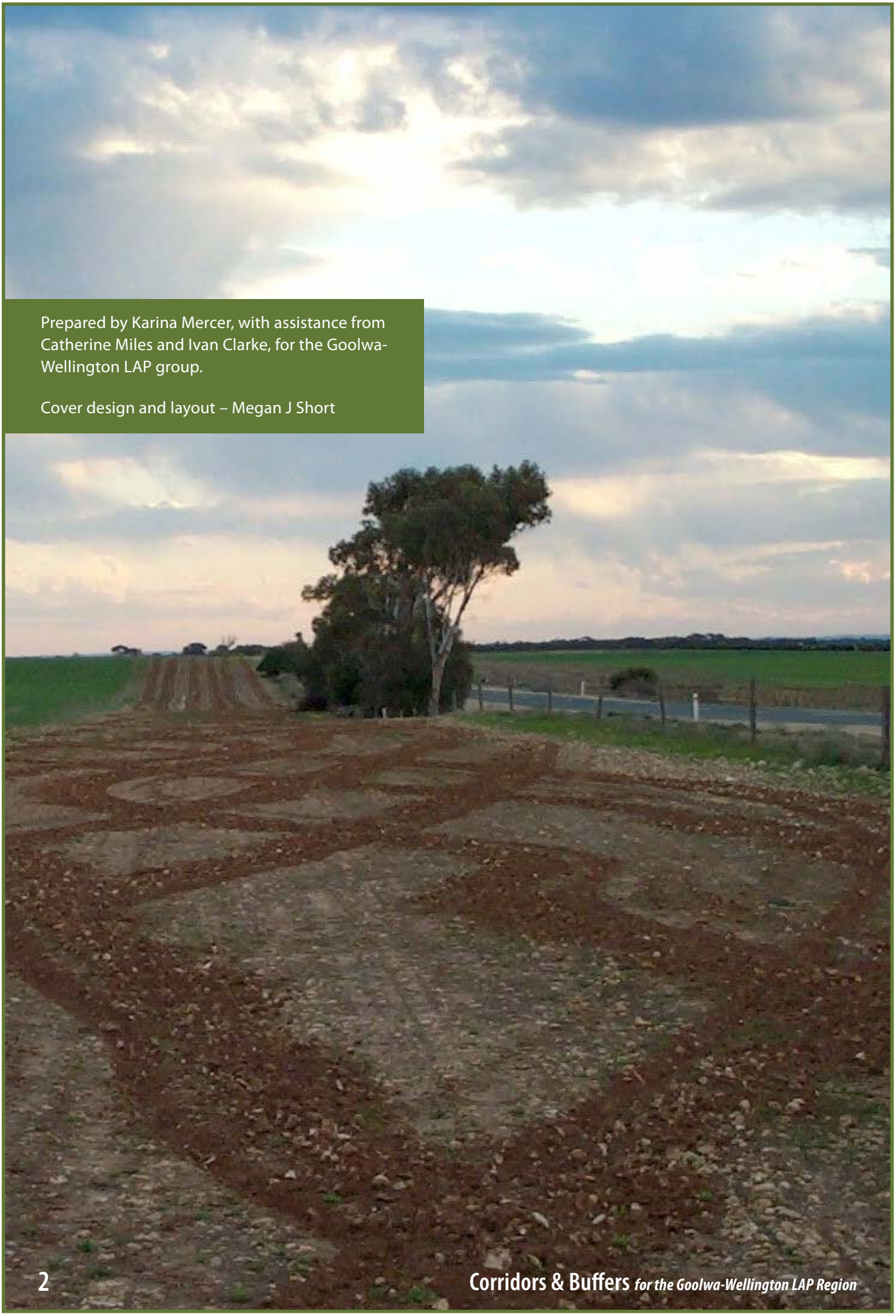
Corridors & Buffers

for the Goolwa-Wellington LAP Region

GOOLWA TO WELLINGTON LOCAL
ACTION PLANNING ASSOCIATION INC

Government of South Australia
South Australian Murray-Darling Basin
Natural Resources Management Board



Prepared by Karina Mercer, with assistance from Catherine Miles and Ivan Clarke, for the Goolwa-Wellington LAP group.

Cover design and layout – Megan J Short

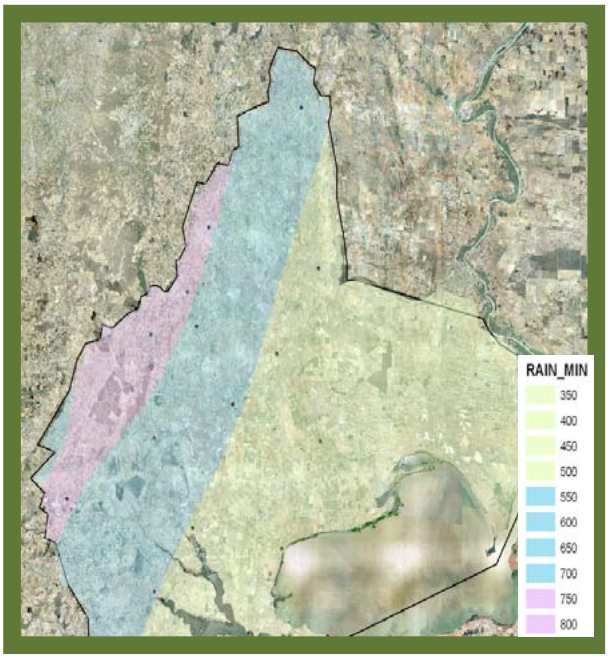
Corridors & Buffers *for the Goolwa-Wellington LAP Region*

1 Introduction

1.1 Purpose of fact sheets

This fact sheet is intended as a guide to assist in designing, managing, and maintaining corridors and buffers on your property. It uses broad rainfall zones to suggest appropriate species for each zone. Rainfall will vary across zones, as will soils, which will determine the most suitable species to plant. Looking at any remnant vegetation on your property, or in the vicinity such as along roadsides, can help you to select the best species to suit the conditions on your site.

For assistance regarding specific species appropriate to your property, please speak with your local LAP officer.



1.2 Catchment region and rainfall zones

The catchment area for the Goolwa-Wellington LAP covers a large area, from Victor Harbor and Hindmarsh Island in the south to Meadows, Kanmantoo and Brukunga further north. It incorporates the Alexandrina Council area, and parts of the Mt Barker, Murray Bridge, and Barossa Councils. Over such a large area there are a variety of possible site conditions. To help in suitable species selection, broad regional rainfall zones have been used to determine species selection.

1.2.1 Low rainfall: 300-500mm

This area extends west of the River Murray (eastern boundary of the GWLAP). Major towns include Wellington and parts north, and Port Elliot, Goolwa, Strathalbyn and Callington. Typical vegetation types included are grasslands and mallee.

1.2.2 Medium rainfall: 500-750mm

Predominantly the eastern flanks of the Mt Lofty Ranges. Major towns include Victor Harbor and Macclesfield. Typical vegetation types included are eastern grasslands, Blue Gum, River Red Gum, and Pink Gum grassy woodlands.

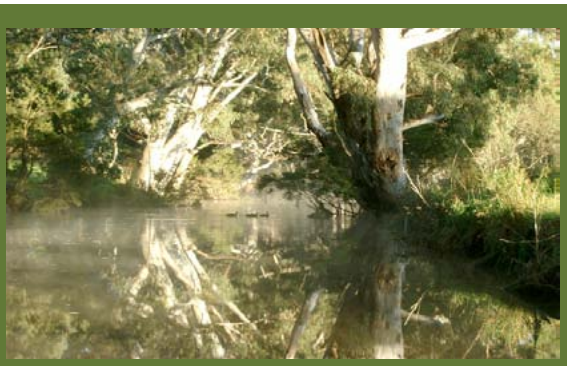
1.2.3 High rainfall: 750+mm

Major towns include Meadows, Kuitpo, Mt Compass and Mt Barker. Vegetation is predominantly stringybark forests and Red Gum, Manna Gum woodlands.

2 Corridors and Buffers

2.1 Purpose and benefits

Consider why you are undertaking the planting. What is its main purpose? Is there remnant vegetation on your property that you want to buffer? Do neighbouring properties have remnant patches with which it would be good to create habitat links? Are you trying to create a habitat area in an otherwise open landscape? Corridors can be an effective supplementary conservation measure accompanying other conservation solutions such as retention of blocks of remnant native vegetation. Buffer zones are useful in reducing 'edge effects' from external impacts such as herbicide drift, nutrients, altered microclimates and soil structure.



Riparian vegetation can act as a filter for sediment and nutrients; provide shade and reduce fluctuations in water temperature and oxygen levels; strengthen and stabilise banks, thus reducing erosion and silting of streams; and provide terrestrial and stream habitat –litter and other debris provide food for stream biota, and logs (snags) provide habitat for invertebrates and fish.

Adult native birds such as Ibis can eat 200 grams of pasture insects including crickets and beetle larvae a day. Multiply that by a flock of several thousand and estimates of half-a-million pasture grubs a day are realistic.
Native flora also helps encourage insects responsible for the pollination of plants, and dispersal of seeds and fruits.

Corridors have numerous benefits. They can:

- Be used to **establish** native vegetation
- Act as a buffer to **protect** native bush from impacts such as chemical spray drift or grazing
- **Link** patches of remnant bush
- **Incorporate** vegetation along creek lines
- **Reduce** erosion
- **Manage** salinity and waterlogging, erosion, and protect water quality
- **Create** carbon sinks addressing climate change
- **Increase** soil fertility, provide shelter and shade
- **Aesthetics**, enhancing the amenity of human environments

3 Design and Placement

3.1 Choosing a location

When planning a corridor or buffer, site selection is important. Buffers may be useful to protect vegetation from chemical spray drift, or to help stabilise a creek line. Corridors are best placed where they can link larger habitat areas – take note of existing areas of revegetation, remnants or other areas such as reserves. Consider how making linkages between these areas can benefit not only your property but also the local flora and fauna.

To be most effective corridors should have a short distance between remnants (<1km) and be as wide as possible, but consideration should be given to other factors such as management and maintenance. A 100m wide corridor is impressive but may require significant time to manage appropriately. The most effective corridor plantings are those that are a patch rather than linear, and link vegetation within the immediate area rather than long risky corridors.

Habitat creation adjacent to existing remnants provides greater opportunity for recruitment of native flora species, as well as providing habitat for native fauna species. The size of the protected area is increased, and exposure to edge effects such as spray drift and thermal variations is reduced.

Take note of soils and topography such as dry slopes and creek lines. Match plant species to the location, i.e. don't use species from damp swampy areas along exposed ridgelines. Species should be planted that are suited to the area and the landform, from locally collected seed (within <5km where possible).

3.2 Creating patchiness and structural diversity

Establish layers of vegetation by planting diversely – structural diversity maximises available resources for native fauna. Include upper canopy, understorey and groundcover vegetation and create patches within each layer. Different types of species within each layer provide different resources also – rough-barked trees such as stringybarks provide habitat under loose bark for invertebrates that are food for lizards, birds and other animals. A lack of understorey plants can favour aggressive increaser species such as Noisy Miners, which can displace less-aggressive species.

Consider, if you are trying to mimic neighbouring remnants, what type of habitats and plants occur naturally. For example, if the area is naturally grassland, work with this rather than trying to create closed woodland. The area may naturally have had minimal trees. In addition, by planting trees extensively in large grassy areas, it is likely that the nature of the grassland will change, and may be lost due to shading.

Habitat features such as dead trees with hollows should be retained as these provide nesting and perching resources for many woodland birds and birds of prey. Ground-layer features such as logs, rocks, cryptograms (lichens and mosses), leaf litter, low vegetation and open spaces provide habitats

suitable for a variety insects and animals such as lizards. Larger predatory species are in turn dependant upon these smaller animals. Such habitat features also encourage soil fauna and fungi to develop, many of which are needed for healthy vegetation (such as mycorrhiza fungi), as well as microphytic crust that help reduce soil erosion.

Avoid neat rows of plants – in natural environments plants are spaced unevenly; revegetation for biodiversity should attempt to mimic this, as it provides the best opportunity for a suite of fauna species rather than restricting to a few, by providing a diverse range of habitats. For example, open grassy areas provide habitat for robins and bird-of-prey such as kestrels, while more closely spaced vegetation provides habitat for more secretive species such as thornbills and wrens.

3.3 Size and shape

Size of patches influences other factors such as habitat availability for fauna, edge effects, potential for outside events to have great impact (e.g. fire through a small patch is likely to be more devastating to restricted populations than through a larger patch where it is possible for areas to remain unburnt, thus providing resources).

As most revegetation sites are small, increasing the size of revegetation areas may be required. Larger patches support higher numbers and diversity of fauna depending on the nature of the vegetation type. Increasing the width of linear strips can avoid edge effects, encourage development of microclimates, and support a greater number of wildlife. For example, it appears that Hooded Robins need a patch area of 100ha in order to breed and persist. While revegetation projects of this scale are rare, it is possible to place revegetation efforts such that they add to existing remnants, thus increasing the size of patches overall. A family of Superb Fairy-wrens needs less space, around 1.5 to 2 hectares to support them successfully[1].

The shape of patches also influences the success of revegetation – impacts such as increased exposure to wind and light (changes in temperature and humidity – microclimate development can be inhibited), invasion of pest plant species, exposure to chemicals, and human disturbance can all be exacerbated in a small patch.

3.4 Management of remnants

Remnants should not be disturbed in the creation of corridors or buffers. It is advisable to undertake a **site assessment** of any neighbouring remnants, and of the site to be planted, prior to any works. This allows for an understanding of the type of vegetation association(s) that may be present as well as which on-site factors need to be considered before planting, such as soil erosion, drainage issues, weed species, or limitations to planting such as overhead power lines or other services. Native vegetation can include native grasses and understorey plants like groundcovers and lilies, and it is important that these are not affected adversely by any planting.

Regardless of the purpose of the planting, it is important to consider that, depending on which species you wish to use, you may need to order at least 6 months if not up to 2 years in advance of planting. Some species can be difficult to propagate, or take a while to germinate, and for others seed availability may determine whether plants are available in a particular year.

1. http://www.birdsinbackyards.net/spaces/urban-landscapes.cfm

4 Species Selection

4.1 Seed ratios and numbers

The number of plants to use per hectare can vary greatly depending on the particular site (such as a very rocky site with minimal topsoil), existing flora (are there trees or other plants already on-site that you can incorporate in the corridor), and other factors such as cost, time, climatic variables like low rainfall zones, and the type of plant association you are trying to establish.

Consider an approximate number of 1000 plants per ha as a minimum, except in areas of Stringybark or mallee. Species ratios should usually have <100 Eucalypts, unless there are already overstorey trees on site, in which case this should be reduced further to <50. The number of colonising species should be quite high for most sites. Your decision regarding shrub and ground layer density for understorey species will be dependent upon the purpose of the planting and type of plant association – if you are attempting to provide nesting resources and shelter for cryptic species, then the number of species and plants used may be quite high. Cryptic species are those that might be hard to see due to their colourings or behaviour, such as Australian Painted Snipe, or Flycatchers.

4.2 Using provenance seed

For all revegetation work including habitat restoration, the use of provenance or local indigenous species, is highly recommended. Local species are particularly adapted to the climatic and physical conditions of a region. They are also more likely to provide appropriate resources for local native wildlife such as food, shelter, and nest material. The use of local species maximises the chance of restoring plant / animal interactions such as pollination and seed dispersal.

Collect seed from within the nearest possible remnant or from the nearest possible remnant with a similar soil type. Consider the diversity of vegetation available, both in terms of species and structural variation. Start with dominant overstorey species (such as eucalypts) and major shrubs (such as tea-trees and wattles), and then consider understorey species (shrubs, groundcovers and grasses). If collecting seed ensure that seed is taken from a variety of sources, not just one plant. Taking seed from across several plants of the same species helps to maintain the genetic diversity. Suppliers of seeds or seedlings can help prepare a species list for your site.

4.3 'Colonising' species

Identify which species to use in the initial phase and second phase. Undertake planting over several years to encourage the development of different age classes. Planting different species in successive years can mimic natural succession; many species do not thrive if planted outside of their natural succession time, or will simply not germinate until conditions are appropriate. Some species require extensive 'weathering' before germination will occur, and may not appear for 2-3 years after sowing.

The species list tables (see Appendix 1) have been split into "Phase 1 – Key Structural Species" and "Phase 2 – Enhancement / Biodiversity" species for ease of use. Phase 1 species are 'colonising' species, designed to grow quickly and provide shelter and leaf litter to enable the less-hardy Phase 2 species to survive.

5 Site Preparation

5.1 Site preparation techniques

Techniques used will depend upon the purpose of planting and individual site characteristics including topography, soils, climate, local flora and fauna, and degree of environmental problems. Consider soil type, climate including rainfall, topography, weeds and fencing.

Preparation of seedbed may be through ripping, herbicide use, burning to create ashbed or other method prior to sowing. Some assessment of which is going to be the best technique to use should be made prior to works.

5.2 Weed control

To be successful with revegetation, you must control existing pasture and weeds well in advance of planting seedlings or direct seeding. Development of a weed management plan provides some structure for control, schedule for follow-up, and monitoring of success. It should be developed in conjunction with a professional, particular if the use of chemicals is involved

Site assessment – *identify weeds, map weeds and features (including whether they are broadleaf, monocot, perennial and annual), understand why weeds are present, identify risks, identify any other flora and fauna (both onsite and adjacent – especially for riparian areas where legislation in relation to the use of chemicals within riparian zones may prescribe which chemicals can be used)*

Develop strategy – *determine priorities, set measurable objectives, plan for the longer term*

Implement strategy – *actions required to achieve objectives, actions to be time-lined and measurable, commence actions*

Monitor and review – *map weeds (note that new weed species can occur as the soil is disturbed or other weeds are removed), assess impacts of actions, determine what has worked and what hasn't, revise plan if objectives not being met (return to step 1)*

More detailed explanation of each of these steps can be found in the CRC for Australian Weed Management "Developing and Implementing a weed management plan" available from NRM staff / CRC Weeds / Australian Govt.

Weed control programs should be put into place at least 18 months prior to planting, especially for perennial weed species or those that are likely to have built up a significant seed bank. Control for perennial weeds such as Veldt Grass should be done the year before planting. Weed competition is a great inhibitor of plant growth, and some species such as Oxalis pes-caprae are known to alter soil pH thereby affecting germination and growth of seedlings.

Most native species have an unknown tolerance for herbicide, and many herbicides will affect young seedlings adversely. Weeds should be controlled on site as least several months prior to seeding / planting, and follow-up control undertaken selectively and only if the weed burden would prevent / inhibit plant germination or growth.

Different techniques exist for controlling different weed species, including hand-pulling, cutting, grazing, competition, biological control, and use of herbicides. Professional advice should be sought when choosing to use herbicides for weed control. Various techniques have been created to treat different types of plants with herbicide, such as spraying, cut 'n swab, stem injection, stem and leaf swabbing. It is important to understand the plant you are dealing with so that the right technique can be applied at the right time.

Contact your local control authority for advice on chemical use. It is important that herbicides are used by appropriately license operators.

5.3 Pest control

Vertebrate pest control should be run in conjunction with weed control activities, and is essential in the establishment phase but also through the life of the project. A variety of methods including non-destructive options such as fencing, prickly plants, distractions and change, are available.

Control of browsing herbivores such as kangaroos, rabbits and hares, and other pests such as insect pests like red-legged earth-mite, caterpillars and grasshoppers may need control. Rabbit control may need to be undertaken up to 2 years in advance, and should be ongoing. It should form part of a regional control program for most effectiveness. Control of kangaroos should be done in conjunction with NPWS. A destruction permit will be required for ulling of kangaroos.

Preferential plants that are selectively grazed can be planted or sown with species that can provide innate protection. For example, species such as *Allocasuarina verticillata* Drooping Sheoaks that are often grazed heavily by kangaroos can be sown with species that are less palatable such as *Acacia paradoxa* Kangaroo Thorn.

5.4 Fencing

Fencing may be required to exclude stock from revegetation areas, or to minimise the impact of grazing herbivores such as rabbits, hares and kangaroos. Electric fencing may be a consideration until seedlings reach a stage of maturity where light grazing by herbivores is not detrimental to the plants survival.

A 'hot wire' top and bottom has been used to minimise kangaroo access to revegetation areas. A 'hot' bottom wire can entangle and harm fauna, so fencing designs should enable ground fauna to move through the site freely, such as Echidnas, which predate agricultural pests.

Phalaris aquatica

A perennial grass up to 1.6m tall, it is a significant roadside weed and bush invader. It has been promoted and widely used as a pasture grass.

If not grazed, the plant can reach its full height, becoming rank and overgrown, and smothering other plants. The build-up of dead material and drying off of the plant in summer presents a high fire hazard.

Control is by slashing or heavy grazing early in the season to reduce seed set. Regular slashing can reduce overall seed set and may kill clumps. Pulling or grubbing of young plants before rhizomes and seeds develop can help in management. A reduction in density can make it easier to kill remaining clumps with herbicides. Fresh green growth with no seed set is essential for active uptake of herbicide.

6 Establishment Techniques – Phase 1: Key Structural Species

Establishment techniques will depend upon the particular species being planted, site-specific features such as rocky or steep terrain, available resources including budget and people, and other factors including environmental conditions. Often a combination of techniques can be used to take advantage of prevailing environmental conditions of a particular season.

The use of infill planting as a management technique also provides the opportunity to out compete exotic grasses while providing a biodiversity benefit at the same time.

Some key points to consider are:

- Select suitable plants - be aware of time require ments for seed collection, plant propagation and planting
- Establish plants when conditions are suitable, particularly soil moisture
- Encourage natural regeneration as an aid to any revegetation
- Establish species in clumps to help improve the habitat value of the planting
- Consider a combination of methods – machine direct seeding for larger species, and follow-up with tubestock and / or hand direct seeding of other species. Seedlings propagated from cuttings will be hand planted. Some seed is too expensive to be used broad scale with machine direct seeding.
- Fertiliser is generally not needed.
  Most agricultural soils have an adequate fertiliser history. Fertiliser encourages weed species to grown, and the majority of native species do not respond to fertiliser or respond adversely
- Sowing at the right time (following breaking rains and once weeds have been controlled) and at the right depth (important to consider if machine direct seeding is to be undertaken with a mixture of species).

6.1 Machine direct seeding

A specialised machine is used to sow a mixture of native seed straight into the ground. This method is cheaper and easier than planting seedlings or hand-direct seeding, but time and weed control is more critical. It is also not suited to all sites, for example those with existing trees or understorey species like native grasses. Preparation of a good seedbed is necessary to allow roots and moisture to penetrate the soil. Lifting the seeder at random intervals will help avoid straight lines and allow for variation in structure as plants mature. Ripping may or may not be appropriate for a site depending on weed levels, soil compaction, opportunity for follow-up control, site stability (Table showing suitability of methods depending on site features, budget etc – 6.4).

6.2 Hand direct seeding

Prepare area for seeding by lightly raking a small area with a rake or hoe, scatter seed and cover. Large seed should not be visible, and fine seed should be sprinkled on top. Mixing a quick-growing hard coat seed (Dodonaea, Acacia) with finer seed (Eucalyptus, Leptospermum) can bring good results, although care should be taken not to create over-crowded conditions by sowing excessive amounts of seed. Hand-seeding spots can be sheltered with fallen branches to protect seedlings from browsing, or to minimise the potential for seeds to be washed from the soil during rain or windy events.

6.3 Tubestock planting

Seed collected from as close to the site as possible is propagated in nursery conditions to enable ad-vanced plants, usually 6-18 months old, to be planted

directly at the site. A good knowledge of particular propagation techniques, such as methods to break seed dormancy, is needed. Numerous contractors are available to collect and propagate local native seed for planting at a site. The GWLAP is able to assist with advice in this regard. Some species are better propagated by cuttings, or by dividing clumps, due to poor germination rates or a lack of knowledge on germination techniques for that species.

The collection of native plant material (seed, fruits, cutting material or bulbs) is governed by the *National Parks and Wildlife Act* 1972 which is administered by the Department for Environment and Heritage. If you wish to collect seed or propagation material from public land such as Forest Reserves, NPW Reserves, Crown Land, and other public land such as roadsides and local council reserves, you will need to obtain a seed collection permit from the Minister for Environment and Conservation through DEH and the permission of the landholder.

Seed or propagation material collected from private land requires the permission of the landholder, but you do not need a permit to collect seed or take cuttings from plants on your own property. There are several conditions to this, for instance if the plant is a prescribed plant (listed in Schedules 7, 8 or 9 of the Act) a permit is required regardless of whether you have the permission of the landholder or if it is on your property. It is best to contact DEH prior to collecting seed or propagation material.

Costs depend on the amount of seed to be collected / number of plants to be grown, availability of seed and difficulty of propagation, age of seedlings, and whether you choose to engage the contractor to plant the seedlings for you. Tube stock planting is undertaken following the first good break-of-season rains, usually from June until as late as September depending on the rainfall and local conditions.

6.4 Comparison of Establishment Techniques

	COST	LABOUR	ESTABLISHMENT	MAINTENANCE	LONG-TERM VALUE	AESTHETICS
MACHINE DIRECT SEEDING	• Economic – seeds generally cost less than seedlings (note some can be expensive due to difficulty in collecting or propagating) • Plentiful seed is required – may be difficult for some species • Some seeds need special treatment prior to sowing which may increase price • Some seed is too expensive to be used broad scale which restricts the diversity of species available • Availability of seed may vary from year to year depending on climatic conditions	• Efficient – less time and labour is needed than propagating seedlings • An experienced operator can seed several hectares a day • Large areas can be revegetated relatively easily • Seed is easier to handle than seedlings (including transportation to the site) • Not effective or efficient for smaller projects, or on difficult terrain	• better suited to sites with no standing vegetation and of gentle slopes • Reduction in stress to plant roots • Reduction in damage to root hairs while planting • Likelihood of introducing new weeds or soil pathogens reduced • Direct seeded plants have better root growth, and are therefore more better suited to cope with varying climatic conditions following germination • Best suited to areas with a reliable moderate to high rainfall without extremes of temperature • Poor seedbed preparation can prevent germination. Timing of sowing, site preparation, weed control, and species selection is critical • Poor weather conditions can effect establishment - failure of seed to germinate due to environmental conditions (such as dormancy, dry conditions, wet conditions). Poor conditions may result in no direct seeding being undertaken in a season • Not suited to some sites such as deep, non-wetting sands or heavy soils. Generally not suited to sandy soils due to sandblasting of seeds and / or drying of sand surface • Predation of seeds by ants can reduce germination rates • Seedlings may be eaten by slugs, grasshoppers, or red-legged earth mites • Requirements of site preparation and sowing can cause damage to seed (herbicide use, soil disturbance) • Timing is more critical than for other methods • Large-scale herbicide use can impact on the environment • Machinery may not be available at optimum sowing times due to high number of requests	• May often be planted in rows, making follow up weed control easier • Infill planting may be used as a management technique to combat weed species and provide a biodiversity benefit • Weed control required – weed invasion is a major reason for failure of direct seeding • Grazing by stock or native animals requires management - inappropriate / insufficient protection enabling grazing by herbivores or damage • Appropriate management of feral pests particularly rabbits is necessary • If a mixture of species is sown, the type of herbicide than can be used for follow-up control of weeds can be limited (some native species are more susceptible to herbicide than others)		• Within-row distribution of seeds creates a less-structured as seeds are not released at a uniform distance apart along the row • May not "see" results immediately as germination and growth of seeds is not as visibly apparent as planting of tube stock • Historically the use of straight rows with little variability has resulted in monotonous revegetation

	COST	LABOUR	ESTABLISHMENT	MAINTENANCE	LONG-TERM VALUE	AESTHETICS
HAND DIRECT SEEDING	• Volunteers or working on your own property can work out very cheap • Can be costly • May be limited by access to seed • Unlikely to be practical / cost efficient over a large area	• Can be a quick process with an efficient operator – estimates of 800-1500 plants per day per person • Enables sowing in amongst established species without causing damage to the plants or root systems	• Best method for some species • Limited soil disturbance • Suitable for steep slopes, difficult terrain, or watercourses • Enables pre-treatment of seed • Enables herbicide pre-treatment of smaller area only required for sowing of seed • Not all seed sown may be viable • Some particles sown may not be seed – known as decoy seed • Not all seeds that germinate will survive • Seed of some species is very small and cannot be sown separately • Knowledge of species requirements, densities, vegetation associations etc required (what to plant where and how much)	• Weed control is essential prior to and in early stages to allow establishment	• Can be used to complement other methods (machine direct seeding, tube stock planting)	• A more "natural" arrangement of species and densities may be achieved as plants grow competitively
TUBE STOCK PLANTING	• Plants may be 'grown to order' 12-18 months in advance of planting which may reduce costs as growers are able to collect specific amounts of seed • May be more costly in the short-term (factor in cost of seed, germination, watering, possibly also delivery to site, planting, tree guards and stakes)	• Use of tree planters can increase efficiency • Planting on difficult sites can be achieved, eg rocky, steep, watercourses • Positives and negatives of labour choices (volunteers, contractors, community planting days) – will depend on factors such as experience	• Planting species in clumps can be undertaken to achieve more natural densities and improve the habitat value of the planting • Enables inclusion of more expensive or difficult-to-grow species • Planting can be timed according to moisture – tube stock can be held over until climatic conditions are right • Enables herbicide pre-treatment of smaller area only required for planting of tube stock • Planting of tube stock may be more successful for particular soil types resulting in better establishment • Timing of planting may be more critical than for seed, particularly if no follow-up watering is planned – tube stock should be planted following the first breaking rains with wet soils • Tree planters can create tight cylindrical holes that discourage lateral root growth • Failure to plant tube stock at the right depth can result in significant losses - skilled planters are a necessity	• Tree guards may be required to minimise grazing by herbivores, thus increasing total cost per plant • Not all styles of tree guard are suitable for all sites – for example, windy sites may require wooden stakes to support guards, while less exposed conditions will cope well with simple bamboo stakes	• Community involvement on a project can be very beneficial	• Opportunity to create more 'natural' looking plantings rather than straight rows may be more aesthetically appealing • An unstructured 'bush look' may not be visually appealing to all

7 Establishment Techniques – Phase 2: Biodiversity Enhancement and Ongoing Maintenance

7.1 Management

Pest plant and animal control programs should be continued over time. Pest plants such as Phalaris can quickly invade and overtake planting sites, particularly if stock has been excluded. In many areas, such control is 'prescribed' meaning it is the responsibility of the landholder to undertake control programs.

7.2 Ongoing management

Phase 2 species can be planted to increase the diversity of species. The site can be further manipulated by removing trees altogether to open areas up (beware that this may encourage weed growth), or coppicing trees to create new waves of growth and multi-stemmed trees.

Habitat features that may develop over time, such as dead trees, should be retained as these provide nesting and perching resources for many woodland birds and birds of prey. Ground-layer features such as logs, rocks, leaf litter and open spaces provide a variety of habitat features for invertebrates and lizards, providing habitat and resources not only to those species but also the species that are in turn dependent upon them. Nest boxes may be attached to larger trees.

7.3 Monitoring

Monitoring can be as detailed or as simple as you like and can include qualitative (photopoints) and quantitative (measurable) methods. For example, photopoints can provide a 'snapshot' of vegetation change over time, while survey transects provide specific information related to species presence / absence and abundance. Recruitment of plant species, or fruiting / seeding events, can be useful indicators of plant health. Lack of fruit / seed may indicate a lack of suitable pollinators either bird or insect.

Observational records of fauna use, such as birds, reptiles or mammals, may also indicate whether the planting is providing habitat for such species – often a secondary benefit. Such species can be important aids in controlling insect and other pests.

There are a range of monitoring techniques and datasheets, many of which can be found freely on the Internet, or through community groups or project officers.

Weed monitoring is also important to gauge the effectiveness of any control programs, and to be aware of any new incursions. It is also important to be aware that some weed species provide essential habitat to native species, and therefore the control of such weeds must be approached with caution. The CRC for Weeds is a useful source of information on weed identification and control.

8 Calendar of Revegetation

Ideally these should be undertaken in advance. Timing will depend on your rainfall area, and the local environmental conditions.

- Begin planning two or more years ahead of seeding or planting
- Start weed control at least 12 months prior to seeding or planting, or earlier depending on the site and the nature of the weeds
- Order seed two years before seeding or planting
- Order plants at least 12 months prior to planting

	YEAR 1				YEAR 2				YEAR 3
ACTIVITY	**SP**	**SU**	**AU**	**WI**	**SP**	**SU**	**AU**	**WI**	
1. Planning									
Determine the area that you plan to revegetate. Work out site specific factors such as: • Tubestock / seed requirements (species quantities) • Proposed weed / animal control programs • Fencing needs Local growers / contractors									
2. Preparing the ground									
Soil Preperation									
Deep ripping of site if appropriate and depending on soil type									
Weed control									
Spray out rows / spot spray for tubestock or hand direct seeding									
Re-spray rows if re-growth, 2-6 weeks prior to planting									
Spray around seedlings									
Spray between planting rows (rip lines only)									
3. Pest animal management									
Pest Control									
Undertake coordinated whole-of-property and preferably region control program									
Fencing									
Fence off area and exclude stock by now									
4.Seeds and seeedlings									
Seed collection, cleaning and ordering									
get in touch with contractors/growers to confirm seed and seedling									

	YEAR 1				YEAR 2				YEAR 3
ACTIVITY	**SP**	**SU**	**AU**	**WI**	**SP**	**SU**	**AU**	**WI**	
Plant orders and propogation									On-going
Finalise									
5. Revegetation									
Direct seeding and planting									
Undertake seeding and / or tubestock planting									On-going
6. Maintenance									
Monitor for snails, rabbits / hares, weeds									
7. Monitoring									
If necessary, slash between rows and / or overspray with grass -selective herbacide									Winter
8. Ongoing									
Continue to control weeds, pest animals and other site specific actions, such as maintaining fences to exclude stock									

9 Useful References

9.1 Managing remnant vegetation

Robertson, M. (1994) *Stop Bushland Weeds – A Guide to Successful Weeding in South Australia's Bushland*, Nature Conservation Society of South Australia.

9.2 Revegetation design & methods

Platt, S.J. (2002) *How to plan wildlife landscapes: a guide for community organisations.* Department of Natural Resources and Environment, Melbourne.

Dalton, G. (1998).*Creative Revegetation - Enhancing biodiversity by design*

NCSSA (2000) *Factsheet Biodiversity*

PIRSA (2005) Factsheet Windbreaks

Martin (1999) Fact Sheet - *Natural Regeneration of Native Vegetation*

Rural Solutions SA (2003) Fact Sheet – *Direct Seeding* (Rural Solutions SA, 2003)

PIRSA (1998) Fact Sheet – *Hand Direct Seeding of Native Plants* (PIRSA, 1998)

Murphy and Martin (1999) Fact Sheet - *Seed Pre-treatments for Native Understorey Species*

9.3 How to collect and grow seed

Bonney, N. (2003) *What Seed is That?* (Revised Edition), Finsbury Press.

Dean, J. (2002) *Hand Direct Seeding of Native Plants*, Primary Industries & Resources SA Factsheet.

Florabank Guidelines: http://www.florabank.org.au/

Greening Australia How to collect native tree seed, easily. Dalton, G. *Direct seeding native trees and shrubs*

10 Appendices

10.1 Appendix 1 – Revegetation species list Phase 1 – Key Structural Species

10.2 Appendix 2 – Revegetation species list Phase 2: supplementary species – Enhancement / Biodiversity

Item	Your project estimates,
Fencing: $3,500 - $8,000/km+ materials and labour (depends on type of fencing and number of bends)	
Pre-planting weed control: $0.40/spot for tubestock or hand direct seeding $200/ha for rows for machine direct seeding	
Seed/Plants: $0.80 - $2.50/seedling if ordered at least 6 months in advance $200-300/kg for machine direct seeding mix	
Seeding/Planting: $100/ha for machine direct seeding (depends on size of area) $0.40 - $1.00/seedling to plant (depending on access and soil type)	
Plant Protection: Red-legged earth-mites (RLEM) and/or snails may need to be controlled for machine or hand direct seeded sites, allow $100/ha for snail baiting at the time of seeding, and $50-$100/ha for RLEM depending on accessibility. Guards may be required for seedling planted sites, allow at least $0.40 - $2.00/guard, plus stakes.	
Post-planting Weed Control: $0.40/plant	

[1] http://www.birdsinbackyards.net/spaces/urban-landscapes.cfm