# Weed Risk Assessment: *Calluna vulgaris*

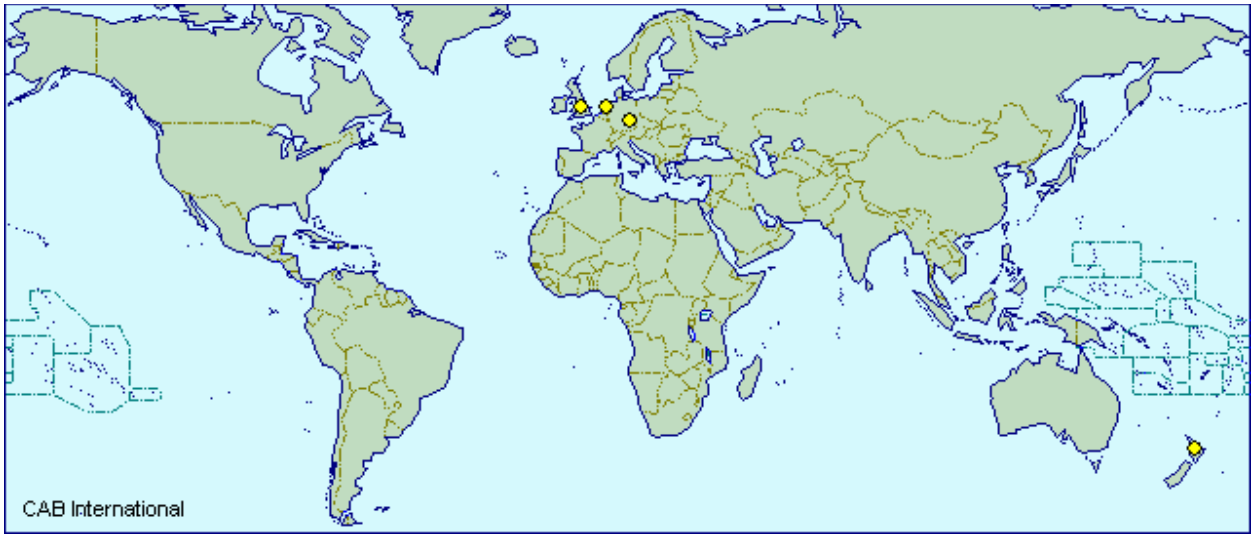
## 1. Plant Details

Taxonomy: *Calluna vulgaris* (L) Hull. Family: Ericaceae. Synonym: *Calluna erica* DC, *Erica vulgaris* L., *Calluna sagittaefolia* S.F.Gray, *Erica vulgaris* Thal.

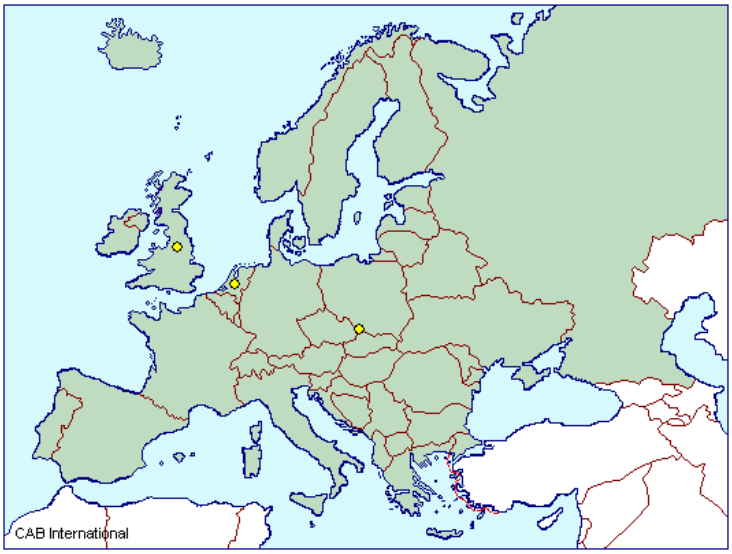
**Common names:** heather, ling, Scotch heather, red- heath, Scots heather, biercol

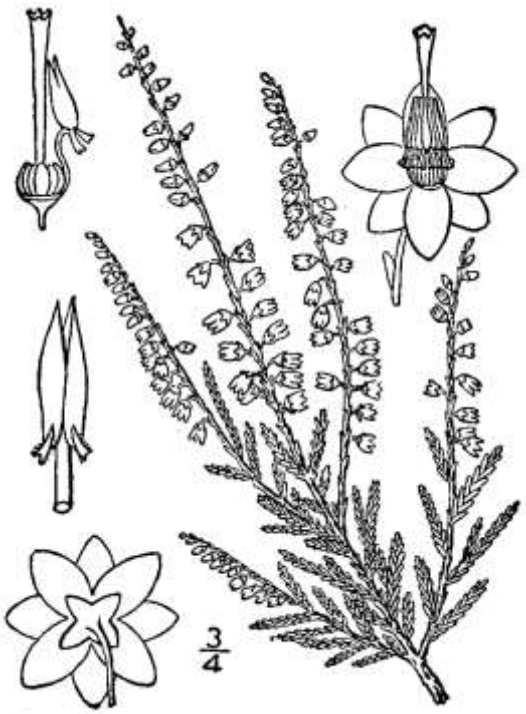
**Origins:** Native to Europe (Denmark, Ireland, Norway, Sweden, United Kingdom, Belgium, Czechoslovakia, Germany, Hungary, Netherlands, Poland, Switzerland, Belarus, Moldova, Russian Federation, Ukraine, Albania, Bulgaria, Greece, Italy, Romania, Yugoslavia, France, Portugal, Spain, Asia- Temperate (Turkey, Altay, Eastern Siberia, Western Siberia), Africa (Morocco, Azores, Madeira Islands) (GRIN database, Syrett, et al., 2000).

**Distribution:** Naturalised in New Zealand, Finland, Canada, western USA, including Alaska, Newfoundland, Michigan, Nova Scotia, New England, West Virginia.




Distribution maps from the Crop Protection Compendium.
Red dots mean widespread in the region.
Yellow dots mean present in the region.
White dots mean present and localised





**Description:** *C. vulgaris* is an evergreen, sclerophyllous perennial that grows to between 0.5 – 1.25 m. Environment determines habit. In some situations it takes on a prostrate form whilst in others it can form a ball-shaped bush or dwarf tree. Stems are ascending, erect or decumbent, round, wiry, woody and pliable and densely hairy when young. Bark is ridged and dark orange to red. Leaves are small, narrowly elliptic to lanceolate initially downy, stalkless and arranged in four overlapping vertical rows with two leaves to each node. Leaves are green and turn brown as the plant matures. Flowers are small, pale purple but also pink or white, bell-shaped with four petals that are separate for the most part but fused at the base to form a short tube. Inflorescence occurs on narrow, leafy stalks up to 90mm long, either terminal or axillary. Fruit is a globose yellowish to orange capsule covered in short white hairs. Seeds are reddish-orange, oblong and less than 1mm. The root system is adventitious, mat –forming and fibrous (Clemants, 1997,CRC Australian Weed Management, 2003).

**Biology and ecology:**

**Habitat.** *C. vulgaris* is well adapted to xeric and nutrient poor conditions. It is also frost hardy and can grow in high-water table situations. It can be found from sea level to nearly 2700m and shows a wide climatic tolerance. It is generally found in conditions of high light and grows poorly in shade. Growth in shade is characterised by lower shoot production, less flowering and reduced production of secondary metabolites. The latter makes the plant more palatable to herbivores (Matthew, 1993). It prefers acidic soils and may be a calcifuge. In New Zealand it thrives on volcanic soils (Roy et al., 1998). It is a component of grasslands, low land and upland heath, moors and bogs, open woodland, sand dunes and partially stabilised scree (Clemants, 1997, Syrett et al., 2000). Generally, *C. vulgaris* is a slow growing successional species that requires fire or disturbance to establish. In the absence of fire it may be replaced by trees. In bog situations it maintains itself without disturbance (Matthews, 1993).

**Life cycle.** *C. vulgaris* germination occurs at any time of the year but mostly in spring and autumn. These are also the main growth seasons during

which new leaves and shoots are produced. Flowers develop during autumn and buds form mid to late winter. As seeds develop, the petals turn brown and shrivel so that the capsule is pulled into an upright position. Plants can produce seeds within two years under favourable conditions (Keys and Syrett, 1995). *C. vulgaris* can live for up to 45 years (Keys and Syrett, 1995, CRC Australian Weed Management, 2003).

Lifecycle can vary according to habitat. In dry heath and moorland environments four distinct phases occur. In the pioneer stage (0-6 years) it grows vertically from the apex. During the building stage (6-14 years) it grows laterally and forms a dense canopy. In the mature phase (14-25 years) lateral growth slows and thinning occurs in the centre of the plant. In the degenerate phase (25 years and over) the central branches collapse, creating a gap. In wet bog communities a phasic lifecycle does not occur. Rather, an uneven age structure of aboveground stems develops due to constant burial of stems by sphagnum moss. The moss grows over the older stems leaving only younger, ascending shoots above ground. The stem population is constantly rejuvenated so that the maximum age rarely exceeds 22 years and a degenerate stage does not occur (Matthews, 1993).

**Reproduction and dispersal.** Reproduction occurs primarily via seeds. Pollination is by various means including bees, other insects or wind. Plants are also self-fertile although some studies suggest self-pollination is less successful than cross-pollination and therefore likely to lead to reduced seed set in nature (Mahy and Jacquemart, 1999). Notwithstanding, mature plants can produce many hundreds of thousands of seeds per year. The proportion of viable seed may decrease with altitude (Keys and Syrett, 1995). Germination requires exposure to light and rates are superior on mineral compared with organic soils (Matthews, 1993). Seeds remain viable for long periods, possibly for over 100 years (Legg et al., 1992). Wind dispersal can carry the small, light seeds many tens to hundreds of metres and there is evidence that spread by running water occurs. People, vehicles, machinery and animals can also spread seeds along roads and walking tracks (Keys and Syrett, 1995).

*C. vulgaris* is also capable of reproducing by stem layering (CRC Australian Weed Management, 2003) and there is some suggestion that root fragments may also give rise to new plants. Damaged stems are able to re-sprout from the base (Keys and Syrett, 1995). Genetic characterisation of *C. vulgaris* in Great Britain demonstrated a lack of clonal dominance within populations and a more varied genetic make-up than might have been expected, given the plant's ability to propagate vegetatively (Meikle et al., 1999).

**Hybridisation.** There is limited information about hybridisation of *C. vulgaris.* It was previously classified as *Erica vulgaris* so the possibility of hybridisation with weedy *Erica* species such as *E. lusitanica* deserves investigation. Hybridisation between *Erica* species is not uncommon.

**Competition.** Mature *C. vulgaris* is highly competitive by virtue of its wide environmental tolerance, high reproductive capacity and ability to form dense canopies that exclude other species. For example, in boreal forest, following

disturbance such as fire or clear felling, *C. vulgaris* may become completely dominant (Norberg et al., 2001). It has also replaced red tussock communities in New Zealand's Tongariro National Park and invades a range of other vegetation types (Keys and Syrett, 1995). A possible mechanism for competition may arise from associations between *C. vulgaris* and ericoid mycorrhiza. One study demonstrated increased reduction in root length of other species grown in proximity to mycorrhizal *C. vulgaris* (Genney et al., 2000). *C. vulgaris* may also release allelopathic compounds that inhibit growth of other plants, particularly trees (Matthews, 1993). In addition, the leaves of *C. vulgaris* have a thick cuticle, thick walled cells, a high content of secondary metabolites (lignin, tannins and phenolic compounds) and form a persistent litter (Webb, 1989). This is thought to be a response to nutrient poor conditions and, because it also increases flammability, may give this species a competitive advantage over others in the event of fire. Indeed, under some circumstances, *C. vulgaris* is favoured by fire which promotes vigorous growth of seedlings and regrowth from old stems (CRC for Australian Weed Management, 2003). Most Western European heaths dominated by *C. vulgaris* were once forested areas. Clear-felling paved the way for heath lands that have been maintained by burning at regular intervals for three to four thousand years (Webb, 1989), principally to maintain habitat for grouse and sheep. However, the response to fire is highly variable and depends on growth phase, habitat and post-fire grazing (Matthews, 1993). The competitive ability of *C. vulgaris* is moderated by grazing. Long-term exclusion of sheep from hill pastures in North Wales resulted in growth of shrubs to full sized bushes that achieved local dominance at some sites, thus demonstrating suppression by grazing (Hill et al., 1992).

**Harmful properties:** None known.

**Economic benefit:** *C. vulgaris* is an extremely useful forage plant for bees and is therefore important to apiarists. In New Zealand for example, honey produced from *C. vulgaris* has four times the value of other honeys (Keys and Syrett, 1995). It is the most important year-long food for rock ptarmigan and grouse in its native distribution in the United Kingdom as well as forming a large proportion of the diet of hill sheep. It also provides essential cover and habitat for a number of game birds (Matthews, 1993). It is used for erosion control and is widely promoted and valued as an ornamental plant. Seed extracts and honey have strong antibacterial properties (Kumarasany et al., 2002, Allen et al., 1991). Extracts have also demonstrated potent anti-inflammatory activity (Tunon et al., 1995) and anti-proliferation effects on certain types of human leukemia (Najid et al., 1992).

## 2. Weed Risk

**World weed status**
*C. vulgaris* is a significant weed in New Zealand and is also naturalised in the United States of America and Canada. In New Zealand it occurs on both islands but is especially problematic in the North Island's Tongariro National Park World Heritage Area. Introduced in 1912, it has the terrible distinction of having become the most widespread and invasive weed in the park. It is the dominant cover in around 1000 ha and is present in another 25 000ha (Keys and Syrett, 1995). It appears to be spreading at an accelerating rate along roads, walking tracks and rivers. The potential for biological control of this plant in New Zealand has been investigated since the late 1980s (Syrett, 1995) but the beetle predator released for this purpose in 1996 has had minimal impact (CRC Australian Weed Management, 2003).

In some areas of its native distribution *C. vulgaris* is considered vulnerable to climatic change and high atmospheric decomposition of nutrients. The latter, for example, has led to higher nitrogen

levels in leaves which in turn has caused increases in insect attack which, if sufficiently severe, can lead to breaks in the canopy and subsequent expansion of grasses (Ladekarl et al., 2001).

**Australian weed status**

*C. vulgaris* is thought to be naturalised in Tasmania but its status in this respect requires verification. It is not regulated in any state or territory. However it is listed on the Australian Government's *Alert List of Environmental Weeds* and as such is marked for eradication and due to be prohibited import to Australia (CRC Weed Management, 2003). Groves et al. (2003) list it as a minor problem in three or fewer areas and note it has potential to spread to New South Wales, Victoria.

**Weed potential in Tasmania.**

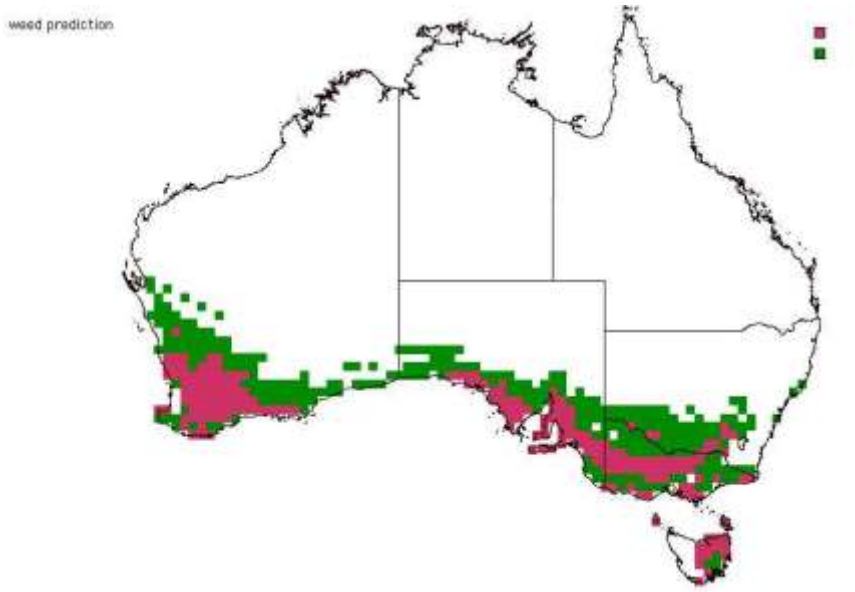
The naturalisation status of *C. vulagris* in Tasmania at this time requires verification.

Climate analysis indicates the plant may grow well in several upland and lowland areas of Tasmania. The following analyses describe the weed potential of *C. vulgaris* in Tasmania.

**Weed risk assessment**

Weed risk assessment undertaken by DPIWE involves use of a point scoring system devised by Pheloung (1995). *C. vulgaris* scores 23 on a scale that is positively correlated to weediness. The nominal score for rejection of a plant on this scale is 7 or greater (see Appendix 1 for risk assessment scoring).

Potential distribution of *Calluna vulgaris* in Australia using CLIMATE (Pheloung, 1995)




## 3. Weed Impact Assessment

Weed impact assessment is based on the DPIWE scoring system designed for that purpose. *C. vulgaris* scores 6 points on a scale where 4 points or more indicates a plant has significant potential impact. The impact scoring system requires that questions be answered with a particular land use

and density in mind. *C. vulgaris* was assessed for its potential impacts upon natural environments at moderate densities.

**Economic impact.** The economic impact of *C. vulgaris* in Tasmania is mostly relevant to natural areas and roadsides, where its establishment would lead to greater cost burdens associated with control and removal. It may also have some impact on eco-tourism values. Whilst unlikely to invade cultivated land or well-managed pasture, incursions in unimproved pasture may also lead to reduced profit (CRC Weed Management, 2003).

**Environmental impact:** *C. vulgaris* is has potential to be a significant environmental weed in Tasmania and may invade a variety of communities in lowland and upland areas, especially after disturbance or fire. It has shown potential to transform tussock communities and to invade a variety of other vegetation types, including native heaths, grasslands or grassy and shrubby understoreys in open forest. Each of these vegetation types exists in Tasmania and some are particularly vulnerable. In addition, the plant can be expected to change fire regimes in natural ecosystems by altering the nature of fuel loads. It may also provide harbour for pest animals such as rabbits.

**Social impact.** *C. vulgaris* is unlikely to have serious social impacts in Tasmania although infestations in natural areas will also compromise cultural values and may reduce access. This is highly undesirable.

## 4. Management Feasibility.

Management feasibility in Tasmania cannot be assessed until the naturalisation status of the plant is confirmed. If the plant is present in Tasmania and its distribution is limited, eradication is highly feasible provided a permit for the appropriate herbicide is arranged and resources are directed towards long-term monitoring of seed banks. However, maintaining freedom from *C. vulgaris* is also highly dependent upon effective import prohibition, early detection and reporting of any occurrences and, concerted community and industry education. In particular, a well-timed surveillance plan undertaken by a suitably skilled person(s) is required since the plant can be difficult to identify during non-flowering periods. At present, the extent of its presence in gardens is not known.

## 5. Declaration Recommendation.

*C. vulgaris* appears to have potential to establish and cause environmental harm in a range of native vegetation communities in Tasmania. It may also become a weed of unimproved pastures and roadsides. Therefore it should be nominated for declaration under the *Weed Management Act 1999*. This will support removal of the plant from trade and timely eradication of any incursions. It will also support national efforts to eradicate and minimise the occurrence and impact of this plant.

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