

# REVEGETATION GUIDE

## HAY AND SURROUNDS



MURRUMBIDGEE  
**Landcare**  
INCORPORATED



[mli.org.au](http://mli.org.au)



*Our Mission:  
Through Landcare, promote  
and implement sustainable  
natural resource management  
in the Murrumbidgee  
catchment in order to protect  
and rehabilitate our natural  
environment.*

## WHO WE ARE

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Murrumbidgee Landcare is the umbrella organisation for 28 Landcare groups and hundreds of volunteers across a land area of 84,000 km<sup>2</sup>.

The responsible management of our natural resources has never been more important. And that is the very core of our mission.

Murrumbidgee Landcare Inc is a whole-of-catchment organisation which provides an overarching structure that allows local Landcare groups and volunteers to get on with the work they want to do - repairing, rebuilding and renewing the natural systems and communities in our catchment.

## WHAT WE DO

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We provide whole-of-catchment coordination through regional level vision and leadership. Our strategies are built from the grass-roots level, integrated across our region, and achieved through the dedication of our passionate and experienced staff and volunteers.

We work with farmers, urban Landcarers, schools, businesses, local government, agri-business and conservation groups. Through our work, we share knowledge and skills, build community capacity, promote economic and environmental sustainability, and nurture the next generation of Landcarers.



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## Level to Depressed Plains - Clay soil

### TREES

- *Acacia homalophylla* - Yarran
- *Acacia oswaldii* - Miljee
- *Acacia pendula* - Boree
- *Allocasuarina luehmannii* - Bulloak
- *Eucalyptus largiflorens* - Black Box

### SHRUBS

- *Atriplex nummularia* - Old Man Saltbush
- *Atriplex vesicaria* - Bladder Saltbush
- *Chenopodium nitrariaceum* - Nitre Goosefoot
- *Enchylaena tomentosa* - Ruby Saltbush
- *Maireana aphylla* - Cottonbush
- *Maireana brevifolia* - Yanga Bush
- *Maireana decalvans* - Black Cottonbush
- *Maireana pyramidata* - Black Bluebush

## Creek Lines and Riparian

### TREES

- *Acacia oswaldii* - Miljee
- *Acacia salicina* - Cooba
- *Acacia stenophylla* - River Cooba
- *Casuarina cristata* - Belah
- *Eucalyptus camaldulensis* - River Red Gum
- *Eucalyptus largiflorens* - Black Box
- *Pittosporum phylliraeoides* - Butterbush

### SHRUBS

- *Atriplex nummularia* - Old Man Saltbush
- *Chenopodium nitrariaceum* - Nitre Goosefoot
- *Enchylaena tomentosa* - Ruby Saltbush
- *Eragrostis australasica* - Canegrass
- *Maireana brevifolia* - Yanga Bush
- *Maireana pyramidata* - Black Bluebush
- *Muehlenbeckia florulenta* - Lignum
- *Rhagodia spinescens* - Thorny Saltbush

## Prior Streams, Lunettes and Sand Ridges

### TREES

- *Acacia homalophylla* - Yarran
- *Acacia oswaldii* - Miljee
- *Acacia pendula* - Boree
- *Acacia salicina* - Cooba
- *Alectryon oleifolius ssp. canescens* - Rosewood
- *Allocasuarina luehmannii* - Bulloak
- *Callitris glaucophylla* - White Cypress Pine
- *Eremophila nivea* - Emu Bush
- *Geijera parviflora* - Wilga
- *Hakea tephrosperma* - Hooked Needlewood
- *Myoporum platycarpum* - Sugarwood
- *Pittosporum phylliraeoides* - Butterbush

### SHRUBS

- *Atriplex nummularia* - Old Man Saltbush
- *Atriplex vesicaria* - Bladder Saltbush
- *Enchylaena tomentosa* - Ruby Saltbush
- *Maireana brevifolia* - Yanga Bush
- *Maireana decalvans* - Black Cottonbush
- *Maireana pyramidata* - Black Bluebush
- *Rhagodia spinescens* - Thorny Saltbush

## Sand plains and low rises

### TREES

- *Acacia homalophylla* - Yarran
- *Acacia oswaldii* - Miljee
- *Acacia pendula* - Boree
- *Alectryon oleifolius ssp. canescens* - Rosewood
- *Allocasuarina luehmannii* - Bulloak
- *Callitris glaucophylla* - White Cypress Pine
- *Casuarina cristata* - Belah
- *Eremophila longifolia* - Emubush
- *Eucalyptus largiflorens* - Black Box
- *Hakea tephrosperma* - Hooked Needlewood
- *Myoporum platycarpum* - Sugarwood

### SHRUBS

- *Acacia hakeoides* - Western Black Wattle
- *Atriplex nummularia* - Old Man Saltbush
- *Atriplex vesicaria* - Bladder Saltbush
- *Chenopodium nitrariaceum* - Nitre Goosefoot
- *Enchylaena tomentosa* - Ruby Saltbush
- *Maireana aphylla* - Cottonbush
- *Maireana decalvans* - Black Cottonbush



*Acacia homalophylla*  
Yarran



*Acacia hakeoides*  
Western Black Wattle



*Acacia oswaldii*  
Miljee



*Acacia pendula*  
Boree



*Acacia salicina*  
Cooba



*Acacia stenophylla*  
River Coobah



*Allocasuarina luehmannii*  
Bulloak



*Alectryon oleifolius* ssp.  
Rosewood



*Angustifolium*  
Butterbush



*Atriplex nummularia*  
Old Man Saltbush



*Atriplex lindleyi*  
Eastern Flat-top Saltbush



*Atriplex vesicaria*  
Bladder Saltbush



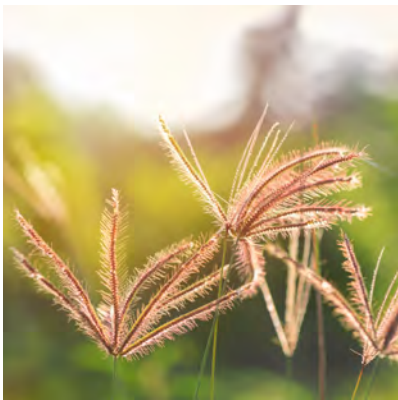
*Austrodanthonia*  
Wallaby Grass



*Callitris glaucophylla*  
White Cypress Pine



*Chenopodium nitrariaceum*  
Nitre Goosefoot



*Chloris truncata*  
Windmill grass



*Pycnosorus globosus*  
Drumsticks



*Dodonaea viscosa*  
Hop Bush



*Disphyma*  
Pigface



*Enchylaena tomentosa*  
Ruby Saltbush



*Eragrostis australasica*  
Canegrass



*Eucalyptus camaldulensis*  
River red gum



*Eucalyptus largiflorens*  
Black Box



*Geijera parviflora*  
Wilga



*Hyalosperma glutinosum*  
Golden Sunray



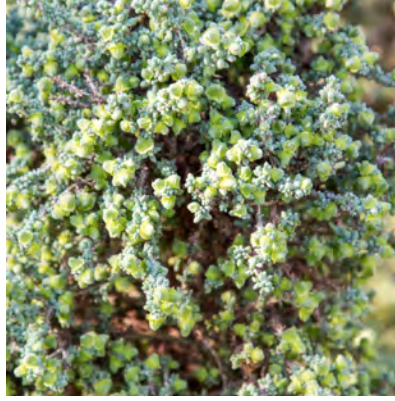
*Hakea tephrosperma*  
Hooked Needlewood



*Maireana aphylla*  
Cottonbush



*Maireana brevifolia*  
Yanga Bush



*Maireana pyramidata*  
Black Bluebush



*Maireana decalvans*  
Black Cottonbush



*Melaleuca lanceolata*  
Moonah



*Myoporum platycarpum*  
Sugarwood



*Muehlenbeckia florulenta*  
Lignum



*Nitraria billardierei*  
Dillon Bush



*Rhagodia spinescens*  
Thorny Saltbush



*Themeda triandra*  
Kangaroo Grass



# PREPARING & PLANTING A REVEGETATION SITE

*"Poor weed control accounts for most planting failures"*

Steps involved in planting a revegetation site, from ground preparation and weed control through to planting tips and follow-up care. Good preparation and management can help minimise seedling losses and encourage healthy plant growth.

## Winter - Summer

### Select and order plants

- Plan and design. Is there good native ground cover to preserve or weeds to suppress. Natural planting or rows?
- Locally indigenous species are always recommended, as they are most suited to the local conditions and climate. Where possible, use seedlings from locally collected seed
- Order plants before Christmas (February at the absolute latest) to help guarantee supply.

### Control Weeds

Poor weed control accounts for most planting failures, due to their competition for light, moisture and nutrients. Eliminate weeds early, before they use up stored water – ideally, keep the planting area free of weeds for a year or more prior to planting to ensure the best results. If using chemical control, apply a knockdown herbicide like Glyphosate well before planting

### Fence the site

- Fencing should be used to protect seedlings from stock for at least the first three years
- Fencing also preserves the leaf litter at ground level, and protects low leafy shoots

## Autumn

### Prepare the ground

- Deep ripping the soil helps root development, as it improves aeration and infiltration of water. This allows deeper penetration and faster growth of plant roots
- Rip before the Autumn break, while the ground is hard and dry, to optimise shattering of the soil
- Rip the planting lines 4 m apart, to a minimum depth of 45 cm, if possible 60 cm or more. Adjust the spacings within rows depending on the species type
- Double ripping with rips 50-100 cm apart is very beneficial as it shatters the soil
- On slopes, rip along contours to reduce erosion risk. On flatter sites, cross ripping on a grid layout will guard against roots growing in one direction along a single rip line (which can result in trees blowing over)
- Don't rip under the drip-line of existing trees
- If ripping brings up large clods or creates large open cracks in the soil, either break up and compress with the tractor wheels or rotary hoe to prevent deep drying of the subsoil.

### Control weeds

- Spray phalaris and/or cocksfoot, if present, one month after the Autumn break, when the plants are actively growing (before frost, but 10 days after rain). These plants are very hard to kill so seek appropriate advice on sprays and rates



## Winter

### Control weeds

- Apply a residual herbicide such as Simazine one month prior to planting, but before the end of July. This will control competition from weeds throughout spring
- If weeds have emerged since the first spray, spray with a knockdown herbicide in conjunction with the residual herbicide

### Prepare for planting

- Inspect your riplines; if they are too loose or full of air pockets, this can be remedied by driving a tractor tyre along it.

### Plant the seedlings

- Plant in winter (from mid-July) to utilise winter rains and allow seedlings to establish slowly over the cooler months, enabling quick growth as soil temperatures warm up
- Seedlings should be given a good soaking in their pots the day before planting
- Fertiliser is generally not necessary for natives
- Plant seedlings between the rips. Where a single rip line is used, plant trees on the shoulder of the ripline, as those planted in the bottom of the ripline can get waterlogged (in wet years). This can be beneficial in dry years.
- Recommended spacing between seedlings varies, but generally trees within a row and between the rows themselves can be spaced at least 4-5 m apart. Smaller trees and shrubs can be spaced 2-3 m apart. Aim for a maximum of 625 seedlings/ha.
- Consider planting dense native grasses and herbs if the site is heavily covered in weeds.
- To plant tubestock, dig a hole slightly larger than the tube, then remove the seedling from the tube, trying to minimise root disturbance. Place the seedling in the hole, with the base of the seedling's stem just below the surface. Place the soil back around the hole, and firm down to collapse any air pockets and give good root to soil contact.
- A Pottiputki planter can be used to plant mini hiko cell tube and a Hamilton tree planter can be used to plant hiko cell tubes and standard forestry tubes.

- Ideally, time your planting with rainfall to avoid the need to water at planting time. If no rain is forecast that night, If it is particularly dry, one litre of water (or more) poured slowly around each seedling will help overcome transplant shock and remove air pockets. In most cases, no further watering should be required.

### Guard your seedlings

- Placing guards around your seedlings can help prevent grazing by rabbits, hares and roos. It also protects the seedlings from wind and maintains a warm and moist environment The cheapest guards are milk cartons held in place by two bamboo stakes. Another common guard is the plastic sleeve, held in place by three hardwood stakes

### Check your site

- In the first week after planting, check your site for vermin or stock damage, to ensure you are able to deal with any interference as quickly as possible.

## Spring

### Check your site

- Make sure there are no weeds within 0.5 m of plants through spring and early summer
- If the summer is especially hot and dry, seedlings may benefit from watering; one litre per seedling should be sufficient, and watering should be limited to once a month at most, so as not to weaken the seedlings
- Watch regularly for grasshoppers, particularly in dry years – spray if they are causing damage.

*This information has been provided by  
Jayfields Nursery  
[www.jayfieldsnursery.com](http://www.jayfieldsnursery.com)  
and Greening Australia  
[www.greeningaustralia.org.au](http://www.greeningaustralia.org.au)*



# SEED COLLECTION CALENDAR

## January

Acacia acinacea - Gold dust wattle  
Acacia brachybotrya - Grey wattle  
Acacia deanei sp deanei - Deane's Wattle  
Acacia hakeoides - Western black wattle  
Acacia pendula - Boree  
Acacia pycnantha - Golden wattle  
Acacia rigens - Needle wattle

Acacia salicina - Native willow  
Acacia stenophylla - River cooba  
Allocasuarina luehmanii - Bull oak  
Atriplex nummularia - Old man saltbush  
Banksia marginata - Honeysuckle  
Dodonaea viscosa - Hopbush  
Eucalyptus microcarpa - Grey box

## February

Acacia oswaldii - Miljee  
Acacia pendula - Boree  
Acacia salicina - Native willow  
Acacia stenophylla - River cooba  
Atriplex nummularia - Old man saltbush  
Atriplex semibaccata - Creeping saltbush

Bursaria spinosa - Native blackthorn  
Eucalyptus melliodora - Yellow box  
Eucalyptus microcarpa - Grey box  
Myoporum montanum - Western boobialla  
Myoporum platycarpum - Sugarwood  
Themeda triandra - Kangaroo grass

## March

Allocasuarina luehmanii - Bull oak  
Bursaria spinosa - Native blackthorn  
Eucalyptus camaldulensis - Red gum

Eucalyptus largiflorens - Black box  
Einadia nutans - Climbing saltbush  
Geijera parviflora - Wilga

## April

Atriplex vesicaria - Bladder saltbush  
Eucalyptus melliodora - Yellow box

Eucalyptus largiflorens - Black box



## May

Acacia implexa - Hickory wattle  
 Eucalyptus largiflorens - Black box

Eucalyptus melliodora - Yellow box

## June/July

Atriplex vesicaria - Bladder saltbush  
 Enchylaena tomentosa - Ruby saltbush  
 Eremophila longifolia - Emu bush

Hakea leucoptera - Neddlewood  
 Hakea tephrosperma - Hooked needlewood  
 Melaleuca lanceolata sp - Moonah

## August

Hakea leucoptera - Needlewood  
 Hakea tephrosperma - Hooked needlewood

Pittosporum phylliraeoides - Butterbush

## November

Clematis microphylla var microphylla  
 - Narrow-leaf clematis  
 Jasminum lineare - Native Jasmine

Melaleuca lanceolata sp- Moonah  
 Sanatalum acuminatum - Quandong

## December

Acacia acinacea - Gold dust wattle  
 Acacia brachybotrya - Grey wattle  
 Acacia dealbata - Silver Wattle  
 Acacia hakeoides - Western black wattle  
 Acacia pendula - Boree  
 Banksia marginata - Honeysuckle  
 Callitris glaucophylla - White cypress pine

Clematis microphylla var microphylla  
 - Narrow-leaf clematis  
 Danthonia spp - White top  
 Dodonaea viscosa- Hopbush  
 Eucalyptus microcarpa - Grey box  
 Rhagodia spinescens - Thorny saltbush  
 Senna artemisoides - Cassia/punty bush



# SEEDS

*"Make sure you don't damage plants  
when taking seed"*

## SEED COLLECTION & GERMINATION

Collecting and germinating local seed is a great way to grow plants of local provenance (adaption) for revegetation, and is also a very rewarding and enjoyable activity! The information below gives you some tips to get started.

### Seed Collection

#### Preparation

Before commencing any seed collection, determine which species you want to collect, and when these are likely to have seed ready.

Some of the equipment which may come in handy includes: buckets, paper bags or envelopes, secateurs, long-handled pruner, gloves, pen and paper.

If you are collecting from land belonging to another landholder (including private, Crown and State Forest land), you will need prior approval. You will also need a licence if you are collecting threatened species or ecological communities.

#### Collection

It is generally best to collect from a site with similar conditions to the site you would like to revegetate (eg soil type, aspect, climate, etc). Some tips to maximise the genetic quality of seed collected include:

- Collect from a wide range of plants - at least 10 individuals of each species is recommended
- Only collect from healthy plants

- Collect from plants scattered throughout an area, rather than from adjacent plants
- Avoid collecting seed from isolated plants, as seed from these plants may be inbred from self pollination
- Collect only as much seed as you need, and make sure you don't damage plants when taking seed Do not remove more than 10% of the fruit of any one plant or more than 1% of the overall biomass

To collect seed from tall trees, you may be able to reach lower branches using a long-handled pruner from the back of a truck or ute. If possible, you may also be able to take advantage of fallen limbs and branches, provided the seed has not already been released.

Seed and pods on small trees and shrubs can be handpicked or cut with secateurs. You can also place a drop-sheet or tarpaulin under the plant to catch fallen seeds, then shake the branches.

For species which release their seed very quickly upon ripening (such as Wattles and Bush Peas), it may be worthwhile to tie paper bags or nylon stockings around the branches before the seed pods ripen.

Collect and dry seeds in paper envelopes or bags, and label with as much information as you can, including species, collection date, collection location, etc

## Eight of the treatments available to overcome seed dormancy

Seed Treatment	Purpose	Method	Examples
<b>Light exposure</b>	Sunrays help to weaken the outside covering of the seed	Sow seed close to or on the soil surface and lightly press in to create good seed to soil contact.	Myrtaceae family, for example, Eucalypts, Bottlebrushes (Callistemon spp.) and Paperbarks (Melaleuca spp.) and native grasses such as Kangaroo Grass (Themeda triandra).
<b>Darkness</b>	Darkness (short day lengths) and cold triggers germination for some species	Sow seed a little deeper; sow in early to mid-winter	Liliaceae family, for example, Flax-lilies (Dianella spp.).
<b>Stratification</b>	Cold conditions trigger germination.	Subject seed to a given period of low temperature, usually in a refrigerator	Cypress-pines, high altitude Eucalypts and Bursaria species (Bursaria spp.).
<b>Maturation or after-ripening</b>	Allow seed to mature before sowing.	Store seed for a given period of time.	Saw-sedge (Gahnia spp.).
<b>Hot water treatment</b>	Crack or soften the outer seed skin to allow moisture into the seed's food storage and embryo.	Check for the correct temperature and duration for the given species.	Hard coated seeds, such as, Wattles, Senna (Cassia spp.) and Eutaxia (Eutaxia spp.).
<b>Scarification</b>	Rubbing or nicking the seed or completely removing the seed coat.	Note: pay careful attention to scarification as it can easily damage the seed's embryo. If nicking, do not nick the seed at the end with the fleshy aril attachment.	Used for hard coated seeds
<b>Leaching</b>	Overcome salts, tannins etc. contained in the seed.	Place seed in running water.	The leaching of salt has been one of the major developments in being able to direct seed many varieties of Chenopod seed (small shrubs and herbs, particularly well adapted to saline areas)
<b>Smoke</b>	Helpful in releasing dormancy factors.	See below points for the different methods of applying smoke.	Leguminosae family (such as Wattles), Proteaceae (such as Banksia) and Myrtaceae (such as Eucalypts).

The above treatments and examples were based on Germination Pathways a presentation given by Neville Bonney at Greening Australia Victoria's 'Smart Seed' Native Seed Forum, 2002 and are presented with permission. The complete Germination Pathway chart developed by Bonney is recommended for more detailed information

### **Cleaning and storing seed**

After collecting seed, you need to separate it from the fruit. First, ensure the seed is completely dry by placing the paper bag containing the seed on a window sill in a sunny position. Once the seed is dried, separate it from the seed pod and any other material by sieving or rubbing it

To store seed, after cleaning place it in a labelled jar or other airtight container. Store in a cool, dark place where they are not likely to be reached by insects or mice. Most seed can be stored at temperatures up to 20°C for several years, although with some loss of viability. Some species (such as Bulloak, Hakea and Banksia) are best stored in the fridge

### **Germinating Seeds**

#### **Preparation**

The best time to propagate is usually spring to early summer. Cell containers, punnets, pots or shallow trays are all suitable for germinating seeds in. Use either a commercial seed-raising mix which is free draining, or make your own - for example, you can mix equal parts of coarse washed sand and vermiculite, or use a 4:1 mix of washed sand and coir fibre

#### **Germination**

Some species, such as Acacia (Wattles), need to be pre-treated before germinating. However pretreatment is not required for many species, including Kurrajong, Callistemon (Bottlebrush), Casuarina (She Oaks) and Eucalypts. To sow the seeds, put the potting mix in the pots and wet it. Sprinkle the seeds on the surface, then cover lightly with sand or some potting mix. Sit the pots in a warm spot, and make sure they stay moist. A good technique is to sit the pots in a tray of water, so they won't dry out (just keep the trays topped up with water!) Otherwise water around once a day. Most species should germinate within about 1 to 4 weeks (some take longer)

#### **Transplanting seedlings**

Once the seedlings have grown big enough to be handled (at least 2 leaves), it's time to transfer them into individual tubestock pots

or similar (if you germinated individual seedlings in separate pots, you don't need to transplant them). Use native potting mix in the pots, either a commercial mix or make your own (eg a 3:2 mix of regular potting mix and washed sand). It helps to add a small amount of controlled-release native plant fertiliser to the potting mix before transplanting, but this is not essential.

Carefully remove each seedling using a flat knife or spatula, and place into a partly filled pot. Gently firm potting mix around the seedling, and water with a light spray, such as from a spray bottle. Keep the pots in a protected area for a few weeks, then harden them by gradually moving them to an area where full sun is available for at least part of the day. Make sure they don't dry out; you may like to use a tray of water as before. Your seedlings should be ready to plant out in about 3-4 months. The best time to plant is winter.

### **Trees**

#### **Kurrajong (*Brachychiton populneus*)**

- Hand pick seeds, from December to January
- Use gloves and mask to protect yourself from the hairs surrounding seeds
- Before sowing, pour boiling water over seeds and soak for 1 minute, or scarify (rub the seeds between sandpaper to abrade the seed coat).

#### **Black Box (*Eucalyptus largiflorens*)**

- Hand pick gumnuts when they are brown, from January to around May
- Place gumnuts in a paper bag in a warm place until the seeds are released, then shake or sieve to clean the seeds

#### **White Cypress Pine**

##### **(*Callitris glaucophylla*)**

- Hand pick the cones just before they open, usually around late December, but can be between November and April
- Lay cones out to dry for a few weeks, then shake in a sieve; the papery seeds should release easily
- Use seed within 12 months
- Before sowing, place seeds in the fridge for 2-4 weeks
- Seed may take up to 6 weeks to germinate.

## Shrubs

### Deane's Wattle (*Acacia deanii*)

- Hand pick seed pods when they are turning brown, around October to February. Remove the seeds by splitting the pods open along the seam of the pod
- Before sowing, pour boiling water over the seeds, and allow to stand for up to 24 hours (discard any seeds that are floating after this time). Alternatively you can scarify the seeds, by nicking or rubbing each seed with sandpaper

### Hop Bitter Pea (*Daviesia latifolia*)

#### Small-Leaf Bush Pea (*Pultenaea foliolosa*)

- Hand pick rattling pods just before they open, between November and February
- Dry pods completely in a warm place, then crush to separate the seed from the pod
- Before sowing, pour boiling water over seeds and soak, or scarify
- Seed may take up to 6 weeks to germinate.

### Wedge-Leaf Hop Bush (*Dodonaea viscosa*)

- Hand pick capsules before they open, from October to February
- Dry seed pods completely in a warm place, then crush to separate the seed from the pod
- Before sowing, pour hot water over seeds and soak for 30 seconds, or scarify.

## Grasses

### Wallaby Grass (*Austrodanthonia caespitosa*)

- Cut stalks with secateurs, from December to March
- Rub the heads between your hands (or two rubber car mats for larger quantities) to extract seeds, then clean by sieving
- Use seeds fresh, before dormancy sets in.

### Weeping Grass (*Microleaena stipoides*)

- Harvest seeds in November-December
- Harvest seeds by running the stem lightly between your fingers
- Seeds need light to germinate, so sow at the surface
- Seed may take up to 5 weeks to germinate.

### Kangaroo Grass (*Themeda australis*)

- Hand pick seeds from December to February
- Strip seed and husks by hand (can be tricky to clean!)
- Store for 6-12 months at room temperature before sowing
- Seeds need light to germinate, so sow at the surface.

## Groundcovers and vines

### Bulbine Lily (*Bulbine bulbosa*)

#### Chocolate Lily (*Dichopogon strictus*)

- Harvest seed heads by hand or secateurs when papery capsules turn brown and brittle, around December to January
- Place stems upside down inside paper bags, and dry until the capsules have opened. Thresh lightly, then shake or sieve to clean the seeds
- Store seeds for 2 to 3 months before sowing
- Sow in autumn, as high temperatures inhibit germination
- Bulbine lily needs light to germinate, so sow at the surface
- Seeds may take up to 8 weeks to germinate.

### Yellow Burr-Daisy

#### (*Calotis lappulacea*)

#### Common Everlasting

#### (*Chrysocephalum apiculatum*)

- Hand pick capsules when they are red-brown and brittle, approximately December to February
- Dry the seed capsules in a paper bag, then break up the seed head by hand and shake or sieve to clean
- Common Everlasting needs light to germinate, so sow at the surface
- Yellow Burr-Daisy may take up to 8 weeks to germinate.

### References and further reading:

Australian National Botanic Gardens, [www.anbg.gov.au](http://www.anbg.gov.au) Australian Native Plant Society, [www.anpsa.org.au](http://www.anpsa.org.au) Greening Australia, [www.greeningaustralia.org.au](http://www.greeningaustralia.org.au) Habitat Network, [www.habitatnetwork.org](http://www.habitatnetwork.org) NSW Office of Environment & Heritage, [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)



# DIRECT SEEDING

*" To aid germination, some seed may need to be treated prior to sowing."*

Direct seeding involves placing your tree and shrub seed in a prepared planting area using a machine or hand broadcast method. It is the least expensive of all planting options at around 25 per cent of the cost of seedling planting if you buy the seed and considerably less again if you collect your own seed.

The results of direct seeding are generally inconsistent, producing 'patchy' rows with clumps of seedlings in some areas and little to no cover in others. For a windbreak this is problematic as it creates variable densities and gaps that can compromise its effectiveness. For environmental plantings though it is ideal as the patchiness creates habitat complexity through a mixture of open and dense areas.

Direct seeding has additional benefits through the real world conditions experienced by the plants after germination. These conditions ensure that only the strongest plants, with the strongest genetics survive. Seedlings that are grown in ideal nursery conditions experience little in the way of adaptive outside pressures until they are planted into the paddock situation (after you have paid for them). This seemingly small difference can actually result in a big variation over the long life of your revegetation site.

## **Preparing for planting**

Direct seeding can occur with little preparation, for example a spray fallow with no soil cultivation, or the full works (soil scalped and then deep cultivated). The choice is best guided by using a soil probe to test soil conditions along the rows. Sites with compacted soils should be aerated with a deep soil fracture to assist root penetration. The condition of the site and disturbance by planting is also a consideration. For example it may be best not to disturb an intact native ground layer and introduce weeds .

Many native plant seeds have evolved to stay dormant until certain conditions provoke their germination, such as bushfires. To aid germination, some seed may need to be treated prior to sowing.

## **Mechanical planting**

Seed is metered out at approximately 300 to 400 grams per linear kilometre. A one kilometre, 25 m wide site, with four rows would require around 1,200 grams of seed for the 2.5 hectares.

*This information has been provided by Local Land Services - Planting your patch. A guide to revegetation on your property. [www.lls.nsw.gov.au](http://www.lls.nsw.gov.au)*














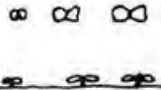



















## NRM NEWS - FEBRUARY 2021 - TERRESTRIAL SYSTEMS

Learning how to identify a recently germinated native seedling from a weed seedling can be tricky. The following germination guide aims to help people identify native plant germination following direct seeding or natural regeneration.

### IDENTIFYING GERMINATED NATIVE VEGETATION

The first pair of leaves that appear on germination are the “seed leaves” or cotyledons. These will often be quite different in appearance to subsequent “true leaves”.

Germination diagrams of some typical native vegetation families used in direct seeding are shown below. Where possible, photos of juvenile species are also included to assist with identifying recently germinated native vegetation.

Genus	Time after Seeding			
	3 weeks	4-8 weeks	2-3 months	4 months
<b>Acacia</b> <b>Wattle</b> Growth: Fast Risks to Germination: Grazing, trampling by feral animals, rabbits and insect damage eg Red legged earth mite				
<b>Senna</b> <b>Cassia</b> Growth: Fast Risks to Germination: Grazing, trampling by feral animals, Insect damage eg Red legged earth mite				
<b>Dodonaea</b> <b>Hopbush</b> Growth: Fast Risks to Germination: Grazing, trampling by feral animals, rabbits and insect damage eg Red legged earth mite				
<b>Eucalyptus</b> <b>Red Gum, Mallee etc</b> Growth: Fast Risks to Germination: Rabbits, Grazing, trampling by feral animals, and insect damage eg Red legged earth mite				
<b>Callitris</b> <b>Native Pine</b> Growth: Slow Risks to Germination: Grazing, trampling by feral animals, rabbits and insect damage eg Red legged earth mite				
<b>Allocasuarina</b> <b>Sheoak</b> Growth: Slow Risks to Germination: Grazing, trampling by feral animals, rabbits and insect damage eg Red legged earth mite				
<b>Pittosporum</b> <b>Butterbush/ Native Apricot</b> Growth: Slow Risks to Germination: Grazing, trampling by feral animals, rabbits and insect damage eg Red legged earth mite				
<b>Atriplex</b> <b>Old Man Saltbush</b> Growth: Fast Risks to Germination: Grazing, trampling by feral animals, rabbits and insect damage eg Red legged earth mite				
<b>Melaleuca</b> <b>Moonah</b> Growth: Slow Risks to Germination: Grazing, trampling by feral animals, rabbits and insect damage eg Red legged earth mite				

Acknowledgement: P. Binney - original idea

### Germination Time

Depending on soil moisture, temperature conditions, and light availability, native seeds can germinate within a few weeks to 3 months or even longer.

There are several instances of direct-seeded sites within the Murray region where seeds have remained dormant for up to nine years until seasonal and soil conditions improved, prompting a germination event

### RECENTLY GERMINATED WATTLE (ACACIA SPS)

Note: All acacias germinate with bipinnate cotyledon leaves (i.e. feathery or fern-like leaves) and to confirm species you need to wait until the second set of leaves or the “true leaves” have developed.



Clockwise from top left: Grey Wattle (*Acacia brachybotrya*), Grey Wattle (*Acacia brachybotrya*), Western Black Wattle (*Acacia hakeoides*), Silver Wattle (*Acacia dealbata*), Streaked Wattle (*Acacia lineata*), Golden Wattle (*Acacia pycnantha*), Kangaroo Thorn (*Acacia paradoxa*), Deane’s Wattle (*Acacia deaneii*).

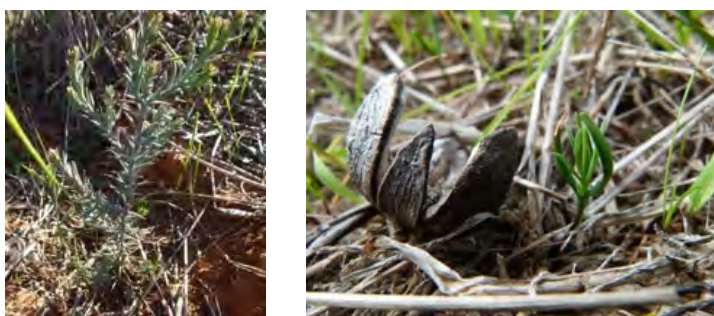
### RECENTLY GERMINATED PUNTY BUSH/ CASSIA (SENNA ARTEMISOIDES)



### RECENTLY GERMINATED WEDGE-LEAF HOPBUSH (DODONAEA VISCOSA CUNEATA)



### RECENTLY GERMINATED WHITE CYPRESS PINE (CALLITRIS GLAUCOPHYLLA)



<https://www.lls.nsw.gov.au/regions/murray/articles,-plans-and-publications/nrm-news-february-2021/native-vegetation-germination-guide>



# PLANTING MACHINERY

*"Mechanical planting is time-efficient and can work well in well-prepared loam and clay loam soils"*

## **Mechanical planting**

Customised tree planting trailers, such as the Youman tree planter, which can be towed behind a vehicle on a three point linkage, are used for large-scale revegetation projects, with varying rates of success. These machines have a single tyre at the front to rip the centre line. A person is seated behind the tyre, with racks on either side of them to hold seedling trays. This person places a seedling down into the prepared soil as they are moving along, in between two press wheels that firm down the soil either side of the seedling and hold it in place. Operators need to be mindful of the safety hazards associated with this planting technique. Mechanical planting is time-efficient and can work well in well-prepared loam and clay loam soils. In some cases, particularly on heavier soils, this method does not create a friable bed for the seedling to be planted in to and leaves too much air around the roots, stressing the plant and resulting in lower planting success rates. This can be partially resolved by having someone follow the planter, to firm down the soil around the plant. While this adds time, it is good practice to check all seedlings.

## **Manual planting**

In general, hand planting methods are the most effective ways to plant your seedlings, giving you the greatest survival rate of plants. Hand planting may seem time and labour intensive but it can be a faster job than you think. Getting it right in the first instance will also save you time in the long run, especially if it means you won't have to replace plant losses. Pottiputki, Hamilton tree planters and spades are all effective planting tools to assist manual tree planting, when used properly in well prepared soil.

## **Pottiputki**

Developed and made in Finland, the Pottiputki planting tool is one of the most ergonomic and efficient tools for broad acre revegetation. They come in a variety of sizes and, combined with a planting belt or kidney tray, one person can plant several thousand seedlings a day into a well prepared planting bed.

The main benefits are:

- no need to bend down
- planter can be self-sufficient, easily carrying around 100 plants in a variety of tray setups
- planter can plant at a fast rate – approximately moderate walking pace.

On the negative side:

- The Pottiputki tool has difficulty penetrating anything other than soft soil.

## **Hamilton tree planter**

The Hamilton tree planter is an Australian designed and manufactured tree planter that creates a planting hole by removing a root ball sized soil core. It is a highly versatile planter able to be used in a variety of soil conditions. In soft soil, the Hamilton tree planter can be used using the same principles as a Pottiputki – create a hole with the planter then lower the seedling and back fill with your feet.

*This information has been provided by Local Land Services - Planting your patch.*

*A guide to revegetation on your property.  
[www.lls.nsw.gov.au](http://www.lls.nsw.gov.au)*



# TREE GUARDS

*"cardboard cartons with two supporting stakes have less environmental impact"*

Tree guards will considerably add to the cost of your project (in dollars and labour).

There are some minor benefits to guards. They highlight your work visually so you can easily find your plants again and, depending on the type of guard, may afford some protection when doing follow up weed management with chemicals or machinery (although they will get in the way if doing manual weed management such as chipping and should not be relied on as chemical shields in their own right).

If you are putting guards on just because of a pest problem, such as grazing by hares, consider controlling the pest beforehand as it will probably be more cost effective and will have additional benefits for your whole property.

It is worth noting that major commercial revegetation programs such as forestry plantations never use tree guards—the cost to benefit ratio does not stack up. Planters have experienced planting two to three plants for the same cost and effort as planting one seedling with a guard.

Two of the commonly used guarding options are covered in detail in this section to help avoid common installation issues if you choose to guard your seedlings.

## **Plastic tree guards**

Plastic tree guards are the most expensive option, requiring the guard and three sturdy support stakes. They are UV stable and in theory can be used many times. In practice, they are often not installed properly, frequently collapsing or blowing away.

This not only looks untidy but can litter the landscape with long lived plastic rubbish impacting neighbours and the environment. If not removed within a couple of years your plant will quickly fill the guard making it difficult to remove and it will need to be cut, which means wasting the guard and causing work that you would likely rather not have to do. If not removed, the guard can detrimentally impact the plants as they mature.

## **Cardboard carton guards**

Wax coated cardboard cartons with two supporting stakes have less environmental impact as the cartons and stakes are biodegradable.

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# WEED MANAGEMENT

*"Once your seedlings become established, annual weeds will struggle to compete for moisture and nutrients against the deep and extensive root system of your newly established seedlings."*

Assess the competition your plants may come up against during their establishment. This can include annual weeds and perennial weeds.

### **Annual weeds**

Annual weeds such as Paterson's curse, cape weed, various thistles and burrs, wild oat, rye, barley and brome grasses generally indicate a cycle of excess nutrients and low levels of perennial groundcover.

Annuals plants have evolved to take advantage of these conditions, typically growing very fast, and then producing a large volume of seeds for the next generation before they die. In really good years, they can continue growing for a long time, producing several seed crops and reaching enormous sizes. This ability to quickly use available resources makes annual competition a big threat to any planting.

No tree, shrub or perennial groundcover seedling can effectively compete once annuals get going. They rob your seedling of access to moisture, nutrients and sunlight.

Annual weeds are easily controlled using well timed applications of herbicide and/ or mechanical disturbance. Spray fallow techniques that create a competition free zone for an extended period and soil scalping preparation techniques work well but must be used carefully on sites that are prone to erosion.

Once your seedlings become established (around one to two years of in-ground growth), annual weeds will struggle to compete for moisture and nutrients against the deep and extensive root system of your newly established seedlings.

Establishing perennial plants is the most effective management tool for breaking annual plant dominance.

### **Perennial weeds**

Perennial weeds such as blue heliotrope, horehound, St John's wort, Lucerne, paspalum and phalaris can be controlled using the same methods for annuals; however, there are a few perennial species that require special attention.

Blue heliotrope, St John's wort and Lucerne are vigorous, deep rooted perennials with ability to regrow from root suckers. Cultivation will spread and aggravate the problem so initial control needs to be undertaken using a suitable herbicide. Scalping alone will have little impact on these weeds, causing the plants to freshen up with new growth. However, stimulating new growth through scalping can assist in getting good follow up herbicide coverage and impact.

Unlike annual weeds, perennial plants will co-exist with your planted seedlings even as they mature to large plants. To avoid weed populations dominating the understorey, a weed management program using low disturbance techniques such as chipping and spot spraying is recommended.

*This information has been provided by Local Land Services - Planting your patch. A guide to revegetation on your property.*  
[www.lls.nsw.gov.au](http://www.lls.nsw.gov.au)



# SOIL

*"In one kilogram of surface soil there can be up to 100 km of fungal hyphae and one million protozoa"*

## LEARNING ABOUT WHAT LIES BENEATH

Soil organisms play a crucial role in decomposing organic matter, cycling nutrients and fertilizing our soils. Understanding the different soil organisms present, along with their functions and relationships, can allow us to better manage our soils, to encourage and maintain healthy soil biology and help generate more productive pastures and crops.

### Benefits of soil organisms

- Promotion of plant growth
- Enhanced nutrient supply to plants
- Increased mineralisation and nutrient cycling
- Nitrogen fixation
- Carbon sequestration
- Stabilisation of soil structure
- Reduced impact of soil pollutants
- Reduced soil-borne pests and diseases.

### Microflora

The microflora are generally microscopic, and include bacteria, fungi and algae. Bacteria and fungi carry out 80–90% of all biological activity in the soil. They are the primary decomposers of organic matter, and are responsible for nutrient cycling and transforming nutrients into forms which plants can take up and use

### Bacteria

Bacteria are some of the smallest and most abundant soil microbes. In a single gram of soil, there can be billions of bacteria. Most live in the top 10 cm of soil, where organic matter is present. They are generally found around the root tips of plants, and depend on flowing water to move through the soil. Bacteria are important in the decomposition of organic materials. Rhizobium bacteria, found on the roots of legumes (eg clover, beans and wattles), can convert nitrogen gas from the air into forms that plants can use.

### Fungi

Fungi consist of hyphae, which grow as 'threads' through the soil. Hyphae can be as small as a few cells, or can stretch as a network for metres or even kilometres throughout the soil. Fungi are important in the decomposition of hard, woody organic matter. They also help improve soil structure, as the hyphae bind soil particles together to create water-stable aggregates which in turn create pore spaces in soil that enhance water retention and drainage. Mycorrhizal fungi colonise plant roots and help the plant to obtain nutrients such as phosphorus from the soil, by providing a greater root area through which the plant can obtain nutrients

### **Microfauna**

Microfauna are small soil animals, including protozoa and nematodes, ranging in size from microscopic to those that can just be seen with a magnifying glass. Most depend on flowing water to move. They graze on the microflora, and are able to ingest small particles of soil organic matter, which are then decomposed by enzymes within the organisms.

### **Protozoa**

Protozoa need bacteria to feed on. They are particularly active in the soil rhizosphere, and help release plant available nutrients to the soil.

### **Nematodes**

Nematodes are non-segmented 'worms' less than 1 mm long. They live in the thin films of water surrounding soil particles, and are generally found in well-structured soils with large pore spaces, or coarser soils with easily available food. Nematodes help break down organic matter, and release nutrients into the soil when they eat bacteria and fungi. They also help by dispersing bacteria and fungi, which cannot move around in the soil without 'hitching a ride' inside or on the back of nematodes. Nematodes can also attack and kill a range of pests such as borers, grubs, thrips and beetles. The digested pests are then added to the soil organic matter reserves.

### **Mesofauna**

Mesofauna are organisms you can see with the naked eye, including spiders, mites and springtails. They need moist soil to avoid drying out, and generally remain on or near the soil surface, within larger soil pores, channels and other sheltered sites such as litter. Mesofauna graze on fungi, algae and lichens in the soil, and play an important role in mixing the soil.

### **Macrofauna**

Macrofauna are generally easily seen with the naked eye, and include earthworms, beetles, termites, ants and slaters. They can be described as shredders, predators and soil engineers. Some need moist soil, while others have protective skins.

Macrofauna are responsible for recycling dead and decaying matter. Their burrowing activity aerates the soil, which allows water penetration, provides channels for root growth and increases soil aggregation. Their bioturbation (disturbance of the soil) also performs an important role in mixing organic matter and top soil with soil from lower down the profile.

Encouraging beneficial soil organisms

- Provide a hospitable environment, with food (organic matter), water and suitable hosts (if necessary)
- Address soil problems, such as acidity and compaction, which depress bacteria populations
- Reduce soil disturbance, as tillage physically severs fungal hyphae and breaks up the mycelium
- Build organic matter through practices such as green manure crops and strategic grazing, and ensure there is good ground cover
- Reduce fungicide use, as broad-spectrum fungicides are toxic to a range of fungi, and will result in a decline in numbers of beneficial types
- Reduce use of pesticides, as pesticides that enter the soil can affect nematode numbers.
- Some have a direct detrimental effect, while others produce non-target effects that damage nematodes

*This information has been taken from Murrumbidgee Landcare's Soil Biology Workshop, run by Janelle Jenkins (Riverina Local Land Services), and the NSW DPI's Soil Biology Basics information series.*

# CRITICAL THREATS TO NATIVE VEGETATION

*"Sticks and leaf litter provide essential habitat for many fauna species"*

## **Threats to native vegetation**

Critical threats to our native vegetation include:

- Clearing, degradation and fragmentation of remnants for agricultural, forestry, infrastructure and residential development
- Continuous heavy grazing and trampling of remnants by grazing stock, resulting in losses of plant species through simplification of the understorey and ground layer, and suppression of overstorey. Other impacts include erosion and other soil changes, such as increased nutrient status
- Untimely grazing that does not allow plants to complete their life cycle and set seed
- Invasion of remnants by non-native plant species, including noxious weeds, environmental weeds and pasture species
- Invasion of remnants by feral animals, resulting in the loss or modification of habitat
- Disturbance of remnants during road, rail and infrastructure maintenance or upgrades, removing habitat and escalating weed invasion
- Removal of habitat timber, both dead and alive
- Collection of all on-ground woody debris (habitat) in the guise of a 'clean-up'
- Nutrient increases from fertiliser runoff, providing a competitive advantage to invasive species over natives
- Removal of bush rock, that provides valuable habitat

## **Actions to help protect native vegetation**

Actions which landholders can take to help protect native vegetation on farming properties include:

- Maintain and improve all existing areas of remnant vegetation, including corridors and landscape linkages to allow for dispersal of pollen and seed, as well as providing for fauna movement
- In areas of native vegetation that are of low to moderate condition, focus on controlling introduced annual pasture grasses and weeds
- In areas of native vegetation that are of high condition, focus on maintaining diversity by reducing thatch and maintaining inter-tussock spaces
- Utilise relatively short but intensive grazing periods that suppress weeds and allow native seed sets.
- Undertake weed control, taking care to minimise spray flow onto native species (if necessary, hand spray or dig out target weed species)
- Control feral animals, using appropriate methods
- Be careful to avoid transfer of weeds or other contaminants through movement of contaminated equipment or vehicles
- Retain all dead and alive timber, including standing and fallen trees. Timber collection for onfarm use should focus on younger solid trees, that do not contain habitat hollows
- Sticks and leaf litter provide essential foraging and nesting habitats for many fauna species, and should be left in situ
- Prevent fertiliser drift and nutrient runoff into areas of native vegetation
- Retain, and avoid disturbance to, all rocks and rock features, as these provide valuable microclimates and protection for many species.



### **Soil preparation**

Some sites, especially those with good native groundcover and few problem weeds may be direct seeded without any prior disturbance of the soil. For most other sites, good soil preparation including a deep cultivation will increase planting speed, facilitate seed germination, root growth and moisture penetration and enhance the survival rate of plants. Several passes using a deep ripping tined implement will adequately prepare most soils for planting. In some cases, such as heavier soils, it may be necessary to follow this with a finer cultivation or harrow to break-up larger clods and further reduce air-pockets. Furrows may be shaped to assist water harvesting, which can magnify rainfall by two to four times, increasing seedling survival and growth rates. Some soil preparation examples are provided in this section. For more site specific advice on ground preparation, please talk to your Local Land Services Officer.

### **Floodplains**

Sites subject to prolonged inundation (under water for several months or more) create low oxygen soil environments that severely limit the species of plants that are able to survive. It should be noted on low lying plains where flooding is relatively frequent (a few times a decade or more), treeless areas can be quite natural. These areas are often dominated by reed beds or lignum scrubs with tree species limited to the edges and high points of these landscapes.

### **Shallow, gravelly soils (lithosols) on hillcrests, ridges and slopes**

These areas are rarely revegetated due to the potential of erosion and the fact that many of these areas are considered to be unproductive and have not been cleared of vegetation. However, there may be cases where you would like to extend or improve hillside sites using low-disturbance techniques. In the western part of the region, some mallee communities occur on these soil types

### **Sandy loam soils on flats and low rises**

Mallee communities are often associated with these soils in the western part of the region.

### **Riparian areas**

Due to the proximity to water, the vegetation within riparian zones is often quite different to that of the adjacent landscape. Plant species must be able to withstand periodic water flows. It is a good idea to choose fast growing native species that establish quickly so they don't get washed away during floods!

### **Saline discharge areas**

Only species that are highly tolerant of salt can be planted on saline discharge areas. Plants may also have to contend with waterlogging. Table 7 (Appendix) provides a list of plant species with a moderate to good tolerance of salt and those that will tolerate waterlogging as well.

### **Heavy clay plains – self-mulching grey/ brown clay soils (vertosols)**

Self-mulching grey/ brown clay soils (vertosols) and other deeply cracking soils place unique limitations on woody plants in that the deep cracks tear the roots apart! These plains have unique woody vegetation that can handle the soil conditions and actually use the soil cracking as an opportunity to regenerate (using root suckers). Weeping myall woodlands are the most common and widely occurring vegetation type on cracking soils in the Central West region. Groundcovers and shrub species, particularly of the saltbush family feature strongly in the understorey layer. In some areas (such as between the Macquarie Marshes and the Warrumbungles around Coonamble), woodlands were commonly surrounded by extensive saltbush shrublands and grasslands were almost entirely free of timber.

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## Amphibians

ENDANGERED

- *Litoria raniformis* - Southern Bell Frog
- 

## Bats

VULNERABLE

- *Chalinolobus picatus* - Little Pied Bat
  - *Myotis macropus* - Southern Myotis
  - *Vespadelus baverstocki* - Inland Forest Bat
  - *Saccolaimus flaviventris* - Yellow-bellied Sheath-tail-bat
- 

## Birds

CRITICALLY ENDANGERED

- *Anthochaera phrygia* - Regent Honeyeater

ENDANGERED

- *Ardeotis australis* - Australian Bustard
- *Pedionomus torquatus* - Plains-wanderer
- *Polytelis anthoepus monarchoides* - Regent Parrot
- *Falco hypoleucos* - Grey Falcon
- *Rostratula australis* - Australian Painted Snipe
- *Calidris ferruginea* - Curlew Sandpiper
- *Botaurus poiciloptilus* - Australasian Bittern
- *Burhinus grallarius* - Bush Stone-curlew
- *Lathamus discolor* - Swift Parrot
- *Climacteris affinis* - White-browed Treecreeper

VULNERABLE

- *Certhionyx variegatus* - Pied Honeyeater
  - *Grantiella picta* - Painted Honeyeater
  - *Melanodryas cucullata cucullata* - Hooded Robin
  - *Melithreptus gularis gularis* - Black-chinned Honeyeater
  - *Oxyura australis* - Blue-billed Duck
  - *Pyrholaemus brunneus* - Redthroat
  - *Chthonicola sagittata* - Speckled Warbler
  - *Stagonopleura guttata* - Diamond Firetail
  - *Stictonetta naevosa* - Freckled Duck
  - *Limosa limosa* - Black-tailed Godwit
  - *Lophoictinia isura* - Square-tailed Kite
  - *Ninox connivens* - Barking Owl
  - *Pachycephala inornata* - Gilbert's Whistler
  - *Lophochroa leadbeateri* - Major Mitchell's Cockatoo
  - *Grus rubicunda* - Brolga
  - *Tyto novaehollandiae* - Masked Owl
  - *Hieraetus morphnoides* - Little Eagle
  - *Circus assimilis* - Spotted Harrier
  - *Daphoenositta chrysoptera* - Varied Sittella
  - *Haliaeetus leucogaster* - White-bellied sea eagle
  - *Petroica phoenicea* - Flame Robin
  - *Petroica boodang* - Scarlet Robin
  - *Epthianura albifrons* - White-fronted Chat
  - *Falco subniger* - Black Falcon
  - *Artamus cyanopterus cyanopterus* - Dusky Woodswallow
  - *Climacteris picumnus victoriae* - Brown Treecreeper
  - *Neophema pulchella* - Turquoise Parrot
  - *Pomatostomus temporalis* - Grey-crowned Babbler
- 

## Ecological Communities

CRITICALLY

- Weeping Myall Woodland

ENDANGERED

- *Allocasuarina luehmannii* Woodland
  - Sandhill Pine Woodland
- 

## Ferns and Cycads

ENDANGERED

- *Pilularia novae-holla* - Austral Pillwort

## Herbs and Forbs

### ENDANGERED

- *Austrostipa wakoolica* - A spear-grass
- *Lepidium monoplocoides* - Winged Peppergrass
- *Leptorhynchos orientalis* - Lanky Buttons
- *Calotis moorei* - A burr-daisy
- *Convolvulus tedmoorei* - Bindweed
- *Cullen parvum* - Small Scurf-pea

### VULNERABLE

- *Brachyscome papillosa* - Mossgiel Daisy
- *Swainsona plagiotropis* - Red Darling Pea
- *Swainsona sericea* - Silky Swainson-pea
- *Brachyscome muelleroides* - Claypan Daisy
- *Maireana cheelii* - Chariot Wheels
- *Solanum karsense* - Menindee Nightshade
- *Swainsona murrayana* - Slender Darling Pea

## Orchids and Shrubs

### CRITICALLY ENDANGERED

- *Grevillea ilicifolia* subsp.- Holly-leaf Grevillea

### ENDANGERED

- *Caladenia arenaria* - Sand-hill Spider Orchid
- *Diuris* sp.- Oaklands Diuris
- *Sclerolaena napiformis* - Turnip Copperburr

### VULNERABLE

- *Diuris tricolor* - Pine Donkey Orchid

## Reptiles

### VULNERABLE

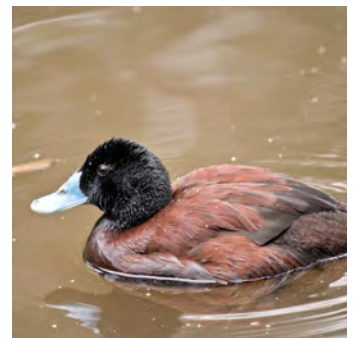
- *Tiliqua occipitalis* - Western Blue-tongued Lizard



*Litoria raniformis*  
Southern Bell Frog



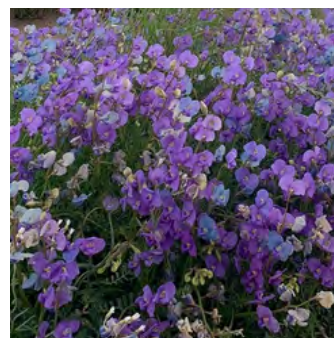
*Pedionomus torquatus*  
Plains-wanderer



*Oxyura australis*  
Blue-billed Duck



*Caladenia arenaria*  
Sand-hill Spider Orchid



*Swainsona* Spp  
Darling Pea



*Tiliqua occipitalis*  
Blue-tongued Lizard



# PADDOCK TREES

*"Paddock trees are considered a keystone structure in agricultural landscapes"*

Scattered paddock trees are a common feature across Australian agricultural landscapes, and are generally relics of the original woodlands and forests that once covered these landscapes. It is hard to imagine the countryside without scattered paddock trees, but that is the future many agricultural areas in our region are facing, given the current trend. A study conducted in the south west slopes predicts that within 120 years almost all paddock trees in the region will be lost, due primarily to a lack of recruitment.

### **The value of paddock trees**

Paddock trees are considered a 'keystone' structure in agricultural landscapes. This means that they have a disproportional influence on how the environment functions. In Australia, paddock trees have been shown to enhance water infiltration and soil quality. They also have a disproportionately high value for biodiversity, providing superior habitat to other vegetation in the landscape for many species. Much of this can be attributed to the great age and size of these trees; not only do they provide habitat in their own right, but they can also increase the biodiversity value of other nearby habitats, such as tree plantings and small remnant patches. Paddock trees also facilitate the movement of wildlife across the landscape. This is important for many reasons: it helps the various nomadic

and migratory birds that occur in our region, it increases the opportunity for wildlife to disperse across the landscape to colonise new habitats, it ensures the flow of genetic material across the landscape and between populations, and at a local level it helps animals gather the resources they need

### **Threats to paddock trees**

Unfortunately, paddock trees are under siege. They are typically the oldest living structures in the landscape, so natural attrition is inevitable. With a lack of regeneration over the past 100-200 years, there are few medium to large trees to take their place

The rate of loss of these trees is amplified by a myriad of factors associated with being in a paddock environment, including:

Threats to paddock trees

- Spray drift, which weakens paddock trees over time, inviting attack by insects and rot
- Increased nutrient loads from fertilisers and stock camps, making trees more susceptible to insect attack and drought stress
- Ploughing and stock camps, which damage the root zone, again weakening the tree
- Erosion and salinity, which add extra stress. The accumulated impact of these stresses on trees can be enough to cause their premature death, but it is often a wind storm or fire which is the final nail in the coffin for these already weakened trees

Preliminary results from our study into the impacts of wildfire show that losses of 20-80% of paddock trees can occur. In addition, deliberate clearing of paddock trees still continues, mostly associated with changing land management practices

### **How landholders can help protect paddock trees**

While the prospects of the paddock tree seem grim there are still things we can do to protect existing trees, recruit new trees, and take advantage of the habitat existing trees provide while they are still about. If we can reduce the stresses on paddock trees, it's possible that some could survive another 100-200 years.

Here are some tips:

- Respect these trees, and the contribution they make to a sustainable environment
- Consider them when planning general farm management practices, such as spraying, fertilising and prescribed burning
- When considering environmental works on your property, give paddock trees high priority. Planting around existing paddock trees can give your new plantings a 200 year head start, and the protection from wind, spray drift and insect attack the new plantings provide may also extend the life of the existing tree.

### **Planting new paddock trees**

Recruiting new paddock trees is desirable not only from an environmental perspective but also for production reasons, such as stock shelter. There are a number of ways to do this effectively

- Change grazing regimes, to allow time for the new tree to germinate, and to recover from grazing. This is particularly successful in pastures that are not heavily modified

- Adopt the principles of whole paddock restoration, or plant a whole paddock with scattered trees, and remove grazing for 2 or more years until the new trees can withstand stock
- Plant individual trees with stock proof guards, or plant clumps of trees protected with temporary fencing

Increasing the number of paddock trees in a paddock will not only reduce the stress on individual trees, it can also increase the biodiversity values of that paddock. Studies conducted by ANU show that even a small increase in paddock tree density, from 2-4 trees/ha to 5-10 trees/ha, has a significant impact on the diversity of insectivorous bats and birds.

However we must be mindful that the tree we plant today will not fully deliver the same benefits that most existing paddock trees provide - at least not in the next 150 years! I am hopeful that through the innovation and adaptability that is continually shown by our rural communities we can address these issues, and that future generations will inherit agricultural landscapes that contain paddock trees.

Author: Mason Crane, Australian National University

# REGIONAL NURSERIES



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*Where do you get  
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## **RIVERINA WILDFLOWERS NATIVE NURSERY**

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Contact: Mike Schultz

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Mobile: 0427 535 914

natives@riverinawildflowers.com.au

www.riverinawildflowers.com.au

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## **MCKINDLAYS RIVERINE NURSERY**

1323 Perricoota Road, Moama NSW 2731

Contact: Felicity and John

Phone: (03) 5483 6240

Felicity: 0408 641 222

John: 0448 836 248

mckindlaysriverinenursery.com.au

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## **SANDY CREEK NURSERY**

416 Gap Flat Rd, Allan's Flat, VIC 3691

Phone: (02) 6027 1497

Fax: (02) 6027 1137

info@sandycreektrees.com.au

sandycreektrees.com.au

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## **JAYFIELDS NURSERY**

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Contact: Tim and Kelly Glass

Phone: (02) 6036 7235

www.jayfieldsnursery.com

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## **TULLA NATIVES**

120 Wakool Rd, Wakool NSW 2710

Contact: Stacey and Marc

Stacey: 0419 296 410

Marc: 0448 627 288

stacey.waylen@bigpond.com

www.tullanatives.com.au

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## **WAGGA NURSERY**

7161 Olympic Hwy, Wagga Wagga NSW 2650

Contact: Shane

Phone: (02) 6931 2600

enquiries@wagganursery.com

www.wagganursery.com

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## **TAYLOR'S TREES AND SHRUBS**

38 Emily St, The Rock NSW 2655

Contact: Ian Taylor

Phone: 0427 220 311

ian@taylorstreesandshrubs.com.au

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## AUSTRALIAN NATIVE FARM FORESTRY

6 Cobrawonga Rd, Cobram East VIC 3644

Contact: Ron

Phone: (03) 5873 5444

Mobile: 0417 1234 32

[www.iwanttrees.com.au](http://www.iwanttrees.com.au)

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## GROWABILITY NURSERY, MILDURA'S SOCIAL ENTERPRISE NURSERY

363 Cureton Ave, Mildura VIC 3500

Phone: (03) 5021 4117

[reception@christiecentre.com.au](mailto:reception@christiecentre.com.au)

[www.christiecentre.com.au](http://www.christiecentre.com.au)

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## PARK LANE NURSERY AND GARDEN CENTRE

95 Park Lane, Wangaratta, Vic, 3677

Phone: (03) 5721 6955

[www.parklanenursery.com.au/](http://www.parklanenursery.com.au/)

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## WANDOO ABORIGINAL CORPORATION

Lot 69 Howlong Road, Albury NSW

Phone: (02) 6023 6436

[wandooalbury@bigpond.com.au](mailto:wandooalbury@bigpond.com.au)

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## RHIMAHDEN NURSERY

11-15 Sea Lake – Swan Hill Road, Swan Hill, VIC 3585

Phone: (02) 6023 6436

Mobile: 0429 437 024

[rhimahden@bigpond.com](mailto:rhimahden@bigpond.com)

[www.rhimahdennursery.com.au](http://www.rhimahdennursery.com.au)

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## VALLEY TREES NURSERY

295 Cornish Rd, Ardmona Vic 3629

Contact: Adrian Taylor

Phone: (03) 5829 0280

[valleytrees@bigpond.com](mailto:valleytrees@bigpond.com)

[www.valleytreesnursery.com.au](http://www.valleytreesnursery.com.au)

note: open 25th June to 30th September each year

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## LEAVES & VINES NURSERY

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Mobile: 0429 899 631

[kmhire@gmail.com](mailto:kmhire@gmail.com)

note: Does a small amount of tube stock and you must have to email to order.

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## ROCHESTER NURSERY

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## RIVERINA NURSERY P/L

84-92 Mackay Avenue, Yoogali NSW 2680

Phone: (02) 6962 1135

[sales@riverinanursery.com.au](mailto:sales@riverinanursery.com.au)

[www.riverinanursery.com.au](http://www.riverinanursery.com.au)

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## REFERENCES AND FURTHER READING

Native Vegetation Guide for the Riverina; notes for land managers on its management and revegetation. Written by Kent, Earl, Mullins, Lunt and Webster (2002) Johnstone Centre, Charles Sturt University NSW. 413 pages.

Greening Australia, environmental not-for-profit organization specializing in revegetation services, seed banking, direct seeding, nurseries and community engagement. [www.greeningaustralia.org.au](http://www.greeningaustralia.org.au)

Local Land Services - Planting your patch. A guide to revegetation on your property. [www.lls.nsw.gov.au](http://www.lls.nsw.gov.au)

Australian National Botanic Gardens, [www.anbg.gov.au](http://www.anbg.gov.au)

Australian Native Plant Society, [www.anpsa.org.au](http://www.anpsa.org.au)

Habitat Network, [www.habitatnetwork.org](http://www.habitatnetwork.org)

NSW Office of Environment & Heritage, [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)

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