

Revegetation case study - 2002

York Gum Jam Remnant Expansion

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Landscape Goal

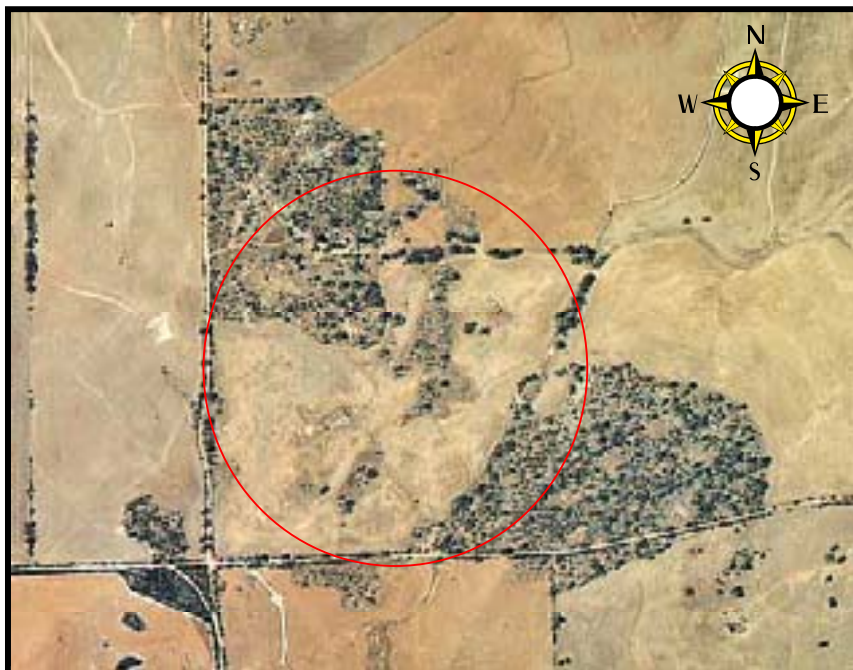
Provide adequate habitat within the Wallatin Creek Catchment by increasing amount of effective habitat to conserve existing resident flora and fauna in the catchment and improve sustainability of land use.

Nature Conservation

- Use of multiple species of local provenance plants that provide an important habitat for locally threatened species.
- Increasing the size of the remnant.

Sustainable Agriculture

- Increase water use to improve hydrological sustainability of property.
- Provide an opportunity for commercial return from Sandalwood products.



Site Characteristics



Figure 2. Landscape position of revegetation.

Soil type:	Rocky red brown loamy sand over clay then bedrock. Soil salinity EC = from 40 to 140 milliseimens per metre using the EM38 below the old contour bank on the eastern side. (Extremely saline >133 mS/m, non saline <17 mS/m)
Landform:	Danberrin landscape unit
Remnant Vegetation:	Approximately 55ha of remnant vegetation.
Vegetation Association:	York gum and jam woodland with the occasional rock sheoak.
Potential Recharge:	Medium
Area:	Approximately area of remnant vegetation 55 hectares, and area of revegetation 15ha.
Rainfall:	Average annual rainfall is 330mm, the annual rainfall for 2001 was 284 mm with 163.5 mm in the growing season (May – October).
Paddock history:	Pasture: wheat : wheat

Design of Revegetation

Species Selection

A natural association of local species was selected based on soil type and landforms (table 1).

Table 1. Species selected for revegetation

Genus	Species	Common name	Number seedlings	Fire Response
Acacia	acuminata	Jam wattle	7320	Seeder
Acacia	microbotrya	Manna gum	540	Seeder
Allocasuarina	huegeliana	Rock sheoak	1380	Seeder
Eucalyptus	loxophleba	York gum	1860	Resprouter
Hakea	recurva	Standback	840	Seeder
Melaleuca	radula		1020	Resprouter
Melaleuca	uncinata	Broombush	300	Resprouter
Santalum	spicatum	Sandalwood		Resprouter
Total			13260	

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

Nature Conservation issues

➤ Focal species requirements

The total area of revegetation and remnant vegetation is equal to 70 hectares. Enlarging the remnant to 70 from 55 hectares will help meet the spatial requirements of area limited focal species.

➤ Natural plant associations

This 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 specific sites.

➤ Vegetation structure

The seedlings were planted at a density of 1111 stems per hectare averaging three metre spacings. The revegetation site consists of 24% overstorey and 76% understorey of the total number of seedlings. Habitat patches were randomly planted across the revegetation site. Each patch consists of *Allocasuarina huegeliana* planted at a density of 10 000 stems per hectare, 360 seedlings in 20m x 20m squares at one metre by one metre spacings to create a thicket effect.

The jam patches (50m x 50m) consisted of *Acacia acuminata* planted along the rip lines at two metre spacings at a density of 2 500 stems per hectare. These jam patches will be the hosts species for the sandalwood, with the sandalwood only to be planted in the patch.

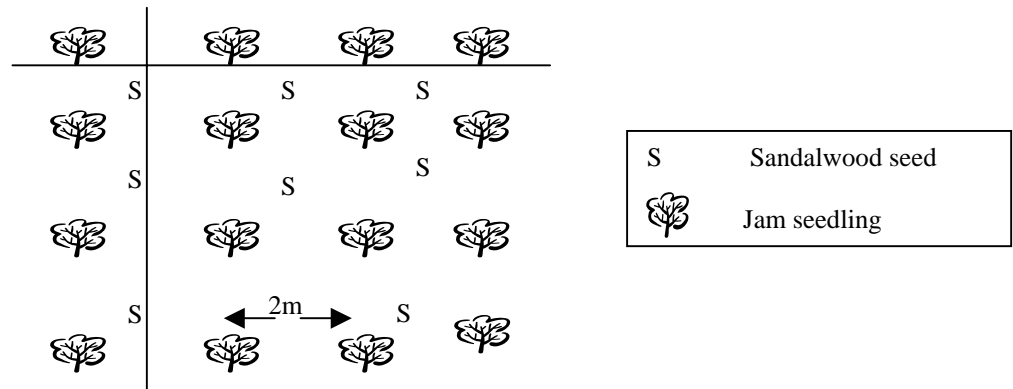


Figure 3. Sandalwood planting pattern.

➤ **Remnant protection**

The paddock remnant has been used as a base point for the revegetation to include age and structure in the revegetation. Revegetating around existing remnants will provide a buffer to protect from edge effects from farming, while fencing the vegetation will provide protection from stock.

➤ **Level of Diversity**

The diversity of plants used included species that had readily accessible seed for propagation in the 2002 planting season and that had proved to germinate readily in the nursery. Six different genera of local provenance plants were used in the revegetation design. These plants represent the dominant species on this soil type and landform.

➤ **Threats to revegetation**

Fire is a significant 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.

Dry seasonal conditions at the time of planting and in the following spring could threaten survival rates. Browsing by kangaroos and parrots could also threaten the revegetation directly after planting and but have not resulted in poor survival at this stage.

Agricultural land use issues

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

Rip lines followed along the contour bank to control surface water runoff and aid surface water retention while alleviating waterlogging.

➤ **Increase water use**

A density of 1111 stems per hectare at 3 x 3 metre spacings will increase water use and help dry the soil profile. This will be particularly effective in this part of the catchment, as it has been defined as a medium potential recharge area.

➤ **Commercial return from sandalwood**

Local provenance sandalwood (*Santalum spicatum*) will be direct seeded on the centre of each cross rip so that they can locate the host plant (*A. acuminata*) from four directions. It is possible that a harvestable crop of sandalwood seeds will be produced within 3-5 years. The wood may be at a harvestable size in 25 years.

Establishment

➤ **Site preparation**

The site was ripped with a 3-point linkage ripper in September 2001. The single rip lines were ripped across with multi tined ripper in April 2002. To create a smooth surface the site was cultivated before planting.

➤ **Weed control**

The site was sprayed in the autumn before planting with 600ml per hectare of Glyphosate cc and 2 litre per hectare of Atrazine May 2001. The pre-planting weed control included 500ml per hectare of Glyphosate cc and 2 litre per hectare of Simazine and 750ml per hectare of Atrazine applied on the 29 April 2002.

➤ **Planting design**

The seedlings were randomly planted with 'potti putki' hand planters alongside the rip lines on 3 metre spacings. Habitat patches were pegged prior to planting, so that the patches were scattered across the site. Each patch of *Allocasuarina huegeliana* was pegged at 20m x 20m square and planted at one metre spacings to create a thicket effect. Jam patches were planted in 50m x 50m square at two metre spacings. The sandalwood seeds will then be seeded in the following autumn between the hosts.

The seedlings were grown in 'Col max' or 'Premium plastic' hard plastic trays each tray containing 64 seedlings. Only 60 seedlings were allocated, allowing for 4 unplantable seedlings when distributing the seedlings to each planting block.

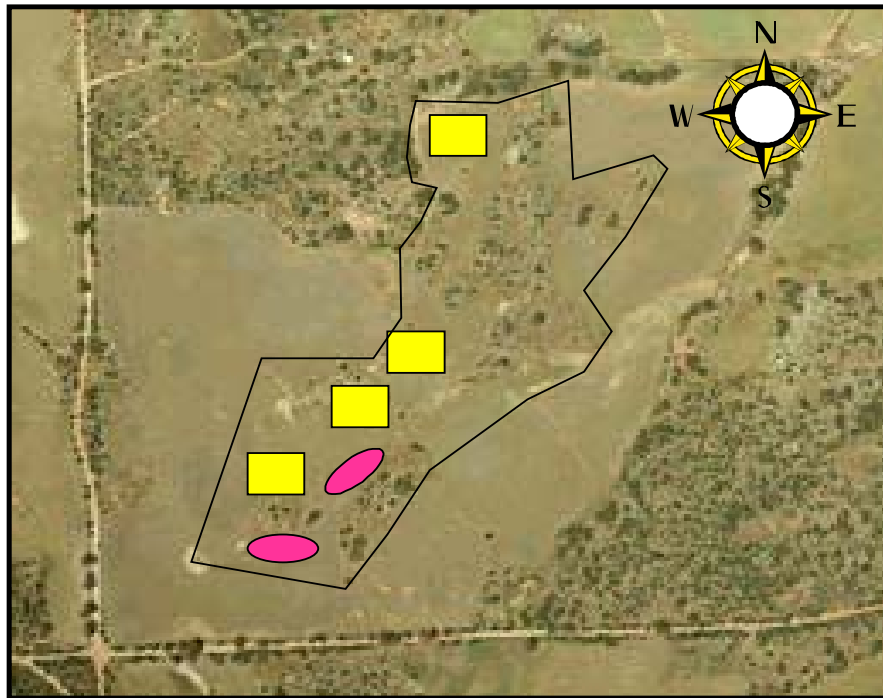
➤ **Implementing the revegetation works**

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	September 01 single tyned ripper at 3-4m spacings. Multi-tyned ripper 4/4/02 across single rip lines, followed by cultivation over rip lines.	Smooth surface to plant.	Able to conserve moisture over a dry summer & winter.
Weed control	May 01 Atrazine 2L/ha plus Roundup Max 600ml/ha. 29/4/02 Roundup Max 500ml/ha, Simazine 2 L/ha and Atrazine 750 ml/ha.	Very clean site at time of planting. Some patches of weeds where boom spray missed.	Competition for moisture in weedy patches.
Seedling quality at time of planting	Good quality seedlings of good size.	Easy to extract and plant seedlings.	Good survival post planting.
Planting	Hand planting using pottiputki 7 people planting 13 260 seedlings over 7 hours	Seedlings planted to correct depth and firmly planted.	Enough time to plant area. Excellent planting conditions; good sized team, efficient delivery and transport system and conveying of planting instructions.

Layout of revegetation



Not to Scale

York Gum Jam Mixed Species 169 trays

- Acacia acuminata (Jam) 82
- Acacia microbotrya (Manna gum wattle) 9
- Allocasuarina huegeliana (Rock Sheoak) 11
- Eucalyptus loxophelba (York gum) 31
- Hakea recurva (Standback) 14
- Melaleuca radula (Graceful honey myrtle) 17
- Melaleuca uncinata (Broombush) 5



Rock Sheoak Patch

20*20m = 6 trays @ 1m spacings
 Allocasuarina huegeliana 12



Jam Patch and Sandalwood Plot

50m*50m = 10 trays @ 2m spacings
 Acacia acuminata 40

Figure 4. 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 (Departmental share) and profitable sustainable agriculture (landholder share). This site had a cost shared ratio of 4:2, four points to nature conservation values and two points to sustainable agriculture.

The nature conservation value was met by using a multiple planting of local provenance plants that provide an important habitat for locally threatened species. The sustainable agricultural value was met by the revegetation using water that recharges area and provides a resource for a commercially prospective industry (sandalwood).

The Bushcare funded, Department of Conservation managed project contributed 49 cents per planted seedling out of a total of 73 cents per planted seedling in the year of establishment (2002). For post planting costs Bushcare funded, Department of Conservation managed project will contribute 18 cents per planted seedling out of 27 cents. The revegetation site was funded at 70% of the cost of fencing materials as the revegetation linked to non-priority bush areas. For details of cost sharing methods see Mullan 2000.

Table 4. Cost of establishment (2002).

Materials and activities	Itemised costs	Total cost
Mixed species seedlings 13260	@ 35c per seedling	\$4641.00
Ripping – @ 2m spacings	@ 10c per planted seedling	\$1326.00
Cultivation	@ 7c per planted seedling	\$928.20
Pre-planting: 500 ml/ha Glyphosate cc 2L/ha Simazine and 750ml/ha Atrazine	@ 9 c per planted seedling	\$1193.40
Hand planting 7 planters	@ 12 c per planted seedling	\$1591.20
Fencing –7 line hinged joint ringlock	@ \$1240 per km x 3km	\$3720.00
Total Cost	73 c per planted seedling	\$13 399.80

Monitoring

16 September 2002

Good survival post planting.

22 October 2002

24 January 2003

- Good winter weed control, limited summer weed control, large melons now present
- Very good survival and growth
- Some kangaroo damage
- Consider tree guards for *Allocasuarina* patches
- Some rabbit damage, especially on the NE side
- Signs of earlier spring beetle attack - seedlings now showing signs of new growth
- Parrot damage noticeable and starting to cause seedling losses, especially *Acacia acuminata*
- Fencing in progress
- Rocky site, however few losses due to shallow soils
- Fox sighting



Figure 5. Jam patch, 24 January 2003.