

Honey locust

Gleditsia triacanthos



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Summary

Gleditsia triacanthos (*G. triacanthos*) is a deciduous, thorny tree native to North America. It was introduced to Queensland in 1907 to provide shade, cattle fodder and ornament. By 1993 it was a serious pest in riparian and floodplain habitats across more than 25 000 ha in the Brisbane Valley and Darling Downs. In some places it had formed extensive pure stands that competed with pastures and native plants. A large proportion of plants were destroyed during a concerted eradication campaign in 1993–94. Scattered plants and individual ornamental specimens remain.

This pest risk assessment presents evidence that *G. triacanthos* poses a significant threat to pasture production, remnant native vegetation and human safety in parts of southern Queensland. It also provides justification for ongoing control.

G. triacanthos has several attributes that contribute to its high pest risk status:

- a proven history as a highly invasive pest in parts of Queensland, New South Wales and Argentina
- climatic adaptation to coastal and subcoastal southern Queensland
- high fecundity and multiple seed dispersal vectors
- a history as a pest within its native range.

Several varieties have been developed as garden ornamentals. However, all have the potential to quickly revert to the wild genotype and, as such, pose a high risk.

Preferred habitats of *G. triacanthos* include fertile floodplains and riparian areas in subtropical to warm temperate areas where annual rainfall is between 500 mm and 1500 mm. Its reproduction is generally from seeds, which are produced in large numbers and remain viable for up to 20 years.

Introduction

Identity and taxonomy

Species: *Gleditsia triacanthos* L.

Common names: honey locust, honey locust tree, McConnel's curse, bean tree, sweet locust, soetpeul, thorn tree honey locust, common honey locust, honey shuck, sweet bean locust.

Family: Fabaceae (Caesalpiaceae)

Cultivars: A number of ornamental varieties have been developed, including 'Christie', 'Elegantissima', 'Emerald cascade', 'Halka', 'Imperial', 'Impercole', 'Inermis', 'Limegold', 'Majestic', 'Mirando', 'Moraine', 'Rubylace', 'Shademaster', 'Skycole', 'Skyline', 'Spectrum', 'Summerlace', 'Sunburst', 'Suncole', and 'Trueshade' (Biosecurity Queensland 2007).

Related species: *Gleditsia* comprises about 14 species. Most are typically deciduous, thorny trees native to the warm temperate and tropical regions of the world (Alden 1994), including Asia and North America.

Description

G. triacanthos is a deciduous tree, often reaching 25 m tall (see Figure 1).



Figure 1. *G. triacanthos* (Photo: Biosecurity Queensland).

Its branches and trunk are armed with long, strong spines (thorns) up to 15 cm long (see Figure 2). Its leaves are up to 20 cm long and are pinnate or bipinnate, with 5 to 30 pairs of leaflets (see Figure 3). Its roots do not have rhizobium nodules, unlike other Fabaceae. Its flowers are arranged in axillary racemes up to 10 cm long. The species is subdioecious—most specimens have either male or female flowers, although bisexual types are known. The flowers are greenish-yellow, generally inconspicuous and strongly scented. They have sepals up to 4 mm long, petals up to 6 mm long and 5 to 7 stamens per flower. The pods are slightly sickle-shaped and up to 45 cm long. Each pod contains between 15 and 30 seeds, which are surrounded by a sweet pulp. The seeds are flattened, ovoid, brown and about 10 mm long (National Academy of Sciences 1983; PlantNET 2009; Sullivan 1994; Weeds Australia 2010).



Figure 2. Thorns of *G. triacanthos* (Photo: Biosecurity Queensland).



Figure 3. Leaves and seed pods of *G. triacanthos* (Photo: Biosecurity Queensland).

Ornamental cultivars generally have brightly coloured foliage (see Figure 4), and many are largely devoid of spines. However, these cultivars sometimes produce thorns as they age and often produce thorny progeny (Biosecurity Queensland 2007).



Figure 4. An ornamental cultivar of *G. triacanthos* (Photo: Biosecurity Queensland).

Reproduction and dispersal

Reproduction is via seeds. Flowering occurs in October and November; it starts between 3 and 5 years of age. Most seeds fall beneath the parent tree. However, seeds can be dispersed over considerable distances by cattle and horses or by flowing water, because the pods float (Schnabel et al. 1991; Wikipedia 2009). The seed pods remain on the tree through winter (Biosecurity Queensland 2007).

The seeds have hard, impenetrable coats and can remain viable for at least 20 years (Biosecurity Queensland 2007). Germination is enhanced when seeds pass through an animal's digestive system. Seeds are usually produced annually, with large crops occurring every 2 years (Sullivan 1994; Weeds Australia 2010). Production rates of up to 14 000 seeds per annum have been recorded (Marco and Páez 2000).

Suckers are produced when the roots are damaged or the plant is cut down.

G. triacanthos can live for over 100 years.

Origin and distribution

G. triacanthos is native to eastern and central North America (Weeds Australia 2010). It is found in the area from central Pennsylvania westward to south-eastern South Dakota, south to central and south-eastern Texas, east to southern Alabama, then north-easterly through Alabama to western Maryland. Outlying populations exist in north-western Florida, west Texas and western central Oklahoma. It is abundant in floodplains associated with the Ohio River and the Mississippi River in the Central Plains region (Skerman 1977) and along stream banks and valleys in southern Indiana and Illinois (Sargent 1965).

In North America, *G. triacanthos* has naturalised east to the Appalachian Mountains from South Carolina north to Pennsylvania, New York, New England and Nova Scotia, Canada (Blair undated; National Academy of Sciences 1983).

G. triacanthos has been introduced to parts of Africa, Europe, the Middle East, Central Asia, Russia, India, China, Argentina, New Zealand and Australia (International Legume Database and Information Service 2009; Global Biodiversity Information Facility undated).

Preferred habitat

G. triacanthos grows best in disturbed sites in full sun, such as gaps in a forest, forest edges and areas disturbed by floods. Its growth is much slower in shade (Sullivan 1994). Its preferred habitat is moist, fertile (alluvial) soil associated with floodplains and the banks of watercourses (Csurhes and Kriticos 1994; National Academy of Sciences 1980). It is well adapted to tolerate flooding (Sullivan 1994). Throughout the Midwest in the United States, it occurs in pastures and old fields. It often coexists with *Maclura pomifera* (Osage orange) in woodlands and early successions (Schnabel et al. 1991; Schnabel and Hamrick 1990).

G. triacanthos prefers a warm temperate climate. The plant is also well adapted to very cold winters where temperatures drop to -34°C , as in the northern part of its native range (Blair undated). Annual precipitation across its native range is between 500 mm and 1500 mm (National Academy of Sciences 1983).

G. triacanthos is easily damaged by fire, but usually resprouts after fire (Sullivan 1994).

History as a weed

Overseas

G. triacanthos is a major pest in Argentina, where it has invaded pampas grasslands as well as riparian zones, roadsides and gaps that are created for cattle grazing (Ghera et al. 2002; Speroni and de Viana 2001). It has become a common invader of the montane forests of central Argentina, and is replacing the native dominant species *Lithraea ternifolia*. It is considered to have high pest potential due to its fast growth, short juvenile period and high seed production (Marco and Páez 2000).

In California, *G. triacanthos* has invaded forests in the Cosumnes River Preserve (California Invasive Plant Council 2005).

In parts of its native range it has invaded pastures and is considered a pest (Sullivan 1994). Sargent (1965) reported that it ‘occasionally covers considerable areas on moist fertile soils, excluding most other species’. It is also listed as a weed in parts of Europe, South Africa and Chile (Holm et al. 1991; Wells et al. 1986; National Academy of Sciences 1980).

Introduction into Australia

G. triacanthos was first introduced into Australia in the mid 1800s when William Macarthur planted it at ‘Camden Park’ at Camden in New South Wales.

In Queensland, it was planted in 1907 as a fodder and ornamental tree.

G. triacanthos was first reported as a pest in 1955 at Cressbrook Creek near Esk, south-eastern Queensland (Biosecurity Queensland 2007).

Current distribution and impact in Australia

Until 1993, extensive populations of *G. triacanthos* existed on the southern and eastern Darling Downs in the Clifton–Allora area and in the Brisbane Valley around Toogoolawah and Esk. Smaller populations were scattered elsewhere, mainly in coastal southern Queensland. At some sites, dense stands of *G. triacanthos* had dominated riparian areas, blocking access to water and competing with improved pastures and remnant native vegetation (see Figures 5 and 6). There was considerable concern that *G. triacanthos* was spreading away from creek banks and out over adjacent floodplain pasture, potentially reducing grazing productivity.



Figure 5. Dense thicket of *G. triacanthos* growing within improved pasture in south-eastern Queensland in 1992, just prior to an eradication campaign (Photo: Biosecurity Queensland).



Figure 6. Dense thicket of *G. triacanthos* surrounding a dead native Queensland blue gum (*Eucalyptus tereticornis*) along the Brisbane River near Esk in 1992, just prior to an eradication campaign (Photo: Biosecurity Queensland).

In 1993–94, the majority of specimens were destroyed in a \$400 000 eradication campaign undertaken by local governments working in partnership with the Queensland Government (see Figures 7, 8 and 9). Most of the funding was provided under SWEEP (Strategic Weed Eradication and Education Program), a short-term state initiative (Csurhes 2004).



Figure 7. Basal-bark application of herbicide to *G. triacanthos* (Photo: Biosecurity Queensland).



Figure 8. Dying *G. triacanthos* in the Warwick region in 1993–94, soon after herbicide application—some locals thought ‘winter had come early’ (Photo: Biosecurity Queensland).



Figure 9. Inspecting dead *G. triacanthos* in south-eastern Queensland in 1993–94 (Photo: Biosecurity Queensland).

Currently, the plant exists as isolated, generally young specimens scattered across its former range (see Figure 10). Ornamental specimens remain in gardens, especially in Toowoomba and Stanthorpe.

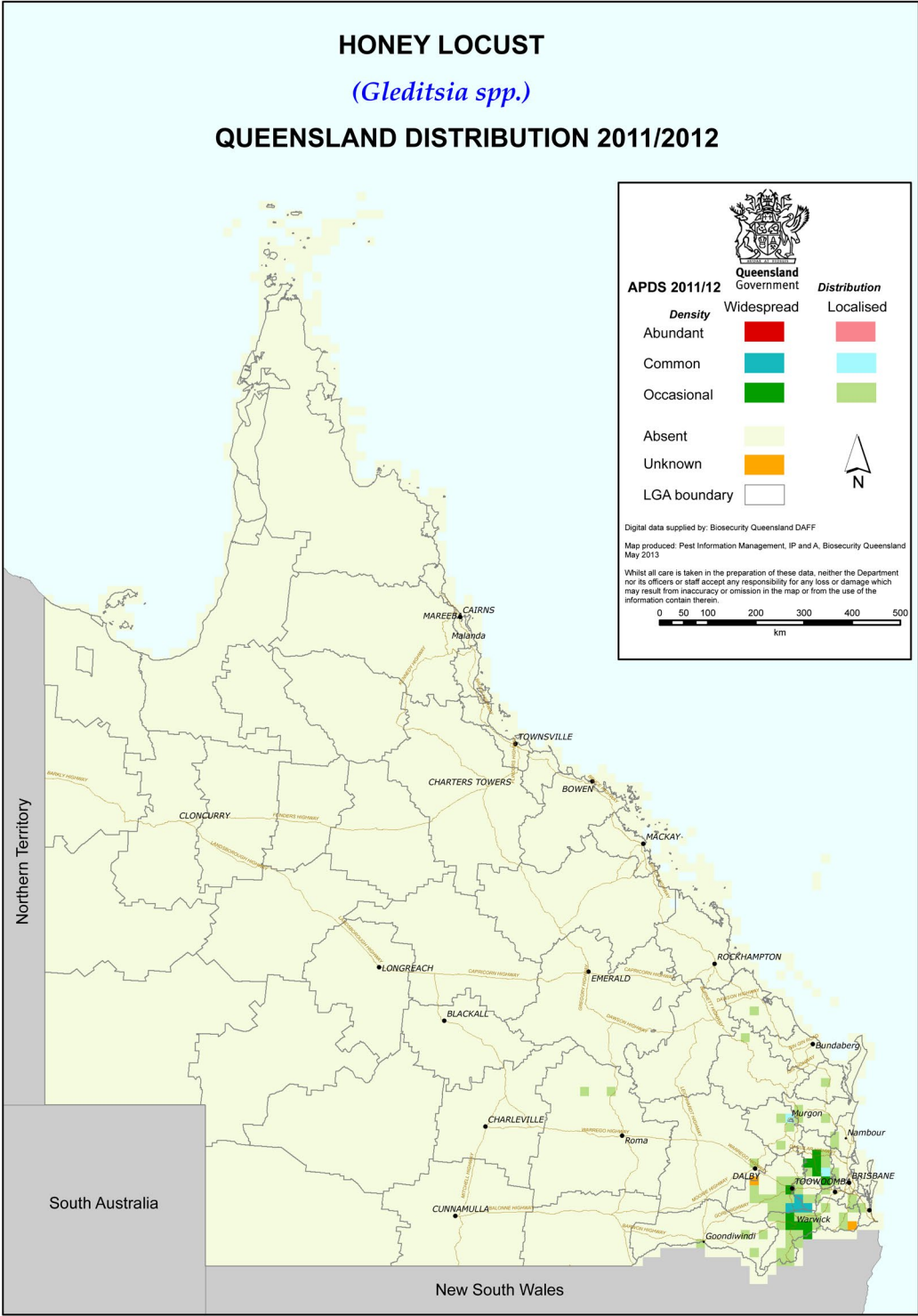
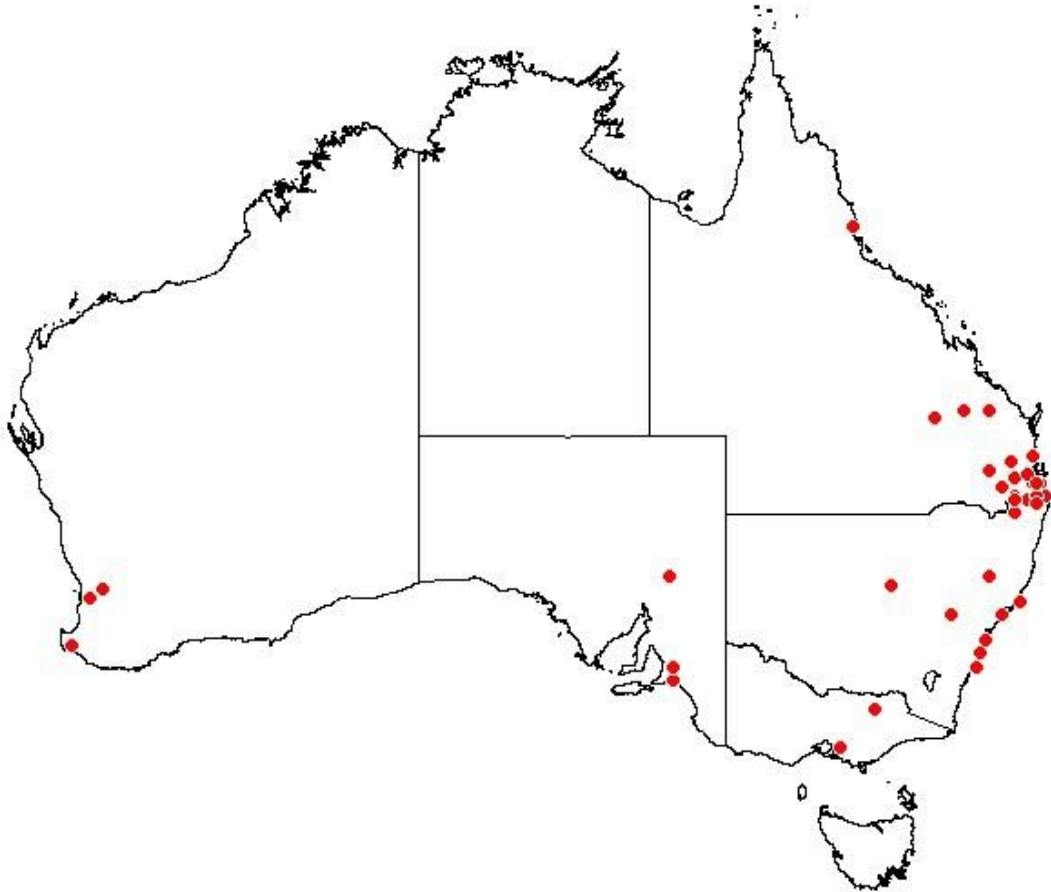


Figure 10. Distribution of *G. triacanthos* in Queensland.

In New South Wales, *G. triacanthos* has formed extensive stands along watercourses on the central coast, western slopes and northern tablelands. It is widespread on the floodplain of the Hawkesbury–Nepean river system (Weeds Australia 2010).

G. triacanthos also exists around Perth (FloraBase 2010), as well as in a few areas in Victoria and South Australia (see Figure 11).



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Figure 11. Distribution of *G. triacanthos* in Australia (Source: Australia's Virtual Herbarium 2010).

Uses

Cultivars of *G. triacanthos* are popular as garden ornamentals. The species is also planted as a windbreak, as a hedge, or to provide high-nutrition fodder for livestock. Its pods are rich in sugar and are enjoyed by people and livestock. The wood is soft but can be used for furniture (National Academy of Sciences 1983; PlantNET 2009; Wikipedia 2009).

Pest potential in Queensland

Climate-matching software (Bureau of Rural Sciences 2009) was applied to predict areas of Queensland where climate is similar to that experienced across the native range of *G. triacanthos* (in the Midwestern region of the United States). Much of coastal southern Queensland appears suitable, as does the Murray–Darling region further south (see Figure 12).

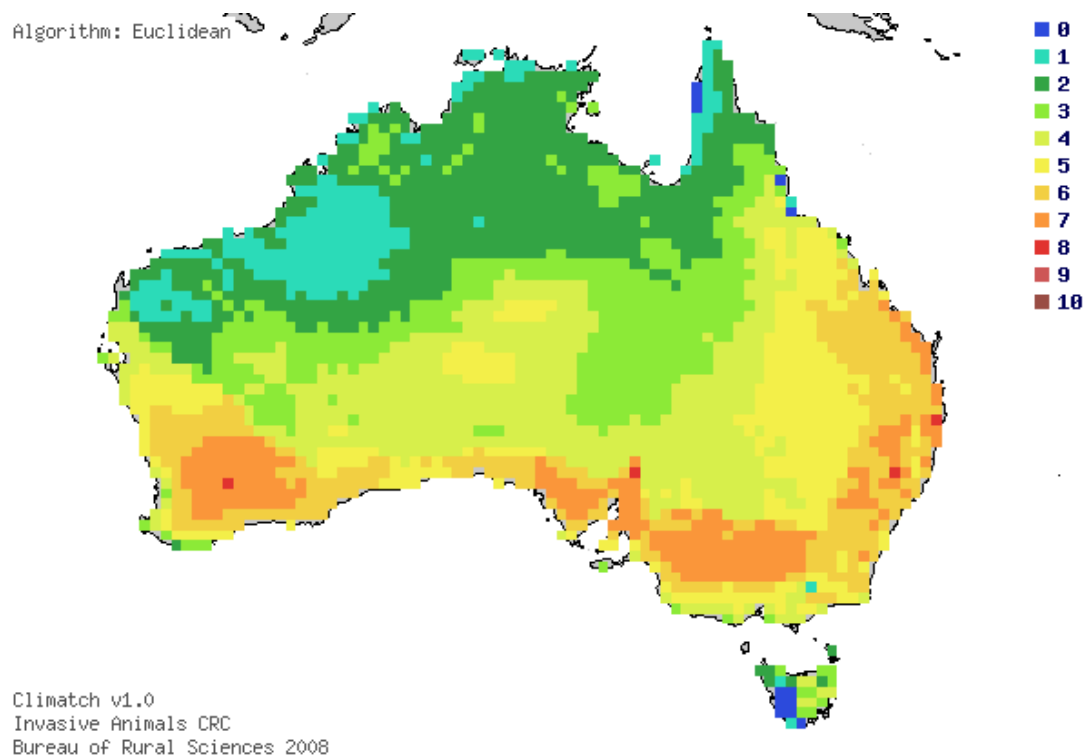


Figure 12. Areas of Australia where the climate appears suitable for survival of *G. triacanthos*: red and dark orange indicate areas where the climate is highly suitable; light orange and yellow indicate areas where the climate is marginally suitable; green, blue and white indicate areas where the climate is considered unsuitable.

G. triacanthos would become a significant problem in Queensland if eradication efforts were relaxed. Experience prior to 1993 provides clear evidence of its potential impact. Habitats at risk of invasion include riparian areas and floodplains across much of coastal southern Queensland. Potential impacts include loss of native riparian vegetation, loss of floodplain pastures and injury to livestock and people caused by the plant's large thorns.

Other congeners, especially *G. sinensis*, *G. texana* and *G. caspica* (also known as *G. melanacantha*), also have significant pest potential. *G. caspica* has formed 'thick impenetrable groves' in the former USSR (Safarov 1960, cited in Paclt 1982).

G. triacanthos can hybridise with *G. caspica* (Santamour 1976). *G. texana* may be a natural hybrid between *G. triacanthos* and *G. aquatica* (Schnabel and Hamrick 1990).

Control

Using a predictive model called WeedSearch, the cost of eradication from south-eastern Queensland was estimated at \$10 million over 39 years (Csurhes et al. 2009). This prediction assumes that a total area of around 25 000 ha will be searched methodically each year.

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