Corangamite Region Guidelines

Acacia mearnsii
Black Wattle

TAXONOMY

Division	Angiosperm (flowering plant)
Subclass	Dicotyledonae (dicotyledon)
Family	MIMOSACEAE

Taxonomic Identification Number 12121 (ANH et al 2006)

Previous Taxonomic Names
Racosperma mearnsii (E.A.J. De Wilderman 1925) (ANH et al 2006).

Taxonomic Status
Short-medium lived woody perennial.

Common Names
Black Wattle, Green Wattle, Late Black Wattle (ANBG n.d.)

MORPHOLOGY
Spreading tree to 15 m high Bark smooth and greenish-brown on young branches, blackish and rough on trunk. Young branchlets downy.
Leaves bipinnate, olive green in colour, fern-like, with a raised gland at the junction of each pinna pair and additional glands irregularly spaced between successive pairs.
8-25 pairs of pinnae, each with 30-70 pinnules (leaflets) of 1-5 mm in length.
Inflorescence globular with 20-30 tiny flowers. Pale yellow in colour.
Pod more or less straight, 5-10 cm long, 5-8 mm wide and strongly constricted between seeds. Dark brown to black in colour (Walsh & Entwisle 1996).

Considered very fast growing and relatively short-lived, averaging 10-15 years. Large, older specimens do exist (20m high, 45cm in diameter), and are documented in early records, but such individuals are now rare (Searle 1997).

SUBSPECIES
None

HYBRIDS
Hybridises with other bipinnate acacias (Searle 1997) including the introduced *A. baileyana* (Cootamundra Wattle), *A. decurrens* (Early Black Wattle) (Moffett 1965), and *A. parramattensis* (Searle 1997).
Also hybridises with *A. dealbata* (Silver Wattle), although different flowering times usually prevent this in a natural setting (Searle 1997).

SIMILAR SPECIES
- ***Acacia dealbata*** (Silver Wattle) - *A. mearnsii* has darker, green, non-silvery foliage and the position of the glands on the foliage are different. *A. dealbata* only has glands at the base of the pinnae. *A. dealbata* generally flowers earlier than *A. mearnsii* (Gowers 1990).
- ***Acacia decurrens*** (Early Black Wattle) - An introduced species from NSW considered an environmental weed in Victoria. *A. decurrens* branches are angled and its dark green foliage has well separated pinnules (Gowers 1990).

GEOGRAPHIC RANGE
Found throughout southern Victoria where it widespread and common in lowlands, in open forest, heathy woodland and on cleared land, particularly on dry, shallow soils (Walsh & Entwisle 1996). Also NSW, TAS and SA (Jovanovic 2002).

Throughout Victoria in grasslands and grassy woodland on the Southern Tablelands, Western and Gippsland plains.

BIOREGIONS

Central Victorian Uplands	Otway Plain	Otway Ranges
Warrnambool Plain	Victorian Volcanic Plain	

PLANT COMMUNITIES

Grows in open forest, woodland or tussock grassland, in gullies or on hillsides, in sandy or gravely clay soils (Maslin, B.R., et al. in Orchard, A.E. & Wilson, A.J.G. (Ed) (2001), *Flora of Australia* 11A: 238).

In Corangamite, it is found in grasslands and grassy woodland and forest ecosystems.

FRAGMENTATION

Recent fragmentation (< 200 years).

The natural distribution of *A. mearnsii* coincided with the regions of earliest European settlement in Australia, and which today, have the highest population densities. Accordingly, *A. mearnsii*'s range has been much reduced (Searle 1997).

Due to the increased use of *A. mearnsii* for roadside, farm and ornamental plantings, natural populations are becoming increasingly difficult to identify, with more recent plantings often of unknown origin. The mixing of provenances is altering the genetic integrity of natural stands, and the planting of other bipinnate acacias together with, or near, natural stands is leading to an increase in hybridisation (Searle 1997).

POPULATION DENSITY

Unknown

Important food source for the sugar glider and Leadbeaters possum, which rely on *A. mearnsii* gum during the winter months (Smith 1982; Smith 1984), and a study site in Rosedale in Gippsland found there was a direct correlation between sugar glider populations and *A. mearnsii* density (Smith 1982).

RELEVANT HISTORY & RESEARCH

Tanning was one of the first manufacturing industries in Australia, and early settlers recognised that *A. mearnsii* was a rich source of tannin. *A. mearnsii* was commercially harvested for tannin from the early settlement through to the 1970s, particularly during times of high unemployment and the period of high immigration after World War II. In 1997, South Africa was the world's largest supplier of *A. mearnsii* tannin, and the adhesive and leather industries in Australia, the largest users (Searle 1997).

Searle and Bell's (1997) study into *A. mearnsii* genetic diversity trialled 19 populations across *A. mearnsii*'s natural range, sampling between 4-10 trees from each location. Of these, five were Victorian populations, although only one of these was located in Corangamite (Lorne, sample size of 4 mother trees). The study found that there is a very low level of inbreeding in the population, and an average of 89% genetic diversity contained within each *A. mearnsii* population tested.

Numerous other studies (see below) have shown there are differences in characteristics between populations (eg. frost tolerance, seedling morphology, growth rate, bark thickness, tree form etc.), but these did not correlate along geographic lines. The moderately low level of differentiation between populations shows no strong clustering into geographic regions (Searle et al 2000). Searle and colleagues (2000) suggested the reason for this may be that because *A. mearnsii* is a pioneer species and populations are easily established in disturbed areas (eg. roadsides), seed could have been moved inadvertently over the past 100 years. They also posed the possibility that *A. mearnsii* seed from Tasmania was brought to Victoria in the early 20th century for use in commercial plantations, although no direct evidence exists to support this other than statements by the Victorian Forestry Commission from the 1920's acclaiming the merits of Tasmanian *A. mearnsii*.

Findings of *A. mearnsii* studies (note that provenance is treated at a much broader scale at the regional level):

- Seedling morphology - divides the Australian mainland populations into two divisions, coastal lowland, and inland, based on leaf shape & pinnule distribution (Bleakley & Matheson 2002).
- Levels of bark tannin - divided populations in non-tropical regions into two division, inland and coastal (Li et al 1994).

- Growth rate & bark thickness - variation found between provenances over *A. mearnsii's* range, but no geographical correlations drawn (Fang et al 1994).
- Frost tolerance - variation found between provenances, with those at higher altitudes generally having higher levels of frost tolerance, although this was not universally true, with two low altitude provenances showing high levels of frost tolerance (Searle et al 1994).

BREEDING SYSTEMS
FLOWERING
Pale yellow flowers held in globular inflorescences from September-November (Walsh & Entwisle 1996), although flowering can be irregular (Bonney 2003). Flowering generally occurs for 8-10 weeks (Moncur et al 1998) and are heavily scented (Gowers 1990).

Flowers are hermaphrodite and stigma becomes receptive after pollen has been released (Moncur et al 1989), although some flowers have little female organ development and are functionally male only (Moncur et al 1991). The proportion of normal hermaphrodite, and 'male' flowers varies from year to year, although studies of a population near Bungendore, NSW have not found a consistent pattern in relation to this (Moncur & Somerville 1989; Moncur et al 1989; Moncur et al 1991; Grant et al 1994).

Grant et al (1994) studied the pollination and breeding systems of an *A. mearnsii* population near Bungendore, NSW over three flowering seasons between 1987-1990. During this time there were two heavy flowering seasons, and one light flowering season. The heavy flowering years had around six times more flowers per raceme (stem). Pollination rates were similar between heavy (16%) and light (14%) flowering years, although during the light flowering year there was a much higher percentage of male flowers, and twice as many hermaphrodite flowers were pollinated.
The study also found that some trees appeared to behave as males, producing a large number of functionally male flowers, and few pods.

POLLEN
Description of pollen yields range from moderate (Creswick provenance workshop, 2004) to abundant, and no nectar is produced (Moncur & Somerville 1989).
Pollen is located within polyads which contain 16 pollen grains. Female flowers have 12-14 ovules, so only a single polyad is required for fertilisation (Moncur et al 1991).
A. mearnsii is considered a valuable pollen source for beekeepers during favourable seasons as it flowers later than most other acacias (Clemson 1985).

POLLINATION
Largely self-incompatible (Moffett & Nixon 1974; Moncur et al 1991; Grant et al 1994).
Estimates of outcrossing in natural populations range between 94-100% (Kenrick & Knox 1989).

Self-pollination causes a decrease in fertility and general vigour and the expression of numerous adverse recessive genes and indicate the species is almost exclusively adapted to out-crossing (Moffett & Nixon 1974).

POLLINATORS
Predominately insect pollinated (Searle 1997), with bees, including the introduced honey bee, of particular importance (Bernhardt 1987; Moncur et al 1991).
Birds are not a major pollinator as *A. mearnsii* does not secrete extra-floral nectar (Bernhardt 1987) although one species of bird, the yellow-rumped thornbill, has been recorded as an effective pollinator (Moncur et al 1991).
There may be some wind pollination, with Moncur et al (1991) recording pollen movement in medium to strong wind.

Moncur and Somerville (1989) found that the introduction of 12 bee hives accommodating approximately 400,000 bees did not appear to significantly effect on the number of stigmas pollinated, or the number of pods set in the *A. mearnsii* study population, and in one season actually slightly reduced pod set. The number of pods initiated significantly increased with the introduction of bees, but the number of pods not reaching full maturity also rose. Without bees, 98.3% of pods initiated matured, while in the two seasons of the study when bees were introduced only 13.3% and 22.3% of pods initiated matured (Moncur & Somerville 1989), indicating that the presence of large numbers of bees may affect more self-pollination (Grant et al 1994).

SEED

SEED DESCRIPTION

Pods 5-10cm long, 5-8mm wide, and strongly constricted between seeds. Seeds, black, 2-3mm in length (Walsh & Entwisle 1996).
70-89 seeds/gram (GAV n.d.)
46-82 germinants/gram (GAV n.d.)
70.4 germinants/gram at 25°C (Gunn 2001).
Seed can persist in soil bank for 60 years (Gowers 1990).

SEED CROP

Seed takes 12-14 months to develop and can generally be collected from December-March, although seed production and timing of seed maturity is irregular, varying at a population and tree level (Searle 1997).
Seed set is low considering the vast number of flowers produce (Moncur et al 1991), although some trees within a population may consistently produce more seed (Grant et al 1994).
Seed is often heavily damaged by insect and fungal attack due to the long maturation period (Searle 1997).

SEED DISPERSAL

Seed is primarily dispersed by gravity and ant activity. Parrots are often observed feeding on seed and probably also play a role as seed dispersers (Searle 1997).

EXTRACTION & STORAGE

Seed needs to be separated from its pod. This can be achieved by placing on a tarp in direct sunlight (Ralph 1994), or rubbing pods over a sieve.
Stored at 18-22°C, A. mearnsii recorded an 88% germination rate after 5 years, and 83% after 10 years (Gunn 2001).

PROPAGATION

Propagate from scarified or heat-treated seed. For tube stock production, sow seed in autumn for spring planting, or sow late spring-autumn for winter planting (Bonney 2003).

The number of insect species which feed on *A. mearnsii* rises rapidly in the first few years of a plants life, but tends to decrease with age (Searle 1997).

TREATMENT OPTIONS

Seed needs to be scarified or heat treated to break dormancy.
For heat treatment pour very hot water to boiling water over seeds and soak overnight (Cavanagh 1987; Bonney 2003). Seed that floats is not viable.
Seed needs to be washed well to remove glue material before drying (Bonney 2003).
Smoke treatment has improved germination with some *Acacia* species (Ralph 2003).
Root nodules formed from symbiotic relationships with soil *Rhizobium* and/or *Bradyhizobium* soil bacteria are commonly found on *A. mearnsii* (Searle 1997).

GERMINATION TIME

Acacia seed usually germinates in 3-10 weeks and seedlings are generally fast growing (Ralph 2003).

FIELD ESTABLISHMENT

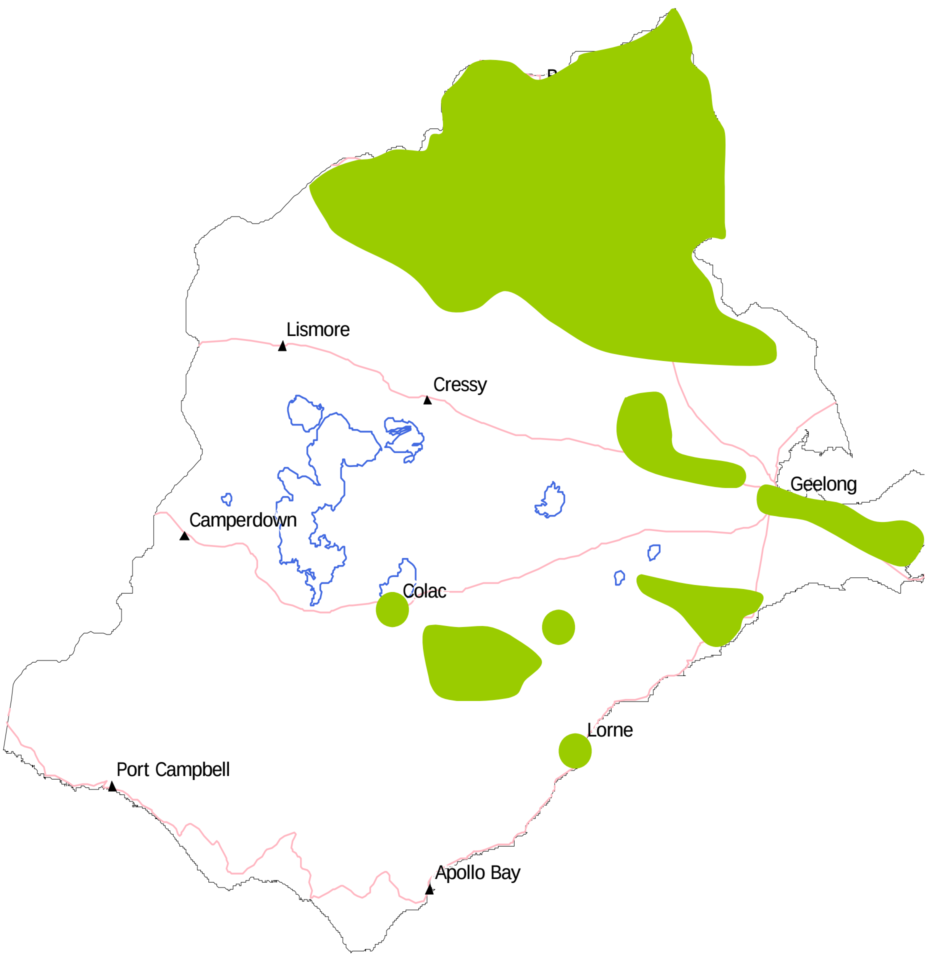
Tube stock (Bonney 2003)
Establishes well from direct seeding (Ralph 1994; Bonney 2003). Sow in spring (Bonney 2003).
Natural regeneration occurs after fire (Gowers 1990) or disturbance (Searle 1997).
Following disturbance *A. mearnsii* seedlings and saplings can dominate a site, but without further disturbance, taller and longer lived eucalypts will supplant them (Searle 1997).

SEED COLLECTION RANGE - *Acacia mearnsii*

Sub-regional collection range - within which, seed can be collected from remnant stands from a very broad range across the Corangamite catchment, not withstanding natural boundaries.

Acacia mearnsii is a colonising species that easily establishes on disturbed sites. Geographical provenance boundaries are considered to be very broad (at a scale greater than the region). The species has a low level of inbreeding and most genetic material sampled through research has shown that populations contain highly similar genetics.

Consideration should be made to collect *A. mearnsii* from populations that are large, healthy and free of wattle hybrids. Collect from at least 30 –60 plants broadly across a population to maintain genetic diversity. There are natural population boundaries between the coast and inland Central Highlands. These geographic and rainfall differences may be expressed in local environmental adaptation by the species.



MAP: *Acacia mearnsii* distribution
DATA SOURCE: DSE Flora Information System May 2005, accessed may 2006.

Acacia mearnsii broad distribution

REFERENCES

ANBG n.d., *Australian plant common name database*, Australian National Botanic Gardens, Dept. of the Environment & Heritage, retrieved 30 Mar 2006, <http://www.anbg.gov.au/common.names/>.

ANH, ANGB & ABRS 2006, *Australian plant name index*, Australian National Herbarium, Australian National Botanic Gardens, Australian Biological Research Study, retrieved 30 Mar 2006, <http://www.anbg.gov.au/cpbr/databases/apni.html>.

Bernhardt, P 1987, 'A comparison of the diversity, density, and foragining behavior of bees and wasps on Australian *Acacia*', *Annals of the Missouri Botanical Garden*, vol.74(1), pp.42-50.

Bleakley, S & Matheson, C 1992, 'Patterns of mophological variation in seedlings of *Acaca mearnsii* De Wild', *Commonwealth Forestry Review*, vol.71(2), pp.101-109.

Bonney, N 2003 (2nd edition), *What seed is that?,* Neville Bonney, Tantanoola, SA.

Cavanagh, T 1987, Germination of Hard-seeded species : mimosoid seeds, *Germination of Australian Plant Seed* (ed PJ Langkamp), Inkata Press, Melbourne, VIC.

Clemson, A 1985, *Honey and pollen flora*, Inkata Press, Melbourne, VIC.

Earl, G, Stelling F, Titcumb, M & Berwick, S (eds) 2001, *Revegetation Guide for the Goulburn Broken Catchment*, Dept. of Natural Resources & Environment, Melbourne, VIC.

Fang, Y, Gao, C, Zheng, F, Ren, H, Li, J, Liu, S & Zhang, Q 1994, 'Field evaluation and selection of *Acacia mearnsii* provenances' in *Australian Tree Species Research in China : proceedings of an international workshop held at Zhangzhou, Fujian Province, PRC, 2-5 November 1992* (ed AG Brown), Australian Centre for Agricultural Research, Canberra, ACT.

Gowers, LJ 1990, *Native trees and shrubs of the Ballarat region*, Dept. of Conservation & Environment, Ballarat, VIC.

Grant, JE, Moran, GF & Moncur, MW 1994, 'Pollination studies and breeding system in *Acacia mearnsii*', in *Australian Tree Species Research in China : proceedings of an international workshop held at Zhangzhou, Fujian Province, China, 2-5 November 1992*, Australian Centre for Internation Agricultural Research, Canberra, ACT.

Greening Australia Victoria (comp.) n.d. *Indigenous plants for North Central Victoria: a revegetation guide*, Dept. of Natural Resources & Environment, Melbourne, VIC.

Gunn, B 2001, *Australian Tree Seed Centre: Operations Manual*, CSIRO Forestry and Forestry Products, Canberra, ACT.

Kenrick, J & Knox, RB 1989, 'Quantitative analysis of self-incompatibility in trees of seven species of *Acacia*', *Journal of Heredity*, vol.80, pp.240-245.

Li, J, Gao, C, Zheng, F & Ren, H 1994, 'Bark quality of *Acacia mearnsii* provenances from different geographic origins growing in south China' in *Australian Tree Species Research in China : proceedings of an international workshop held at Zhangzhou, Fujian Province, PRC, 2-5 November 1992* (ed AG Brown), Australian Centre for Agricultural Research, Canberra, ACT.

Maslin, B.R., et al. in Orchard, A.E. & Wilson, A.J.G. (Ed) (2001), *Flora of Australia* 11A: 238

Moffett, AA & Nixon, KM 1974 'The effects of self-fertilization on green wattle (*Acacia decurrens* Willd.) and black wattle (*Acacia mearnsii* De Wild.)', *South Africa Wattle Institute Report* 1973-1974, pp.66-84.

Moncur, MW, Moran, GF, Boland, DJ & Turner, J 1989, 'Floral morphology and breeding systems of *Acacia mearnsii* De Wild.', paper to workshop, Use of Australian Trees in China, Guangzhou, pp.266-276.

Moncur, MW, Moran, GF & Grant, JE 1991, 'Factors Limiting Seed Production in *Acacia mearnsii'*, in *Adavances in tropical acacia research: proceedings of an international workshop held in Bangkok, Thailand, 11-15 February 1991*, Australian Centre for International Agricultural Research, Canberra, ACT.

Moncur, MW & Somerville, D 1989, 'The use of honey bees for pollen transfer and increased pod set in black wattle (*Acacia mearnsii*), *Australasian Beekeeper*, vol.91, pp.73-89.

Ralph, M 1994 (2nd edition), *Seed collection of Australian native plants: for revegetation, tree planting and direct seeding*, Bushland Horticulture, Fitzroy, VIC.

Ralph, M. 2003 (2nd edition), '*Growing Australian native plants from seed : for revegetation tree planting and direct seeding'*, Bushland Horticulture, Fitzroy, VIC.

Searle, SD, Owen, JV & Snowden, P 1994 'Frost tolerance variation amongst 25 provenances of *Acacia mearnsii*' in *Australian Tree Species Research in China : proceedings of an international workshop held at Zhangzhou, Fujian Province, PRC, 2-5 November 1992* (ed AG Brown), Australian Centre for Agricultural Research, Canberra, ACT.

Searle, SD 1997, '*Acacia mearnsii* De Wild. (Black Wattle) in Australia', in *Black wattle and its*

utilisation, abridged English edition (eds AG Brown & CK Ho) Rural Industries Research & Development Corporation, Canberra, ACT.
Searle, SD, Bell, JC & Moran, GF, 2000, 'Genetic diversity in natural populations of *Acacia mearnsii*', *Australian Journal of Botany*, vol.48, pp.279-286.
Smith, AP 1982, 'Diet and feeding strategies of the marsupial glider in temperate Australia', *Journal of Animal Ecology*, vol.51, pp.149-166.
Smith, AP 1984, 'Diet of Leadbeaters possum, *Gymnobelideus leadbeateri* (Marsupialia)', *Australian Wildlife Research*, vol.11, pp.265-273.
Walsh, NG & Entwisle, TJ (eds) 1996, *Flora of Victoria*, Volume 3, Inkata Press, Melbourne, VIC.

ACKNOWLEDGEMENTS

Information compiled for this note series was a result of extensive literature reviews and plant record searches completed by Lucy Nuttal, with assistance from Michelle Butler, Christine Gartlan and Anne Ovington.

To contribute to or provide feedback on this note, please email the Corangamite Seed Supply and Revegetation Network Coordinators:

Michelle Butler, DPI michelle.butler@dpi.vic.gov.au
Christine Gartlan, GAV christine.gartlan@dpi.vic.gov.au

DISCLAIMER 2006
The authors do not guarantee that the information is without flaw of any kind or wholly appropriate for your purposes and therefore disclaims all liability for any error, loss or consequence which may arise as a result of you relying on this information.