Corangamite Region Guidelines

Banksia marginata
Silver Banksia

TAXONOMY

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

Taxonomic Identification Number 54354 (ANH et al 2006)

Previous Taxonomic Names
Current name has been in use since 1800 (ANH et al 2006).

Taxonomic Status
Long-lived woody perennial.

Common Names
Silver Banksia, Honeysuckle (ANBG n.d.), Warrock (Walsh & Entwisle 1996).

MORPHOLOGY
Shrub or tree up to 12m high, with or without lignotuber.
Bark think, brown, sometimes thick and tessellated on taller trees.
Branchlets hairy. Leaves 1-8 cm long, 3-15 mm wide, dark green on the upper side with lower surface white and hairy.
Seed is held in valve-like follicles within the spike (Walsh & Entwistle 1996).

A diagnostic feature of *Banksia marginata* is the notch on the end of the leaf tips. Most often the leaves are toothed.

Banksia marginata - (left) toothed leaves and (right) notch at end of leaf tip

A very variable species, particularly in relation to form (from tall and bushy to a stunted, sparse shrub), leaf shape, ability to produce suckers, fire tolerance and the presence or absence of a lignotuber (Gowers 1990; Walsh & Entwisle 1996).

SIMILAR SPECIES
There are 75 Banksia species endemic to Australia. Only *B. marginata* and *B. integrifolia* (Coast Banksia) are indigenous to the Corangamite region. Coast Banksia is found on the Bellarine area, near Geelong.

HYBRIDS
Natural hybrids with *B. integrefolia* ssp. *integrefolia* have been recorded in Victoria (ANH et al 2006). Natural hybrids have also been reported with *B. saxicola* in the Grampains (Walsh & Entwisle 1996) and with *B. conferta* ssp. *penicillata* and *B. paludosa* ssp. *astrolux* in NSW (ANH et al 2006).

GEOGRAPHIC RANGE
Was once widespread across southern and north eastern Victoria (Walsh & Entwisle,

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1996). Also ACT, NSW, Qld, SA & TAS.

BIOREGIONS

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

PLANT COMMUNTIES

In Corangamite, Banksia is associated with grasslands, woodlands, coastal heath and scrubs and forest ecosystems.

FRAGMENTATION

Fragmentation is recent, occurring since European settlement.

RELEVANT HISTORY & RESEARCH

Research into gene flow distances is currently (2005-2006) being researched by La Trobe University (Dr John Morgan, pers. comm.).

Blake and Hill's (1996) study into *B. marginata* over a narrow geographical range in Tasmania found a high degree of diversity in relation to frost and drought tolerance. Blake and Hill (1996) suggested this could be indicative of a diverse gene pool within the species.

POPULATION DENSITY

A few known large populations (over 500 plants) of the shrub form, but mostly small stands. The large populations of the Volcanic Plains shrub form are known to sucker, which may dramatically reduce 'effective population size' through single plants suckering (Dr John Morgan, pers. comm.). Small to medium stands of the tree form, mainly less than 100 plants. In Corangamite *B. marginata* is highly fragmented into less than 10 small stands.

BREEDING SYSTEMS

FLOWERING

Inflorescences have up to 1000 flowers that open sequentially over several weeks (Vaughton & Ramsey 1998), mainly between February and July (Walsh & Entwisle 1996), although Gowers (1990) reports that in the Ballarat region flowering time is from September to April.
Yellow, bisexual flowers are arranged in pairs and densely packed in cylindrical cone-like spikes.

Banksia seed

POLLEN

Cream white pollen in medium quantities. Good nectar yields, especially after good autumn rains (Gowers 1990).

POLLINATION

According to Vaughton and Ramsey (1998) *B. marginata* is self compatible, but also outcrosses. Dr John Morgan (pers. comm.) has stated that the species is not self-compatible and this is why outcrossing by honeyeaters is an important pollination mechanism.

Follicle with seed

POLLINATORS

Nectar feeding birds are the major pollinators (Vaughton & Ramsey 1998), with honeyeaters being of particular importance, especially New Holland Honeyeaters (Dr John Morgan pers. comm.).
Other pollinators include bees, insects (Gowers 1990) and small mammals.

Studies have found that the Feathertail glider, Sugar glider, Eastern pygmy-possum, and to a lesser extent, the Brown antechinus and Bush rat, all of which are found in Corangamite utilise *Banksia* nectar and pollen as a food source (Turner 1984; Van Tets & Whelan 1997).

SEED

SEED DESCRIPTION

Seed is black and triangular in shape to 5 mm, with a flat wing to 10 mm attached (Bonney 2003).

Some seed is held in follicles until high temperatures, such as those associated with fire, induce release (Vaughton & Ramsey 1998), while some seed may be released within 3-8 weeks of reaching maturity (Earl et al 2001).
Data relating to the weight and viability of *B. marginata* seeds varies:

- 102 seeds/gram (Hammill et al 1998).
  61-80 seeds/gram (GAV n.d.)102 seeds/gram (Hammill et al 1998).
- 16-25 viable seeds/gram (Ralph 1994)
  96% viability rate from a northern tablelands, NSW provenance, not including the 21% of insect damaged seed found at the site (Williams & Clarke 1997).
- 25-37 germinants/gram (GAV n.d.)
  96% germination rate from a NSW provenance in the laboratory, and 60% germination rate in the field (Williams & Clarke 1997).

SEED CROP
In Corangamite the coastal tree form produces prolific seed, while the basalt tree form varies in quantity. The suckering shrub form doesn't appear to seed very often.

Seed can generally be collected 12 months after flowering (Bonney 2003). Some forms of *B. marginata* retain seed in fruits for many years, and seed can be collected year round (Hammill et al 1998; Bonney 2003)
To test whether seed is ripe, scrape the follicle of the fruit, if hard, dark and woody seed is most likely mature, but if soft and green, it is immature (Ralph 1994).
If seed is cut in half, viable seed will be white and firm, and non-viable seed brownish and brittle or pliable (Ralph 2003).

Williams and Clarke (1997) in their Glen Innes, NSW study found a high proportion (21%) of seed was insect damaged.

SEED DISPERSAL
Wind is a major disperser of seed, with height of seed drop and wind speed the significant factors determining the distance of dispersal (Hammill et al 1998).
Secondary dispersal was found to occur through seeds being blown along the ground (Hammill et al 1998).
Studies of post-fire sites in Sydney, NSW found patterns of seed dispersal indicating that seed dispersal generally occurs close to parent plants rather than over large distances, and is rarely any greater than 40 metres (Hammill et al 1998).
Ants and birds may also play a role as seed dispersers (Gowers 1990).

EXTRACTION & STORAGE
Fruits may need to be heat treated to induce seed release (Williams & Clarke 1997; Bonney 2003; ANBG 2004). This can be done by placing in a warm to hot place, for example a plastic igloo (Bonney 2003), or by heating fruit in an oven at between 120°-140°C for around one hour (ANBG 2004).
A small hole in the woody fruit is usually a sign of insect damage (ANBG 2004).
Seed loses viability quickly after extraction from cone (Ralph 1994; Ralph 2003).
Ensure that the woody separators that hold the seed in the follicle aren't confused with the seed itself (Bonney 2003).

PROPAGATION
Propagate from fresh seed, as seed loses viability quickly after extraction from cone (Ralph 1994; Ralph 2003). Sow just beneath the soil from winter to spring (Bonney 2003).
Germination of seed is inhibited by light (Gowers 1990).
High temperatures at the time of sowing can induce dormancy (Ralph 2003).
Highly sensitive to elevated phosphorous levels (Earl et al 2001) and a slightly acidic (pH6) potting mix is recommended (Ralph 2003).
Seedlings susceptible to fungal damage (Ralph 2003).
Can also be propagated from cuttings of firm young growth (Gowers 1990; Earl et al 2001).

TREATMENT OPTIONS
Stratification for 6-10 weeks is recommended (Fox et al 1987; Ralph 2003).
Soaking seed in water for 8 hours before sowing may improve germination rates (Ralph 2003).
Smoke is also thought to increase germination rates (Ralph 2003.).

Williams and Clarke (1997) studied *B. marginata* from the northern tablelands of NSW and found that seed from this region had no innate dormancy. Untreated seed was found to germinate at a rate of 96% in the laboratory and 60% in the field. They hypothesised that the difference in germination rates between the lab and field was due to seed decomposition or consumption by organisms of buried seeds as they observed little secondary emergence in following seasons.

GERMINATION TIME
Good germination rates can usually be achieved within 2-8 weeks (Ralph 2003).

FIELD ESTABLISHMENT
Tube stock
Direct seeding is successful, but as *B. marginata* is a limited seed resource this is not recommended.
If direct seeding, sow 10 mm below the soil level (Ralph 2003).
Natural regeneration is from seed, particularly after fire, or in some forms from lignotuber (Earl et al 2001).

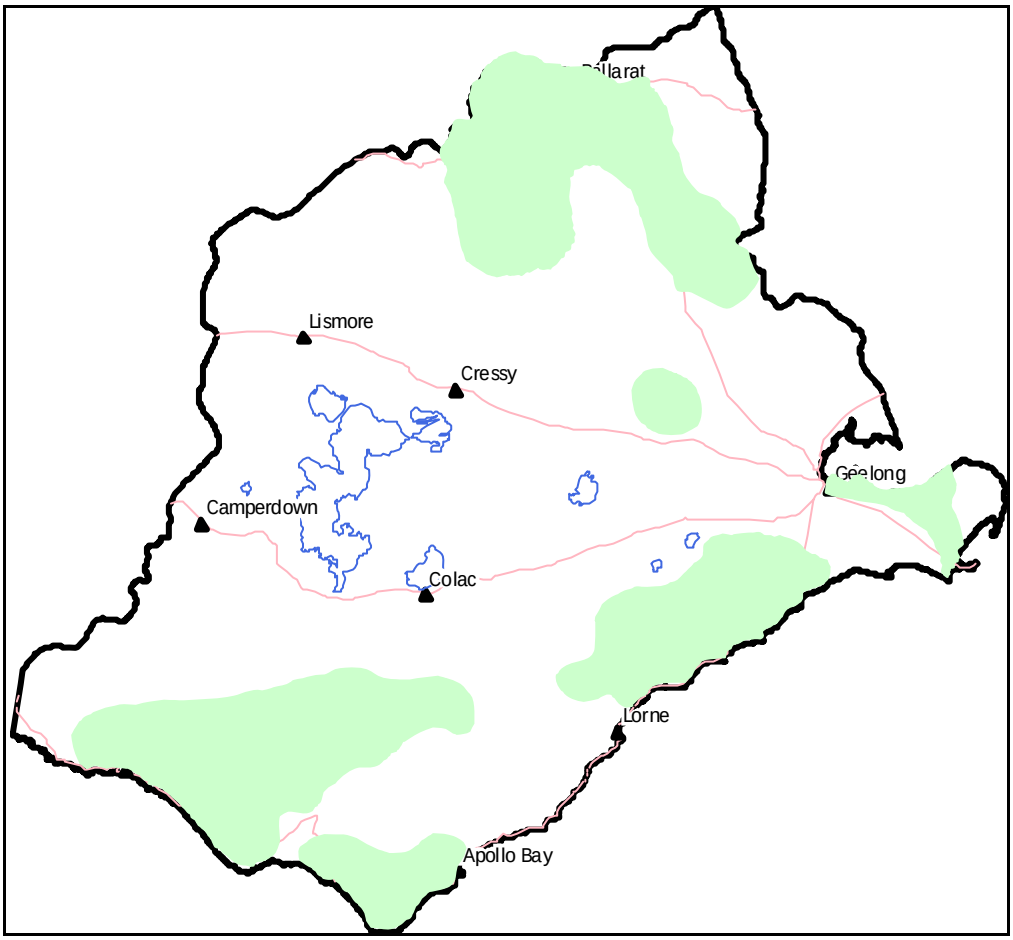
SEED COLLECTION RANGE - *Banksia marginata*

Intermediate - within which, collection can be extended to formally contiguous remnants

Once widespread, Banksia stands are now extremely small. Seed should be sourced and mixed from a wide sample of sites within a formally contiguous population to increase the genetics for revegetation. Collection should focus on providing seed for revegetation projects that will increase the viability of existing remnant stands rather than broad-scale revegetation activities.

Consideration needs to be given to:

- Identifying and separating both tree and shrub forms of *Banksia marginata* and ensuring that plant form is recorded on the field data sheet
- Ensuring collection from a large number of plants over several years as yield is low
- Following ethical seed collection practices which focus on minimal disturbance and ensuring that less than 10% of available seed is collected from a given plant
- Confining collections to within particular bioregions (such as Central Victorian Uplands, Victorian Volcanic Plains)
- Matching soil type of collected seed to a revegetation project soil type
- Separating coastal collection from inland collection as rainfall, topography and soils are significantly different and natural boundaries exist.



MAP*: Banksia marginata* distribution

DATA SOURCE: DSE Flora Information System May 2005, accessed May 2006

Banksia marginata broad distribution

REFERENCES

ANBG n.d., *Australian plant common name database*, Australian National Botanic Gardens, Dept. of Environment & Heritage, retrieved 18 Apr 2006, <http://www.anbg.gov.au/common.names>.

ANBG 2004, *Banksias*, Australian National Botanic Gardens, Dept. of Environment & Heritage, re trieved 18 Apr 2006, <http://www.anbg.gov.au/banksia/index.html>.

ANH, ANGB & ABRS 2006, *Australian plant name index*, Australian National Herbarium, Australian National Botanic Gardens, Australian Biological Research Study, retrieved 18 Apr 2006, <http://www.anbg.gov.au/cpbr/databases/apni.html>.

Blake, J. & Hill, R.S. 1996, 'An examination of the drought and frost tolerance of *Banksia marginata* (Proteaceae) as an explanation of its current widespread occurrence in Tasmania', *Australian Journal of Botany*, vol.44, pp.265-281.

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

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

Fox, J, Dixon, B & Monk, D 1987, Germination in other plant families, in *Germination of Australian Plant Seed* (ed. P.J. Langkamp), Inkata Press.

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

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

Hammill, KA, Bradstock, RA & Allaway, WG 1998, 'Post-fire seed dispersal and species re-establishment in Proteaceous heath', *Australian Journal of Botany*, vol.46, pp.407-419.

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.

Turner, V 1984, '*Eucalyptus* pollen in the diet of the feathertail glider, *Acrobates pygmaeus* (Marsupialia:Burramyidae)', *Australian Wildlife Research*, vol.11, pp.77-81.

Van Tets, IG & Whelan, RJ 1997, '*Banksia* pollen in the diet of Australian mammals', *Ecography*, vol.29, pp.499-505.

Vaughton, G & Ramsey, M 1998 'Sources and consequences of seed mass variation in *Banksia marginata* (Proteaceae)', in *Journal of Ecology*, vol. 86, pp.563-573.

Walsh NG and Entwisle TJ (eds.) 1996, Flora of Victoria, Volume 3, Inkata Press, Melbourne, Vic.

Williams, PR & Clarke, PJ 1997, 'Habitat segregation by serotinous shrubs in heaths : post-fire emergence and seedling survival', *Australian Journal of Botany*, vol.45, pp.31-39.

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