

Revegetation case study - 2001

Buffer zone along neighbouring remnant bush

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Landscape Goal

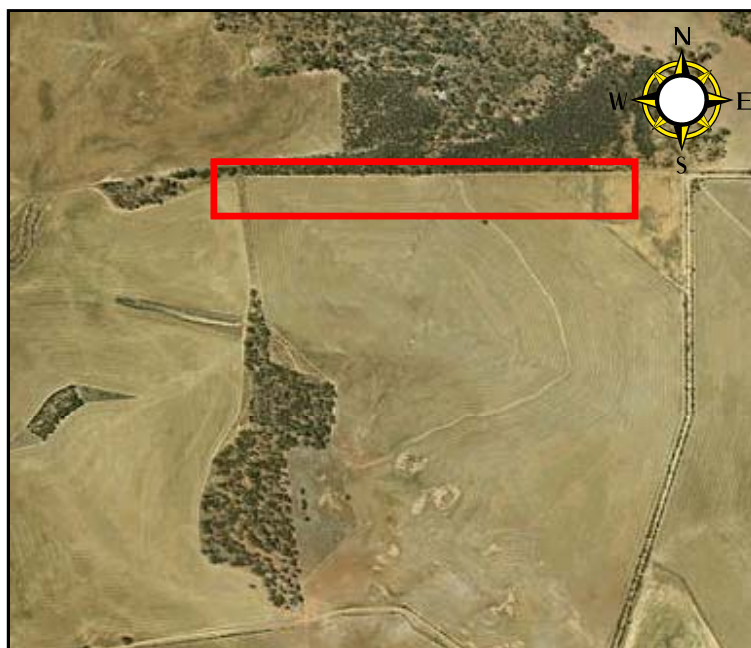
Provide adequate habitat within the Wallatin Creek Catchment, by increasing the amount of effective habitat to conserve existing resident flora and fauna in the catchment and improve sustainability of land use.

Nature Conservation

- Increase the size of the remnant vegetation.
- Provide a buffer alongside the remnant.

Sustainable Agriculture

- Reduce the amount of unproductive land receiving inputs.
- Increase water usage.
- Reduce surface water runoff.



Not to Scale

Site Characteristics



Figure 2. Landscape position of revegetation.

Soil type:	Yellow, gradational loamy sand to shallow mottled zone (conglomerate).
Landform:	Ulva landscape unit
Remnants Vegetation:	The revegetation adjoins a 125ha private remnant to the north and joins an existing planting on the western boundary that connect to a 10ha private remnant on the southern edge (Figure 1).
Vegetation Association:	Mixed heathland changing into mixed york gum woodland.
Potential Recharge:	Medium - high
Area:	6 hectares, 100 metres wide by 600m.
Rainfall:	Average annual rainfall is 330mm, the annual rainfall for 2001 was 279.5 mm with 161 mm in the growing season (May – October).
Paddock history:	Wheat: Lupin: Wheat: Wheat

Design of Revegetation

Species Selection

A natural association of local species was selected based on similar soil and landforms. See table 1 for species list.

Table 1. Species selected for revegetation

Genus	Species	Common name	Number seedlings	Fire Response	Direct seed grams
Acacia	acuaria		360	Seeder	200
Acacia	acuminata	Jam wattle	240	Seeder partial resprouter	200
Acacia	hemiteles	Tan wattle	180		
Acacia	lasiocalyx	Caterpillar wattle	180	Seeder	100
Acacia	microbotrya	Manna gum		Seeder	200
Allocasuarina	acutivalvis	Black tamma	480	Seeder	200
Allocasuarina	campestris	Tamma	600	Seeder	280
Eucalyptus	burracoppinensis	Burracoppin mallee	180	Resprouter	20
Eucalyptus	capillosa	White gum	180	Resprouter	80
Eucalyptus	flocktoniae		180	Resprouter	20
Eucalyptus	loxophleba	York gum	60	Resprouter	80
Eucalyptus	pluricaulis	Purple leaved mallee	180	Resprouter	20
Hakea	coriacea	Pink spiked hakea	120		20
Hakea	cygna	Swan hakea	60	Seeder	
Hakea	erecta		240	Seeder	20
Hakea	invaginata		0		20
Hakea	recurva	Standback	60	Seeder	40
Hakea	scoparia		60	Seeder	40
Isopogon	divergens	Cone flower	0		100
Leptospermum	erubescens	Tea tree	60	Resprouter	100
Melaleuca	cordata		180		80
Melaleuca	coronicarpa	Hidden honey bush	240		40
Melaleuca	leptospermoides				40
Melaleuca	platycalyx		120		20
Melaleuca	spicigera		120		20
Melaleuca	uncinata	Broombush	420	Resprouter	80
Senna	nemophila	Desert cassia	180		20

Note: Seeder/Resprouter refers to the main form of regeneration, especially after fire.

Nature Conservation objectives

➤ Focal species requirements

The total area of revegetation is six hectares, the adjoining remnant is 125 hectares of mixed heathland. This revegetation design and remnant target the area-limited species increasing the size of the vegetation area, greater than the minimal viable size for focal species of birds using heathland. The vegetation is within a 2km radius of other remnant vegetation, which aid the spatial requirements for the focal species. The 100 metre buffer will protect the remnant vegetation from the edge effects of farming

including fertiliser drift, chemical drift, invasion of weeds and prevent the native plants along the edge from being buried by any sand drift

➤ **Natural plant associations**

The vegetation on this site includes a mixed heath that naturally occurs on this soil landscape unit. The composition of local plants will mimic the natural composition of similar landforms nearby.

➤ **Provenance protection**

Special permission was granted by the Department of Conservation and Land Management to allow all seed to be collected from the neighbouring three Nature Reserves: Durokoppin, Kodj Kodjin and Burgess Spring in the Kellerberrin Shire. All lie within a 10-15km radius of the revegetation site. This seed was propagated in selected nurseries for planting into each revegetation site.

➤ **Vegetation structure**

The seedlings were planted at a density of 1000 stems per hectare averaging three metre spacings. A mix of species was planted randomly alongside every rip line across the entire site. The revegetation site consists of 25% overstorey species and 75% understorey species of the total number of seedlings planted. Habitat patches of single species understorey were planted randomly at a density of 120 seedlings in 10m x 12m squares. Each patch consisted of a single understorey species planted at one metre by one-metre spacings.

➤ **Remnant protection**

The revegetation and the adjacent remnant have been fenced to protect the vegetation from grazing by stock. The neighbouring remnant will provide different ages of vegetation and structure to the canopy of the revegetation. Revegetating on the southern boundary of the 125ha remnant will provide a buffer to protect from edge effects from farming, while fencing the revegetation will protect the seedlings from stock. The revegetation connects with a previous planting that links to another 10ha remnant.

➤ **Level of Diversity**

The diversity of plants used reflected the species that had readily accessible seed and were mature in time for seed collecting and delivery to the nurseries in early December, for propagation in the 2001 planting season. Seven genera and 1 - 2 different species of local provenance plants were used in the revegetation design.

➤ **Threats to revegetation**

Fire is one threat to the revegetation. A mix of species that regenerate after fire by seed or resprouting will improve the probability of plants regenerating after fire. Weeds will be another threat to newly planted seedlings competing for moisture at critical times of the year (spring and summer). The direct seeding plots will have the greatest threat of weeds in the second year, as residual and knockdown herbicides can not be used.

Dry seasonal conditions at the time of planting and in the following spring threatened survival rates. Browsing by rabbits, kangaroos, parrots and locusts threatened the revegetation directly after planting and resulted in very poor survival.

Agricultural land use objectives

➤ **Reduction of surface water run-off**

Rip lines at 7-inch spacings constructed using a cultivator bar will help reduce the surface water runoff by increasing the water penetration into the soil profile, rather than allowing the water to run off. The seedling roots will use this soil moisture.

➤ **Increase water use**

A density of 1000 stems per hectare at 3 x 3 metre spacings will assist in water usage and drying the soil profile. This will be particularly effective in this part of the catchment, as it has been defined as a high potential recharge area.

➤ **Area culling**

The shape of the revegetation and fenced remnant is designed to reduce the amount of unproductive land that is farmed. This will reduce the amount of costs spent on land that hasn't yielded well in the past.

Establishment

➤ Site preparation

The site was ripped using a cultivator at seven-inch spacings, ripping to an average depth of 20 – 30cm on 22 January 2001, after 50mm of summer rainfall.

➤ Weed control

The area to be planted with seedlings and direct seeding was sprayed with 1.5 litres per hectare of glyphosate, and 100ml/ha of dimethoate on the 7 June 2001. The seedling sites were sprayed with 1.1 kg per hectare of Simazine granules and 1L/ha of Spray seed on the 10 June 2001. The day before planting the entire site was sprayed with Fusion 200g/ha and 1% Supercharge to target the ryegrass germination.

➤ Planting design

Habitat patches were pegged prior to planting, so that the patches would represent irregular natural boundaries. Seedling areas were pegged into four blocks with a direct seeding block at each end. The seedlings were planted with 'potti putki' hand planters randomly into the ripped area on 5 August 2001. The seedlings were grown in 'Col max' hard plastic trays each tray containing 64 seedlings. Only 60 seedlings were accounted for when distributing the seedlings to each block.

➤ Direct Seeding

The direct seeding was seeded using the broadcast by hand method on the 6 August 2001 and 22 August 2001. One part of seed was mixed with 4 parts vermiculite and 5 parts coarse brown sand as bulking agent in a cement mixer. Prior to mixing, the Acacia species were treated with boiling water for 30 seconds. Spreading of the seed mix occurred immediately following cultivation. The seed mix was spread by hand across the sites. After seeding, the site was sprayed with 200ml per ha of Talstar® to give 60 days residual control of red legged earth mite.

➤ **Implementing the revegetation works**

The schedule and description of revegetation works undertaken are summarised below for each area.

Table 2. Schedule of Works – Seedlings

TASK	ACTION	OUTCOME	COMMENTS
Site preparation	Ripped with cultivator @ 20-30cm depth 22/01/01	Smooth and even surface for planting	Even and effective coverage of herbicide
Weed control	Seedlings & Direct seeding area – 1.5L/ha Glyphosate, 100ml/ha Dimethoate 7/6/01. Seedlings only 1L/ha Spray seed, 1.1kg/ha Simazine granules 10/6/01. Seedling & Direct seeding area 200g/ha Fusion, 1% Supercharge 4/8/01.	Weed free site for planting.	High survival rate.
Seedling quality at time of planting	Good although some small seedlings.	Small seedlings difficult to plant.	
Planting	5 planters using 'pottiputkis' planted on 5/8/01	Good survival of most species.	

Table 3. Schedule of Works – Direct Seeding

TASK	ACTION	OUTCOME	COMMENTS
Site preparation	Ripped with cultivator @ 20-30cm depth 22/01/01. Harrowed on the day of direct seeding.	Smooth and even surface for seeding	Even and effective coverage of herbicide
Weed control	Seedlings & Direct seeding area – 1.5L/ha Glyphosate, 100ml/ha Dimethoate 7/6/01. - 200g/ha Fusion, 1% Supercharge 4/8/01.	Weed free site for seeding.	Some germination of ryegrass in spring.
Direct seeding method	Broadcast seed by hand on 6/08/01 & 22/08/01. Using a vermiculite and coarse sand as bulking agent with 1020g of seed. Pesticide application of Talstar 300mls/ha		
Germination	None so far 23/01/02		

Layout of revegetation

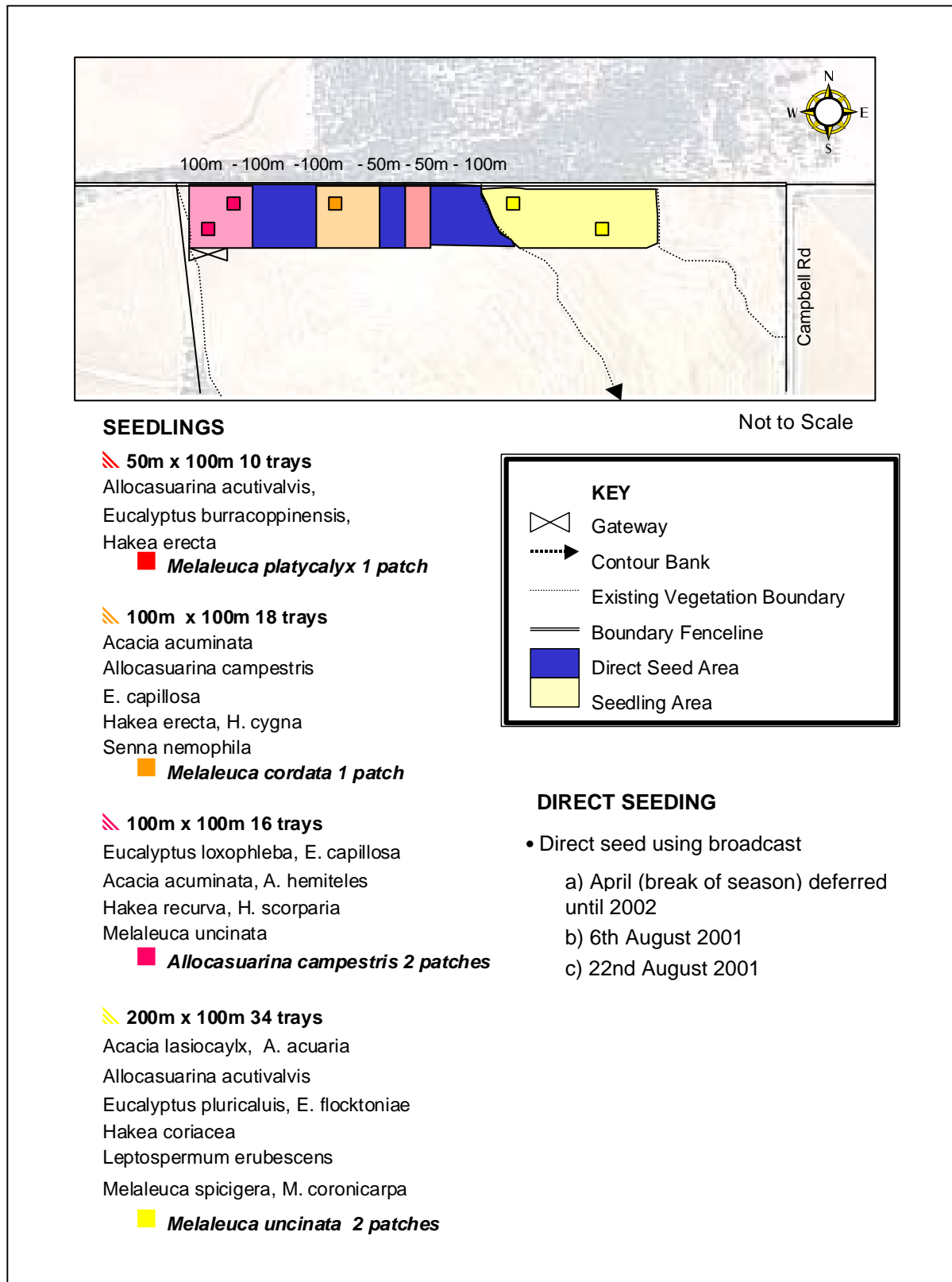


Figure 3. Planting patterns for revegetation design, (60 seedlings per tray).

Costs

➤ **Cost sharing arrangements**

The revegetation design was cost shared on its value to nature conservation and profitable sustainable agriculture. This site had a cost shared ratio of 5:1, five points to nature conservation values and one point to sustainable agriculture.

The nature conservation value was met by using a multiple planting of local provenance that provides an important habitat for locally threatened species and contributes to recharge control that protects priority bush (125ha remnant). The sustainable agricultural value was met by the revegetation contributing to recharge control of the adjacent farmland, mapped as high potential recharge.

The Bushcare funded, Department of Conservation managed project contributed 61 cents per planted seedling out of a total of 73 cents per planted seedling in the year of establishment. For post planting costs the Bushcare funded, Department of Conservation managed project will contribute 22 cents per planted seedling out of 27 cents.

Table 4. Cost of establishment (2001)

Materials and activities	Itemised costs	Total cost
Rabbits – 1080 poisoned oats	@ \$7.72/km x 3km	\$23.16
4680 Mixed species seedlings	@ 35c per seedling 4680	\$1 638.00
Ripping – Cultivator	@ 10c per planted seedling 4680	\$468.00
Planting @ 12c each (contract rate)	@ 12 c per planted seedling 4680	\$561.60
Seedling - Weed control 1 st application: 1.5L/ha glyphosate, 100ml/ha Dimethoate 2 nd application: 1.1 kg /ha Simazine granules, 1L/ha Spray seed, 3 rd application: 200g/ha Fusion	@ 9 c per planted seedling 4680	\$421.20
Direct Seeding Local Provenance seed 1020g/ha Bulking agent vermiculite Weed Control 1 st application: 1.5L/ha Glyphosate 2 nd application: 200g/ha Fusion & 1% Supercharge Pest Control 1 st application: 100ml/ha Dimethoate 2 nd application: 300 mL/ha of Talstar®	@ \$516/ha x 2.5ha @ \$16/100L \$7.50/ha x 2.5ha @ \$2/ha x 2.5 ha @ \$22.50/ha x 2.5ha	\$1 290.00 \$16.00 \$18.75 \$5.00 \$56.25
Fencing – 7 line hinged joint netting	@ \$1240 per km x 1km	\$1240.00
Total Cost	73 c per planted seedling	\$5 737.96

Monitoring

11 September 2001

Good post planting survival, most species identified. No germination seen in direct seeding blocks. Weeds germination in direct seeding block.

29 November 2001

No deaths observed.

23 January 2002

Approximately 80% survival across the seedling site. No germination as yet on the direct seeding site. Gaps can be seen across the site but the species that can not be identified are *Allocasuarina campetris*, *A. acutivalvis* and *Senna nemophila*. Insect attack (spring beetles) on the *Eucalyptus capillosa* seedling was occurring, but major damage should not be a problem.

24 January 2003

- Some good growth, especially on the eastern side of the planting - possibly worth a more detailed examination of the soil types. Also could be influenced by better weed control (rye grass noted on W site of plot)
- *Hakea francisiana* (formerly *H. coriacea*) seedlings very robust
- Direct seeding unsuccessful - consider scarifying the site and planting with seedlings this year, as seed supply is limited.
- Considerable kangaroo damage noted
- Some rabbit damage noted
- Signs of earlier spring beetle attack - seedlings now showing signs of new growth
- Site fenced



Figure 4. Western view of buffer zone (24 January 2003).