North America and is under prevention and control programmes.

Alder buckthorn (*Frangula alnus* Mill. syn. Rhamnus frangula L.) is a shrub commonly 4-5 m tall, which can develop with age into a small tree up to 7 m in height[1, 2]. Branches are multi-stemmed, not very regular and arranged in alternate pairs. The bark on young shoots is green, becoming grey-brown. Buds are naked, consisting of miniature leaves heavily clothed in brown hairs. Leaves are **obovate**, with an entire but wavy margin, shiny upper surface and markedly parallel veins, turning a clear yellow and red in autumn[3]. The flowers are **hermaphrodite**, white-greenish, 4 mm diameter[4] with a five-part **corolla**, and are arranged in small groups in the leaf axils[3]. Flowers produce nectar secretions which attract insects for pollination[2, 4, 5]. The mature fleshy fruits are globose **drupes** with 3 (rarely 2) separate one-seeded stones[4]. They are 6-10 mm across, changing from green to red, then to violet-black on ripening[3]. Birds are the main dispersers of seeds, but other potential dispersal agents include small mammals, gravity and water[2]. Flowering and fruit development seasons are variable, showing temporal differences between populations at the southern and northern parts of the distribution[5].



Map 1: Plot distribution and simplified chorology map for *Frangula alnus*. Frequency of *Frangula alnus* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *F. alnus* is derived after Meusel and Jäger[6].

Distribution

Alder buckthorn has a wide distribution, occurring over most of the temperate area of Europe and western Asia, covering also northern parts of the Mediterranean region and southern Boreal areas, except the extreme north[1]. Its elevational range is from sea level in southern Scandinavia to 2 000 m in Spain. Eastwards this species reaches the Ural Mountains and Caucasus. It is also present in North-West Africa, in Algeria and Morocco[3, 6]. Several subspecies and varieties have been described through most of its natural range. Probably introduced before 1800 as an ornamental plant, it is widespread in North America and has been naturalised since the last century, with an increasing abundance generally over time[2, 7]. Linnaeus described this species as *Rhamnus frangula*, but it was renamed by the Scottish botanist Philip Miller in 1768 because its tiny green-white flowers are **hermaphrodite** with five petals, in contrast with those of *Rhamnus* species, which are **dioecious** with a four-part **corolla**[8].

Young alder buckthorn in shrub form. This species rarely develops over 7 m in height.
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Habitat and Ecology

Alder buckthorn is a light-demanding pioneer species which thrives in temperate forests principally on mildly acid moist soils although it can be found also in other soil types. It prefers humid and wet habitats, avoiding permanent waterlogging, but also can colonse rocky and dry soils. It can build up large populations on fens, clear-cut areas or forest edges, later becoming substituted by secondary species[3]. In the southern areas it tends to colonise mainly cool riparian forests concentrated in mountain ranges[9]. Thanks to its frugality and adaptation to several habitats, this species can be found in different forest communities in the shrub layer, such as the mixed coniferous lowland boreal forests in Scandinavia dominated by spruce (*Picea abies*) and birch (*Betula* spp.), in the temperate mixed broadleaved forests in Central Europe with oaks (*Quercus robur, Q. petraea*) and beech (*Fagus sylvatica*), or in the Mediterranean cool alluvial forests with alder (*Alnus glutinosa*), poplars (*Populus* spp.) and willows (*Salix* spp.)[10, 11].

Importance and Usage

Since the Middle Ages, the alder buckthorn has been used in folk medicine for its extremely laxative effects of bark or black berry decoctions[12]. The wood is soft, pale orange and can produce a very high quality and fast-burning charcoal, used for producing gunpowder. Today the Swiss black powder is still made with alder buckthorn and is used for fireworks, blast fuses and various military applications[2, 3, 12]. Over the years the wood was also used for making walking sticks, umbrella handles, wooden pegs and butchers' skewers[2, 12]. Bark, leaves and unripe berries can be used to obtain the sap-green dye and other dyes[3, 12]. Different cultivars have been selected for ornamental purposes, such as 'Asplenifolia' with very fine leaves used for gardening, or 'Tall hedge' with a columnar habit and used for hedging. The alder buckthorn also has an ecological importance, providing winter food for birds, mice and other small mammals with its berries and seeds, improving species richness with its presence[2]. The presence of the yellow brimstone butterfly (*Gonepteryx rhamni*) is closely related to the range of alder buckthorn, which is a natural host plant providing food for its larvae[13, 14].

Threats and Diseases

The alder buckthorn is generally free from any significant pests and disease[8]. It can be a host in the life cycle of the crown rust fungus (*Puccinia coronata*), which affects oat and barley[15, 16]. In southern Spain relict populations of *Frangula alnus* subsp. *baetica*, which occur at the limits of geographic range for this species, are in decline and threatened by increasing summer droughts[17]. On the contrary, in North America this species is ranked as "highly invasive", due to its tendency to replace native plants, and several prevention and control programmes have been started where dominant alder buckthorn can negatively affect native species richness, simplify vegetation structure, disrupt food webs and delay succession[2, 7].

Violet black mature fruits: these fleshy drupes are principally dispersed by birds.
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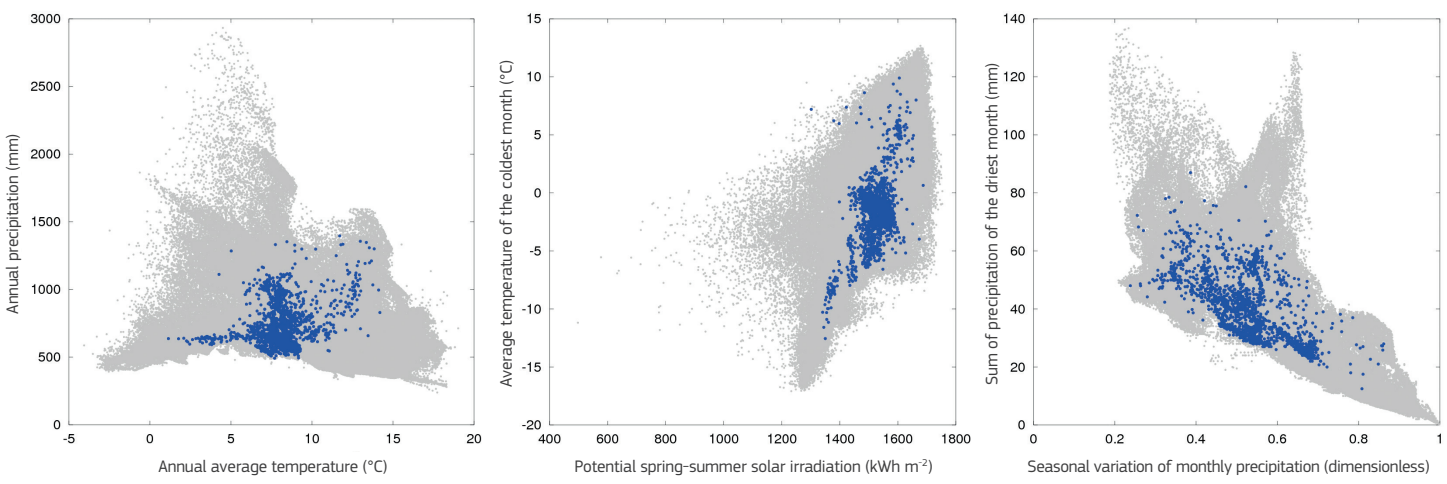
Field data in Europe (including absences) ● Observed presences in Europe ●

Autoecology diagrams based on harmonised field observations from forest plots.



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