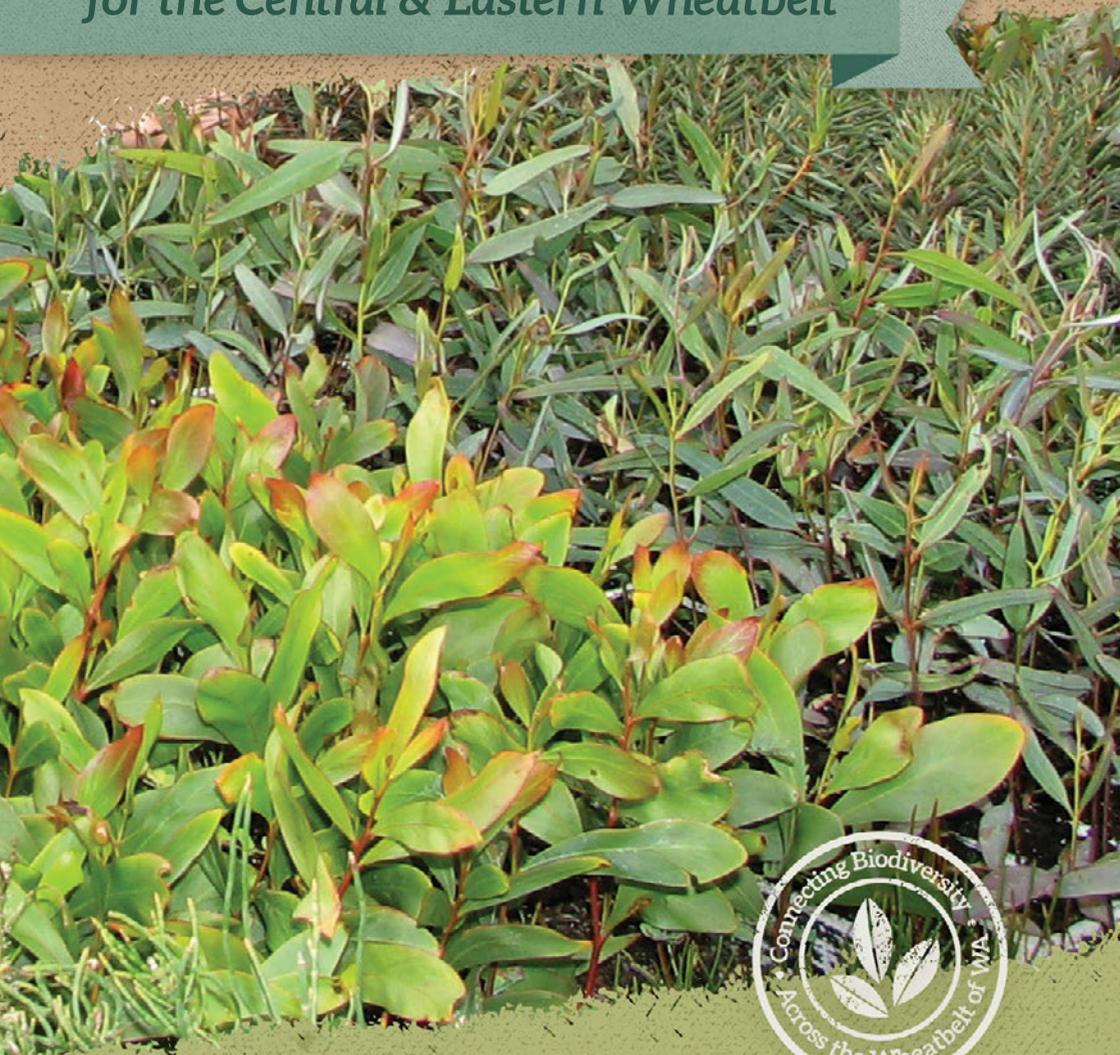


# REVEGETATION GUIDE

*by soil type*

*for the Central & Eastern Wheatbelt*



This publication is designed to assist land managers to identify the different vegetation and soil types that make up the Central and Eastern Wheatbelt and enable them to best decide the most suitable species when planning biodiverse revegetation.

All flower, tree and landscape photographs have been kindly donated by Stephen Fry, Natural Resource Management Officer, Bruce Rock.

For further information or assistance please contact the Natural Resource Management Officer at your local Shire.

Introductory pages written by Tracey Hobbs, Natural Resource Management Officer, Kellerberrin. Revegetation pages written by Stephen Fry, Natural Resource Management Officer, Bruce Rock

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Publication designed by Juliette Dujardin.

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Find out how to prepare your site for regeneration

Choose your soil type



Ken Hodgkiss & friend, John Butcher, Lawry Keeler & Merrilyn Temby

# INTRODUCTION

The Avon Catchment of WA has less than 10% of its original vegetation remaining.

This extremely fragmented remnant vegetation is of high conservation value because of its high level of genetic variation and endemism, and as habitat for threatened and endangered fauna and flora species.

The Central Wheatbelt of WA also has 41 Beard and Hopkins Vegetation Associations (BHVA) identified by the WA Department of Environment and Conservation as priority vegetation. Priority vegetation is recognised as having less than 10% remnant vegetation existing.

We are a collaboration of fifteen Shire Councils working together to provide Natural Resource Management (NRM) services for the central and eastern regions of the Wheatbelt in Western Australia.

This collaboration is essential in achieving maximum NRM outcomes on-ground across the farming community and NRM resources and services have been able to cover an area of 71,480 km<sup>2</sup>. This has created a greater opportunity for landholders and local government to work together to achieve large-scale environmental gains.



# USING THIS GUIDE

This publication has been written from a practical on-ground perspective for landholders to identify their own soil/vegetation types and the best species to use for their revegetation project.

This publication describes the different soil types, their associated vegetation type, and what defines them. This includes the dominant vegetation and other plants that make up the unique character of this area.

For each soil/vegetation type there is a suggested list of species to be used for revegetation of that area. Some of the species of the original vegetation have not been included in this list as they are difficult or even impossible to grow horticulturally and therefore unable to be sourced through local nurseries.

## TIP

Several photos of defining flowering shrub species have been included as a reference guide for what you might see in the original vegetation type. Generally these are plants that you will not be able to find at farm tree nurseries.



# PREPARATION AND ESTABLISHMENT OF YOUR SITE

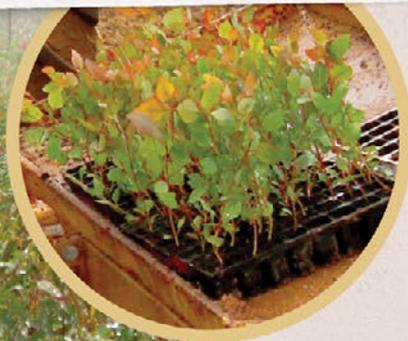
There are many different methods of revegetation but the one outlined below is the most common and successful process for the Central and Eastern Wheatbelt.

## Planning

To ensure the availability of the preferred seedlings you will need to place an order with your chosen nursery by November the year before you plan to revegetate.

## TIP

*There are specialist biodiversity nurseries where difficult to source species can be ordered. Contact your local Natural Resource Management Officer for further details.*



## Site Preparation

### Ripping

If your site has a hard pan it may be necessary to rip 4-6 months prior to planting as this will allow the moisture to penetrate the soil and enable the seedling roots to spread.

### Pre-planting Weed Control

Weed control is important to conserve the available soil moisture and avoid competition with your seedlings. This can be done using a knockdown (Glyphosphate) herbicide. Your local agronomist can assist you with further recommendations.

### Pest Control

If rabbits are abundant in the area it would be advisable to carry out some form of rabbit control in the summer/autumn prior to planting. This could be in the form of baiting, warren ripping or fumigation.

### Planting

The most common method of planting in the area is with a one pass Chatfield's Tree Planter. This machine will allow you to rip and scalp the site at the same time you are planting the seedlings. These machines can usually be hired from your local Shire or Landcare group.

For the best success rate it is important that the seedlings are planted in the best possible conditions. This is usually in July when there is soil moisture and potential rain to help establish the seedlings.

### Hand Planting

Hand planting can be just as quick and more successful than machine planting, if the preparation is well done. A Chatfield Tree Planting machine with the press wheels removed creates the perfect hand planting environment. It affords you the opportunity to return to the site and replant or seed Sandalwood in subsequent years.



## Post-Planting

### Pest Control

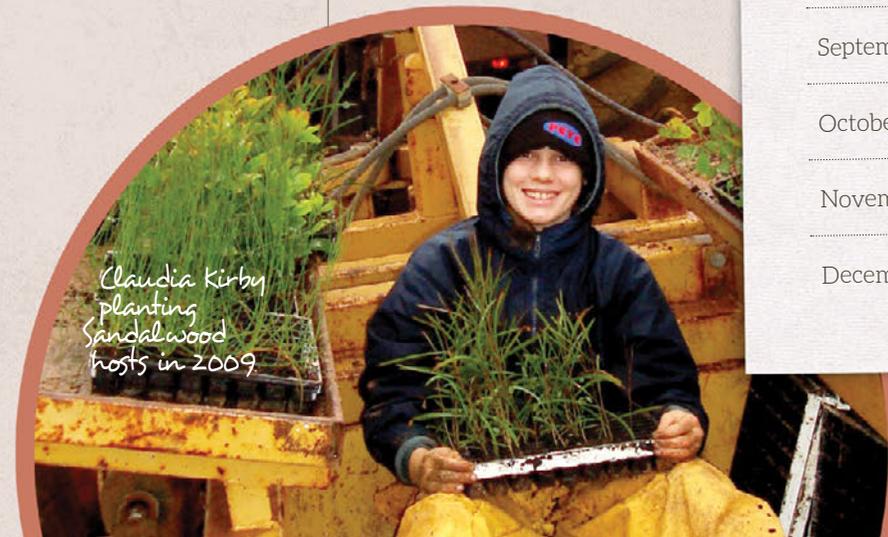
Post planting rabbit control may be required if rabbits pose a threat to seedlings. You will first notice this where the site is close to existing vegetation.

### TIP

*Rabbit control will be more important in dry years when they are seeking food. In these circumstances kangaroos may also pose a threat to seedlings.*

### Stock Restriction

It is essential to restrict stock from the site until the seedlings have properly established. For a biodiverse site this will be at least four years. If you are revegetating with fodder shrubs as part of a grazing system this time frame can be reduced to 18 months. When stock are allowed access to the site, seedlings will need to be closely monitored for signs of grazing damage.



*Claudia Kirby planting sandalwood hosts in 2009*

# REVEGETATION TIMELINE



Order seedlings from nursery



Rabbit control



Weed control



Site preparation



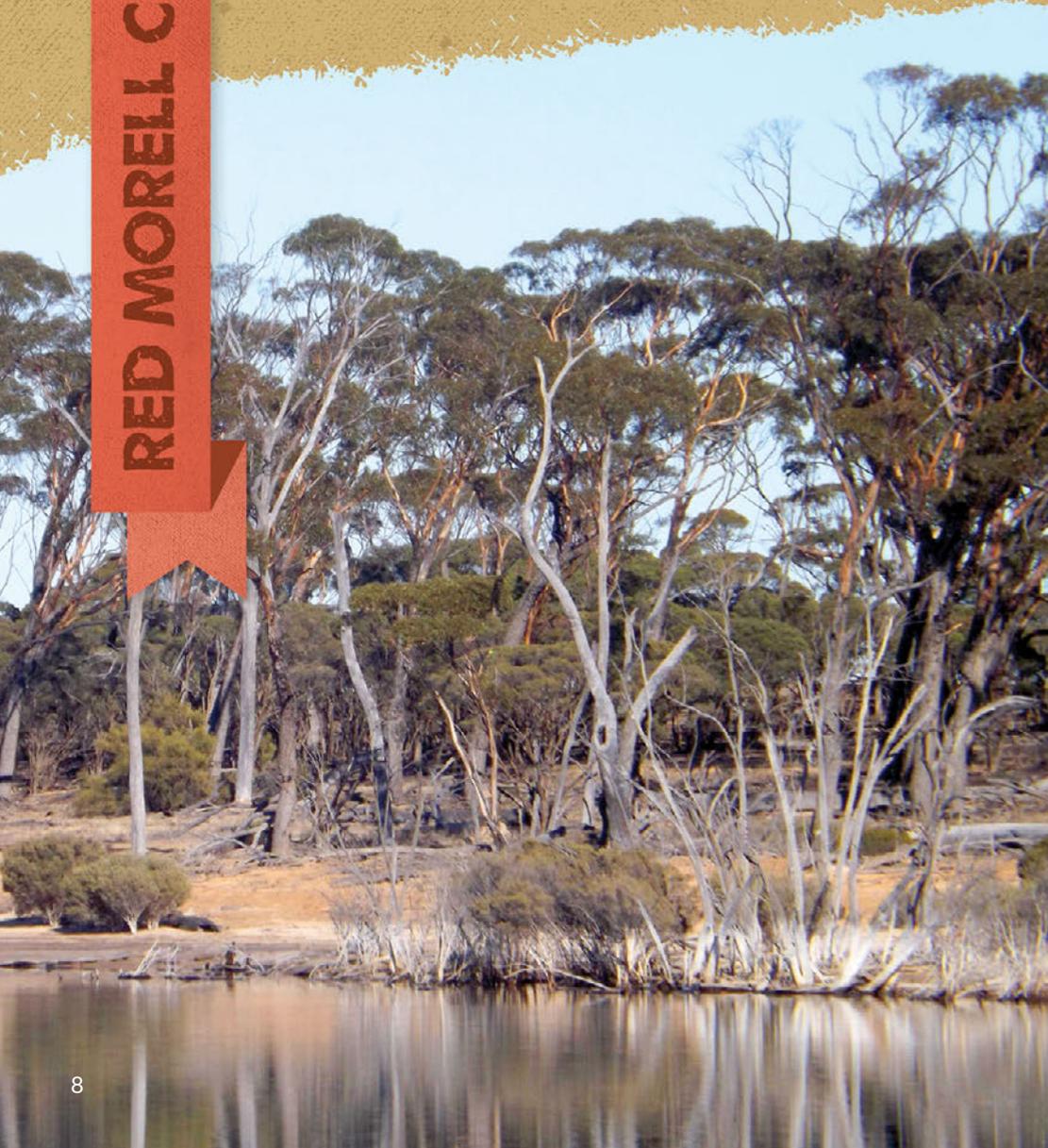
Planting



Monitor & survival count

|           | First Year | Second Year | Third Year |
|-----------|------------|-------------|------------|
| January   |            |             |            |
| February  |            |             |            |
| March     |            |             |            |
| April     |            |             |            |
| May       |            |             |            |
| June      |            |             |            |
| July      |            |             |            |
| August    |            |             |            |
| September |            |             |            |
| October   |            |             |            |
| November  |            |             |            |
| December  |            |             |            |

Morell is probably the most difficult soil to work with, apart from heavy clays, which are usually close by. The soil is structureless, fine and dusty with a propensity to erode easily.



**Characteristics**

- \* Morell has very saline subsoil.
- \* Once the topsoil erodes, salinity is sure to follow.
- \* Morells are often associated with saline landscapes.
- \* The understory is sparse and dominated by saltbush species.
- \* As many as 10 saltbush species can be identified under morell canopies.
- \* *Melaleuca pauperiflora* is the most common mid story species associated with Morell.
- \* Gimlet often interacts at the margins to heavy clays and if Salmon Gum is present, double check to make sure that it isn't *Eucalyptus urna*, which grows with Morell and looks very similar to Salmon Gum.
- \* Morell (*Eucalyptus longicornis*) can survive in saline margins and heavy clays and performs well in revegetation projects.

**Standard Nursery Species**

|  |                   |
|--|-------------------|
| <i>Acacia hemetiles</i>                  | Tan Wattle        |
| <i>Atriplex amnicola</i>                 | River Saltbush    |
| <i>Atriplex nummularia</i>               | Old Man Saltbush  |
| <i>Atriplex semibaccata</i>              | Creeping Saltbush |
| <i>Atriplex vesicaria</i>                | -                 |
| <i>Casuarina obesa</i>                   | Swamp Sheoak      |
| <i>Eucalyptus longicornis</i>            | Red Morell        |
| <i>Eucalyptus loxophleba-lissophloia</i> | Oil Mallee York   |
| <i>Eucalyptus myriadena</i>              | -                 |
| <i>Eucalyptus salubris</i>               | Gimlet            |
| <i>Enchylaena tomentosa</i>              | Ruby Saltbush     |
| <i>Maireana brevifolia</i>               | Bluebush          |
| <i>Melaleuca pauperiflora</i>            | Boree             |

Things you may see in Morell country but won't be able to get from the nursery...



Gimlet country is characterised by clay. Gimlet soils will be hard, sticky, grey to red clays. You will need plenty of horsepower to ensure that it is ripped well for a good revegetation outcome.



## Characteristics

- \* Whether red cracking clays or grey clays, *Eucalyptus salubris* will dominate on valley floor environments.
- \* Gimlet is often joined by Salmon Gum, Morell or *Eucalyptus urna*.
- \* The soils are generally in the valley floor and as the soil slope rises, other species will take over.
- \* Gimlet can also grade to *Eucalyptus capillosa* or to York Gum.
- \* *Eucalyptus loxophleba ssp lissophloia* can also be associated with Gimlet.
- \* It is common to see all of the mentioned Eucalypts growing together where the soil structures are constantly changing.

## Standard Nursery Species

|  |                        |
|--|------------------------|
| <i>Acacia hemetiles</i>                      | Tan Wattle             |
| <i>Atriplex semibaccata</i>                  | Creeping Saltbush      |
| <i>Atriplex vesicaria</i>                    | -                      |
| <i>Eucalyptus longicornis</i>                | Red Morell             |
| <i>Eucalyptus loxophleba ssp lissophloia</i> | York Gum<br>Oil Mallee |
| <i>Eucalyptus myriadena</i>                  | -                      |
| <i>Eucalyptus salubris</i>                   | Gimlet                 |
| <i>Enchylaena tomentosa</i>                  | Ruby Saltbush          |
| <i>Melaleuca pauperiflora</i>                | -                      |
| <i>Maireana brevifolia</i>                   | Bluebush               |

Things you may see in clay but won't be able to get from the nursery...

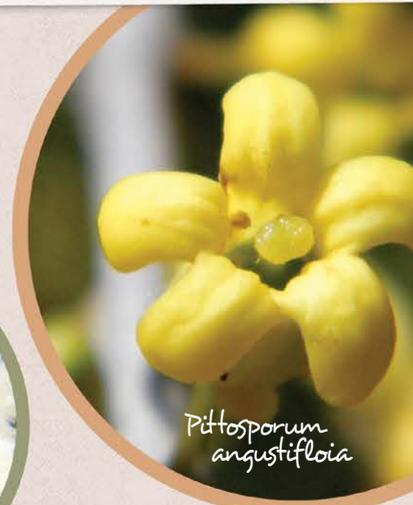
*Acacia hemetiles*



*Ptilotus spathulatus*



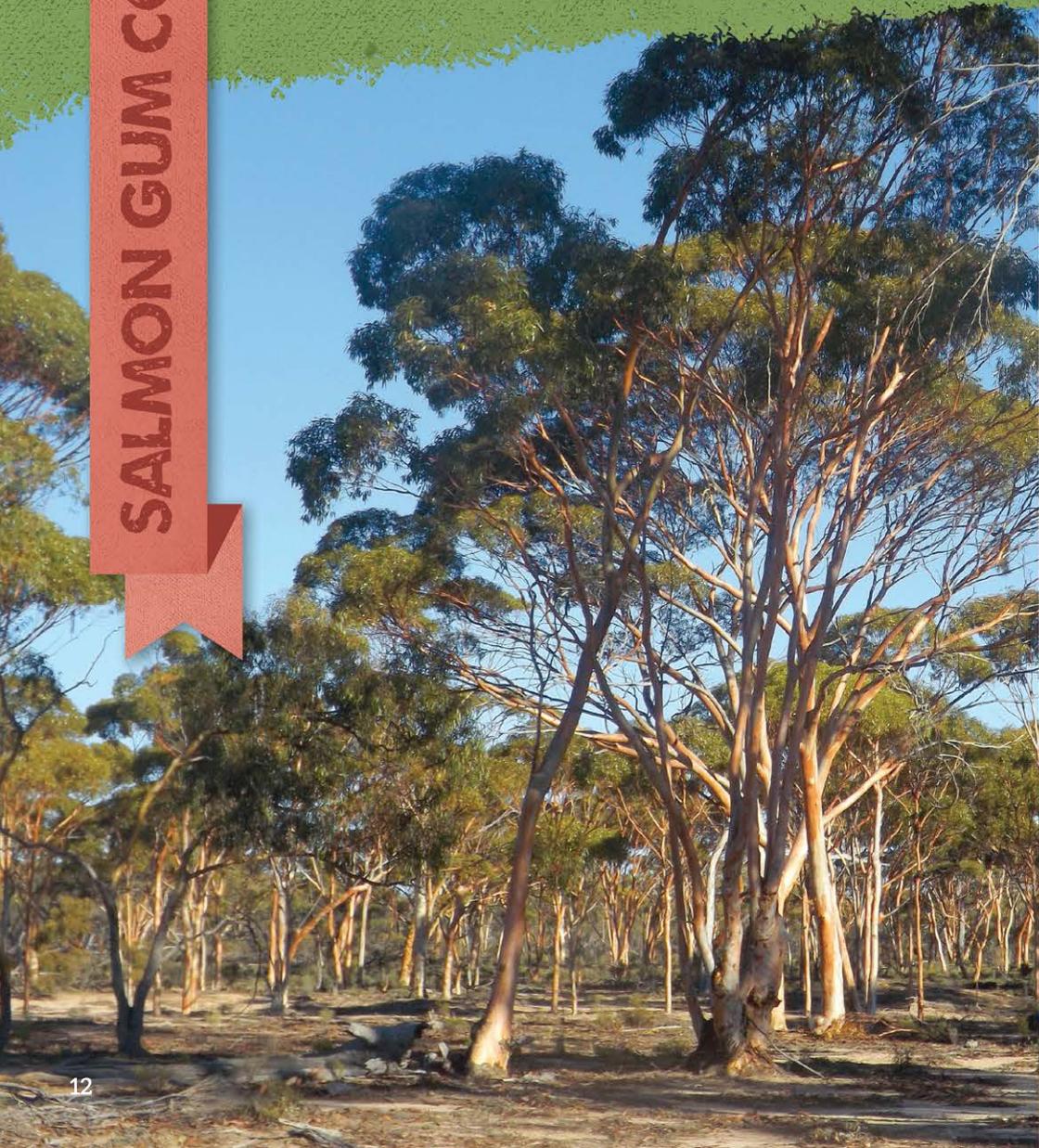
*Pittosporum angustifloia*



*Grevillea huegellii*



Salmon Gum country (*Eucalyptus salmonophloia*) is perhaps the most reliable and productive soil in the Wheatbelt.



**Characteristics**

- \* With loamy or sandy topsoils and deep loamy clays beneath, this soil will support many other Eucalypts and understory and mid story species.
- \* Many of the soils are granite derived, but in the valleys the soils can be grey clays with calcium nodules present in the soil.
- \* *Eucalyptus salubris* and *Eucalyptus loxophleba* are often associated with Salmon Gums as the soils grade to heavier clays or lighter loams.
- \* Once Salmon Gum country becomes salinised, it is best not to try to reintroduce it. Like many soils, salinity destroys the soil structure and it is best to refer to the saline systems page for revegetation options.

.....

**Things you may see in Salmon Gum country but won't be able to get from the nursery...**

**Standard Nursery Species**

|                                 |                   |
|---------------------------------|-------------------|
| <i>Acacia acuminata</i>         | Jam               |
| <i>Acacia hemetiles</i>         | Tan Wattle        |
| <i>Acacia microbotrya</i>       | Manna Wattle      |
| <i>Allocauarina huegeliana</i>  | Rock Sheoak       |
| <i>Atriplex semibaccata</i>     | Creeping Saltbush |
| <i>Atriplex vesicaria</i>       | -                 |
| <i>Enchylaena tomentosa</i>     | Ruby Saltbush     |
| <i>Eucalyptus loxophleba</i>    | York Gum          |
| <i>Eucalyptus salmonophloia</i> | Salmon Gum        |
| <i>Eucalyptus salubris</i>      | Gimlet            |
| <i>Eucalyptus longicornis</i>   | Morell            |
| <i>Melaleuca lateriflora</i>    | Diamond Myrtle    |
| <i>Melaleuca pauperiflora</i>   | -                 |
| <i>Melaleuca uncinata</i>       | Brushwood         |
| <i>Maireana brevifolia</i>      | Bluebush          |



Perhaps the most desirable farming country, with loamy soils, often stony with high productivity and well drained. As a medium for revegetation, it is unsurpassed.



**Characteristics**

- \* This soil retains high levels of soil moisture well.
- \* The soil does however, transition into other soils and granite and it can contain pockets of White Gum, Mallee, Salmon or Gimlet. It is impossible to plant to soil type when this occurs, so it is wise to include a variety of other Eucalypts in your seedling list.
- \* York Gum (*Eucalyptus loxophleba*) is the most versatile species there is.
- \* Sub-species such as *lissophloia* can handle clays and has even been used on sand and gravel for Oil Mallee plantations.
- \* Sandalwood (*Santalum spicatum*) occurs most heavily on these soils in association with *Acacia acuminata* and sandalwood plantations do very well on this country.
- \* Jam country will support a large variety of species and naturally has a huge diversity of annuals and understory species.

.....  
**Things you may see in Jam country but won't be able to get from the nursery...**

**Standard Nursery Species**

|                                 |                      |
|---------------------------------|----------------------|
| <i>Acacia acuminata</i>         | Jam                  |
| <i>Acacia hemetiles</i>         | Manna Wattle         |
| <i>Acacia lasiocalyx</i>        | Shaggy Wattle        |
| <i>Allocasuarina huegeliana</i> | Rock Sheoak          |
| <i>Atriplex semibaccata</i>     | Creeping Saltbush    |
| <i>Callistemon phoeniceus</i>   | Bottlebrush          |
| <i>Eucalyptus capillosa</i>     | Inland Wandoo        |
| <i>Eucalyptus loxophleba</i>    | York Gum             |
| <i>Eucalyptus salmonophloia</i> | Salmon Gum           |
| <i>Eucalyptus salubris</i>      | Gimlet               |
| <i>Enchylaena tomentosa</i>     | Ruby Saltbush        |
| <i>Leptospermum erubescens</i>  | Tee Tree             |
| <i>Melaleuca elliptica</i>      | Granite Myrtle (red) |
| <i>Melaleuca radula</i>         | Mauve Myrtle         |
| <i>Melaleuca uncinata</i> group | Brushwood            |
| <i>Santalum spicatum</i>        | Sandalwood           |



*Waitzia acuminata*



*Dianella revoluta*



*Calytrix leschenaultia*



*Thelymitra macrophylla*

Gravel soils are commonly covered with a sandy topsoil of varying depths. On ridge lines this sand has eroded and leaves a purely gravel conglomerate.



**Characteristics**

- \* Gravel soils are dominated by Proteaceae family members and Allocasuarinas.
- \* Eucalypts tend to only dominate where the sandy topsoil is deeper.
- \* *E. burracoppinensis* tends to be the dominant Eucalypt.
- \* As the top soil deepens, usually with yellow sand plain, *E. leptapoda* takes over as the dominant Eucalypt.
- \* Gravel soils are usually species rich.
- \* As the photo demonstrates, species which make up mid story in most habitats, tend to dominate as an overstory.
- \* Grevilleas, Hakeas, Calothamnus, Acacias, Persoonias and Melaleucas are in abundance.
- \* Often, when burnt or severely disturbed, gravel soils will flourish with species, not seen in mature shrub land.
- \* Gravel soils will often have white rocky soils below them, as they grade to White Gum soils.

.....  
**Things you may see in gravel but won't be able to get from the nursery...**

**Standard Nursery Species**

|   |                    |
|---|--------------------|
| <i>Acacia assimilis</i>                   | Narrow Leaf Wodjil |
| <i>Acacia neurophylla</i>                 | Broad Leaf Wodjil  |
| <i>Acacia resinomarginea</i>              | Old Man Wodjil     |
| <i>Allocasuarina acutivalvis</i>          | Black Sheoak       |
| <i>Allocasuarina campestris</i>           | Tammar             |
| <i>Allocasuarina huegeliana</i>           | Rock Sheoak        |
| <i>Calothamnus gilesii</i>                | Claw Flower        |
| <i>Eucalyptus burracoppinensis</i>        | Burracoppin Mallee |
| <i>Eucalyptus capillosa</i>               | White Gum          |
| <i>Eucalyptus capillosa ssp polyclada</i> | Mallee White Gum   |
| <i>Eucalyptus plenissima</i>              | Oil Mallee         |
| <i>Leptospermum erubescens</i>            | Tee Tree           |
| <i>Melaleuca cordata</i>                  | Pom Poms           |
| <i>Melaleuca uncinata</i>                 | Brushwood          |



*Isopogon scabriusculus*



*Grevillea asteriscosa*



*Grevillea paradoxa*



*Stylidium species*

This view of Inland White Gums (*Eucalyptus capillosa*) invariably lacks mid or significant understory species. The white clay, rocky soils grow a variety of Eucalypt species, but White Gum usually predominates.



**Characteristics**

- \* This soil consists of sandy, white to grey topsoil over a deeper layer of decayed granite, white clayey rock, clay or gravel.
- \* Depending on the depth to the underlying base soil and its nature, dominant Eucalypts will vary toward Mallee species such as *erythronema*, *eremophila* or *salmonophloia* as the topsoil increases over clay.
- \* The shallower the soil gets, species such as *E. capillosa* ssp *polyclada* on white rocky soil or *burracoppinensis* on gravel will prevail.
- \* *Eucalyptus capillosa* can exist on all these soils and is a very versatile tree to plant on diverse shallow white soils. It will also thrive on gravel.

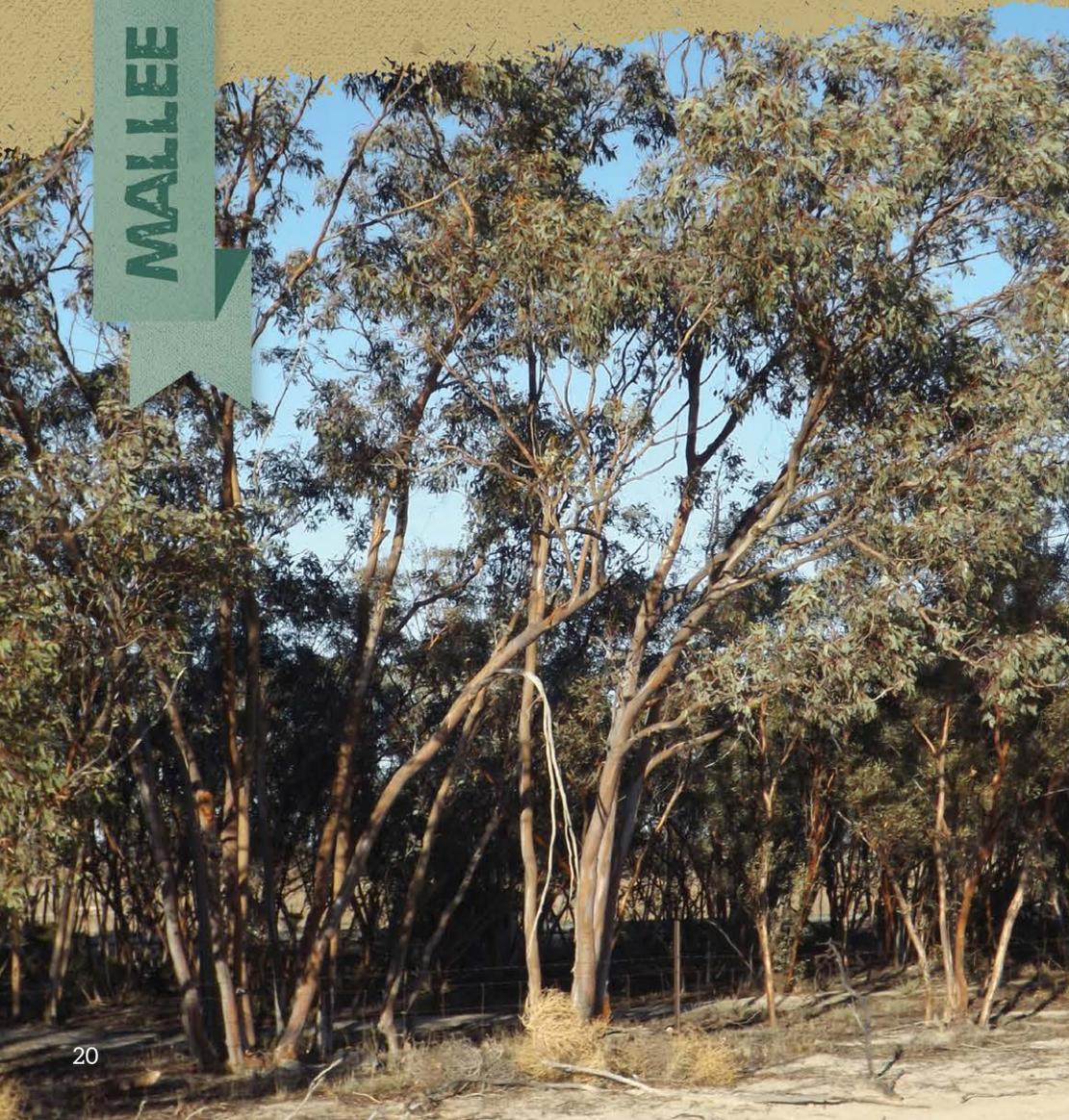
.....  
**Things you may see on White Gum soils but won't be able to get from the nursery...**

**Standard Nursery Species**

|  |                     |
|--|---------------------|
| <i>Acacia acuminata</i>                          | Jam                 |
| <i>Acacia hemetiles</i>                          | Tan Wattle          |
| <i>Acacia microbotrya</i>                        | Manna Wattle        |
| <i>Allocasuarina campestris</i>                  | Tammar              |
| <i>Allocasuarina huegeliana</i>                  | Rock Sheoak         |
| <i>Atriplex semibaccatta</i>                     | Creeping Saltbush   |
| <i>Callistemon phoeniceus</i>                    | Bottlebrush         |
| <i>Eucalyptus capill</i>                         | White Gum           |
| <i>Eucalyptus capillosa</i> ssp <i>polyclada</i> | Mallee White Gum    |
| <i>Eucalyptus salmonophloia</i>                  | Salmon Gum          |
| <i>Melaleuca lateriflora</i>                     | Diamond Leaf Myrtle |
| <i>Melaleuca uncinata</i>                        | Brushwood           |
| <i>Enchylaena tomentosa</i>                      | Ruby Saltbush       |



Many soil types can support Mallees. Mallee simply refers to a tree's ability to reshoot from its stump after being burnt, ringbarked, sawn or suffered some other disaster which would normally kill other non-Mallee trees.



## Characteristics

- \* White Gums and York Gums, although trees, exhibit Mallee characteristics, whereas Gimlet or Salmon Gum would die after being cut down or burnt.
- \* Mallee country is often transition country, where a soil changes from one type to another.
- \* It is often duplex soil of sand over clay and is very common in association with or below White Gum country.
- \* York Gum Oil Mallee such as *Eucalyptus loxophleaba lissophloia* also exist in redder soils with higher clay content.
- \* A large range of Eucalypt species can be classed as Mallees, which tend to dominate the landscape upon which they grow.

.....  
**Things you may see in Mallee country but won't be able to get from the nursery...**

## Standard Nursery Species

|   |                       |
|---|-----------------------|
| <i>Acacia acuminata</i>                   | Jam                   |
| <i>Acacia microbotrya</i>                 | Manna Wattle          |
| <i>Acacia hemetiles</i>                   | Tan Wattle            |
| <i>Allocasuarina campestris</i>           | Tammar                |
| <i>Callistemon phoeniceus</i>             | Bottlebrush           |
| <i>Eucalyptus calycogona</i>              | Square Fruited Mallee |
| <i>Eucalyptus capillosa</i>               | Inland Wandoo         |
| <i>Eucalyptus capillosa ssp polyclada</i> | Mallee Wandoo         |
| <i>Eucalyptus celastroides</i>            | -                     |
| <i>Eucalyptus eremophila</i>              | -                     |
| <i>Eucalyptus erythronema</i>             | -                     |
| <i>Enchylaena tomentosa</i>               | Ruby Saltbush         |
| <i>Melaleuca lateriflora</i>              | Diamond Leaf Myrtle   |
| <i>Melaleuca uncinata (hamata)</i>        | Brushwood             |



Sandplain means a lot of different things to different people. Different regions exhibit different types of sandplain. Some are actually Mallee sands, some are deep yellow sand, some are over gravel, deep or shallow and some are just plain sand.



*Eucalyptus leptapoda*

**Characteristics**

- \* The proportion of clay in the sand tends to define its quality.
- \* Like gravels, many of the endemic species are difficult to obtain from commercial seedling nurseries.
- \* When ordering species for sandplain, there are a couple of nurseries who specialise in hard to get species. They are expensive, but worth the effort if you want to achieve a worthwhile result.
- \* Sandplain is rarely homogeneous. It will grade to gravel or clay eventually and it's wise to use species from neighbouring soil types in your species mix.
- \* Care should be taken when revegetating sandplain to avoid wind erosion. Once disturbed, this soil type can erode very quickly, damaging young seedlings in the process.

Things you may see in the sandplain but won't be able to get from the nursery...

**Standard Nursery Species**

|                                    |                    |
|------------------------------------|--------------------|
| <i>Acacia acuminata</i>            | Jam                |
| <i>Acacia assimilis</i>            | Narrow Leaf Wodjil |
| <i>Acacia neurophylla</i>          | Broad Leaf Wodjil  |
| <i>Acacia resinomarginea</i>       | Old Man Wodjil     |
| <i>Allocasuarina campestris</i>    | Tammar             |
| <i>Banksia prionotes</i>           | Acorn Banksia      |
| <i>Calothamnus quadrifidus</i>     | Clawflower         |
| <i>Eucalyptus burracoppinensis</i> | Burracoppin Mallee |
| <i>Eucalyptus capillosa</i>        | Inland Wandoo      |
| <i>Eucalyptus leptapoda</i>        | Tammin Mallee      |
| <i>Eucalyptus macrocarpa</i>       | Mottlecah          |
| <i>Leptospermum erubescens</i>     | Tee Tree           |
| <i>Melaleuca cordata</i>           | Pom Poms           |
| <i>Melaleuca hamata</i>            | Brushwood          |
| <i>Santalum spicatum</i>           | Sandalwood (seed)  |

*Conospermum stoechadis*

*Grevillea cagiana*

*Grevillea petrophiloides*

*Grevillea eriostachya*

When drainage lines cut through sandplain or sandy floodplains, a highly diverse landscape results. The photo depicts *Eucalyptus salicola* (Salt Salmon Gum) rising from thickets of *Melaleuca* at Yarding.



**Characteristics**

- \* Healthy saline systems depicted here are rare.
- \* The depressions will often have the dead remnants of what used to be dense Tee Tree thickets.
- \* This soil type is highly vulnerable to soil erosion and needs fencing from the rest of the paddock, so sheep don't camp on the area causing further erosion.
- \* Revegetation is often highly successful in the sandy rises off the edge of the depressions.
- \* Sustainable agriculture crops such as Saltbush grazing areas or Brushwood plantations can be very productive.
- \* Biodiversity plantings are also very successful and can include a large variety of species.

.....

**Things you may see in saline systems but won't be able to get from the nursery...**

**Standard Nursery Species**

|                                |                       |
|--------------------------------|-----------------------|
| <i>Atriplex amnicola</i>       | River Saltbush        |
| <i>Atriplex nummularia</i>     | Old Man Saltbush      |
| <i>Atriplex semibaccata</i>    | Creeping Saltbush     |
| <i>Callistemon phoeniceus</i>  | Bottlebrush           |
| <i>Casuarina obesa</i>         | Swamp Sheoak          |
| <i>Eucalyptus salicola</i>     | Salt Salmon Gum       |
| <i>Eucalyptus sargentii</i>    | Salt River Gum        |
| <i>Enchylaena tomentosa</i>    | Ruby Saltbush         |
| <i>Leptospermum erubescens</i> | Tee Tree              |
| <i>Melaleuca adnata</i>        | -                     |
| <i>Melaleuca atroviridis</i>   | Brushwood sp          |
| <i>Melaleuca lateriflora</i>   | Diamond Leaf Tee Tree |
| <i>Melaleuca thyoides</i>      | -                     |
| <i>Melaleuca uncinata</i>      | Brushwood             |
| <i>Maireana brevifolia</i>     | Bluebush              |

*Caladenia vulgata*



*Hibbertia rupicola*



*Clematis delicata*



*Acacia uniphisillis*





Australian Government



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