Betula nana L.

Dwarf Birch

Betula nana is a monecious, wind-pollinated deciduous shrub with prostrate, hairy twigs and small orbicular leaves with regular toothing. In Britain its stronghold lies in the Highlands of central and north-west Scotland, with outlier populations in the southern Uplands and English border counties of Northumberland, Cumbria and County Durham. It is absent from Wales and Ireland. *B. nana* is typically found in peats on sloping and saturated ground above 300 m AOD in vegetation equivalent to NVC M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire. The species is categorized as of Least Concern in Great Britain but has been assessed as Critically Endangered in England.

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IDENTIFICATION

A prostrate, deciduous sub-shrub up to 100 cm in height, with small, unmistakable fingernail-sized leaves (<2 cm) rounded in outline, whose size renders the even-toothing very obvious.

Twigs are stiff, minutely hairy, dull grey-brown, and often have many resin glands (Poland & Clement, 2009). Fruits have bracts that are longer than wide and with lateral lobes pointing forwards, and the crescent-shaped wings of each fruit are narrow and ± the same length as the fruit (Stace, 2010).

SIMILAR SPECIES

Small saplings of other birch species may be of similar height but they lack the small, rounded leaves of *B. nana* and usually have a clear leading shoot. Of several ericaceous sub-shrubs in the same habitat, none has its distinctive leaf form. When not in leaf, the plant has a more open 'canopy' of thicker, stiffer, twigs than the other sub-shrubs with which it grows, and these are hairy. The remains of the distinctive leaf litter may persist beneath the bushes.

The hybrid with *B. pubescens* (*B.* × *intermedia*) occurs within the range of *B. nana* in Scotland, usually in the vicinity of both parents, and is intermediate in the main diagnostic characters (see Stace *et al.*, 2015, p.100).

Caged plants of *Betula nana* protected from over-grazing at Widdybank Fell, Teesdale, the most southerly location for this species in the British Isles. ©Stuart Hedley

HABITATS

In the northern hemisphere *B. nana* is a key component of arctic and alpine tundra and water-logged montane habitats (de Groot *et al.*, 1997). However, in Britain it is confined to blanket peats on sloping and saturated level ground above 300 m. Its entire distribution occurs within NVC M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire vegetation.

In its core Scottish localities, and its other England localities where conditions are favourable, the plant potentially forms the dominant in its own habitat, although such circumstances are rarely met in Britain, and *B. nana* scrub is accordingly not recognized in the NVC (Rodwell 1991a,b).

BIOGEOGRAPHY

During the Late Glacial *B. nana* was widespread across the British Isles but it is now restricted to central and north-west Scotland, with scattered southern outliers in the Southern Uplands, the English borders (Cumbria and Northumberland, where a new population was recently discovered; see Burlton *et al.*, 2014) and Widdybank Fell, County Durham, it's most southerly British site.

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Globally, *B. nana* is a widespread circumpolar Arctic-montane species, with subsp. *nana* found in western Greenland, Iceland, the British Isles, northern Europe and southwards to the northern Alps and Carpathians and into western Siberia (Jalas & Suominen, 1976). Subsp. *exilis* occurs across Siberia, Alaska and northern Canada to Baffin Island and Labrador (de Groot *et al.*, 1997). *B. nana* grows at between 245 m and 855 m AOD in Scotland reaching 1075 m in Scandinavia and 1300 m in Alaska.

ECOLOGY

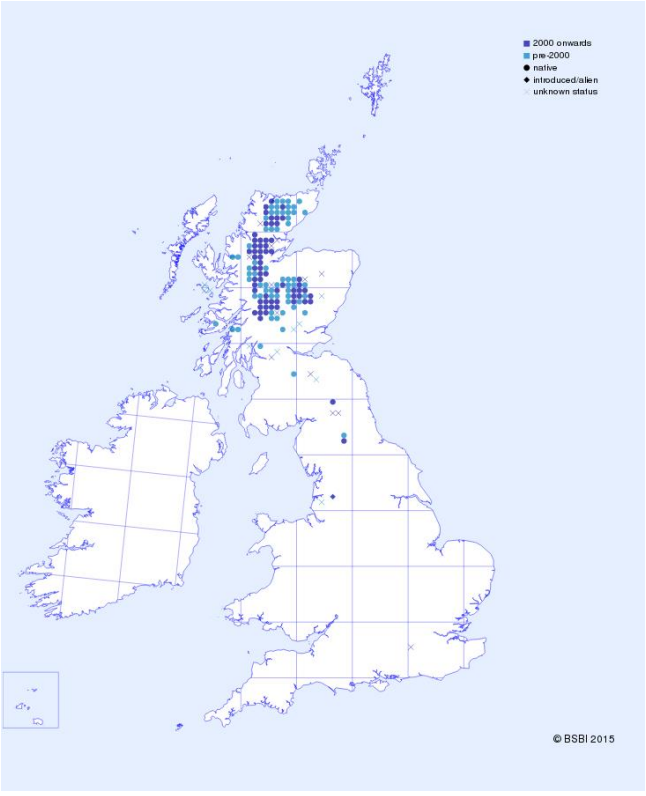
Betula nana scrub is a characteristic component of the natural shrub zone intermediate between coniferous forest and montane heathland e.g. at Hardanger in Norway, as well as more widely in Boreal and Arctic regions. Like many phanerophytes (shrubs and trees), *B. nana* is capable of becoming a dominant plant where conditions are favourable.

It is a monoecious, wind-pollinated species that sets much fertile seed (Dines, 2002). Seedlings attain a height of 3 cm in their first year, with 4-6 true leaves, and the plant is also capable of vegetative spread through layering of shoots and growth from rootstocks, the latter measured at 147 years of age in Greenland (Watson-Featherstone, 2000). Like other birch species, mycorrhizal associations are present, though how important these are in small, isolated stands is not known. Leaves of the species are sometimes predated by caterpillars of Northern Eggar *Lasiocampa quercus callunae*.

Unsurprisingly, English populations on the very edge of its British range do not exhibit the extent and vitality of boreal and arctic ones, although the two extant English border populations less than a hundred kilometers further north are significantly larger and more viable than the Teesdale vestige.

In recognition of the lost ecological role of *B. nana* in Britain, the species has become a focus for restoration projects in Scotland, with for example, ex-situ cultivation and replanting in suppressed areas by the conservation charity Trees for Life.

It is interesting to note that further north in the tundra of western Greenland, *B. nana* appears to have reacted positively to warmer winter and spring air temperatures associated with climate change, with increased spread contributing to what is becoming known as the 'greening of the arctic' (see Hollesen *et al.* 2015).



Distribution of *Betula nana* in Great Britain and Ireland.

THREATS

Grazing and burning have been cited as factors in the decline of this plant in Scotland, and may historically have played a role in the diminution of the plant at its southernmost British limit in Teesdale, where perhaps the greatest threat lies in its presence in very small numbers. The recorded history of the plant at Teesdale suggests it has been present in only very small amounts for perhaps two centuries and this, coupled with poor or no flowering, suggests possible inbreeding depression and perhaps the end-point of a decline which, although not possible to profile, is likely to have been continuous for many centuries; subfossil leaf remains show presence in the current location for seven thousand years.

MANAGEMENT

Betula nana can persist and flourish in suitable conditions without the requirement for specific species-driven management. However, extant populations are vulnerable to overgrazing and heather burning, and consequently management should focus on establishing communication with relevant landowners to draw attention to the location of the species and its ecological requirements.

With regard to the outlier English populations, although the same threats apply they are amplified by small population size and fragmentation. It may therefore be a question of preservation rather than conservation for the English localities, with management aimed at protecting individual plants from grazing and burning, and potentially the planting of seedlings/mature plants to bulk up the extant population.

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