Report on sandalwood seed enrichment trials on Burnerbinmah and Thundelarra, March 1997

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Aim

Measure and compare sandalwood germination, survival and growth rates from seed sown beneath different hosts, growing on different land types.

Land types

Sandalwood regeneration trials were established on four different land types on Burnerbinmah. Land type maps of the Yalgoo region, compiled by Agriculture, WA were used to identify the different land types. The four land types were: Sherwood (LT 4), Kalli (LT 12), Woodline (LT 13) and Ero (LT 17). Sherwood is described as having breakaways, kaolinized footslopes and extensive gently sloping plains on granite with mulga and halophytic shrublands. Kalli consists of level to gently undulating plains of red sand over laterite, with grassy *Acacia* shrublands. Woodline has nearly level sandy surfaced plains over hardpan, with mulga shrubland. Ero and Roderick contain alluvial plains, with saline soils and predominantly halophytic shrublands. On each of these landforms, sandalwood ecology, seed enrichment and vegetation assessment trials were established.

Sandalwood seed enrichment

Unfenced plots

On Burnerbinmah, sandalwood seeds were enriched at four separate sites for each of the four land types, in March 1996. Only one site was seed enriched for each of the four land types on Thundelarra. The sites were spaced at least 500 m apart and were distributed throughout both stations (Figures 1&2).

At each site, the seeds were sown beneath 10 mulga trees and 10 trees of another species (Table 2). The other four species were curara (*Acacia tetragonophylla*), jam (*Acacia acuminata*), miniritchie (*Acacia grasbyi*), and currant bush (*Scaevola spinescens*). A different species was enriched on each of the land types which were as follows: curara (LT 4), currant bush (LT 12), miniritchie (LT 13) and jam (LT 17).

Due to the poor fruiting season on Burnerbinmah and Thundelarra no sandalwood seeds were used from these stations. Instead, sandalwood seeds from Kalgoorlie were used in the seed enrichment trials. Before sowing, the leather-like exocarp was removed from the endocarp (seed), but no other pre-treatment was used. Beneath each host tree, four untreated sandalwood seeds were sown on the south side and four seeds were sown on the north side. The seeds were buried 2-3 cm below the surface and about 20-30 cm from the host stem. Each site was enriched with 160 sandalwood seeds and a total of 2560 seeds on Burnerbinmah and 640 seeds on Thundelarra were sown (Table 1).

Table 1. The number of sandalwood seeds sown in unfenced plots on Burnerbinmah and Thundelarra. Sandalwood seeds were sown beneath mulga (*Acacia aneura*), curara (*Acacia tetragonophylla*), currant bush (*Scaevola spinescens*), miniritchie (*Acacia grasbyi*) and jam (*Acacia acuminata*), in March 1996.

Land type/system	Host species	Seeds sown	Reps	Total seeds
Burnerbinmah				
4. Sherwood	Mulga, curara	160	4	640
12. Kalli	Mulga, currant bush	160	4	640
13. Woodline	Mulga, miniritchie	160	4	640
17. Ero	Mulga, jam	160	4	640
Total				2560
Thundelarra				
4. Sherwood	Mulga, curara	160	1	160
12. Kalli	Mulga, currant bush	160	1	160
13. Woodline	Mulga, miniritchie	160	1	160
17. Roderick	Mulga, jam	160	1	160
Total				640

All host trees seed enriched were tagged and their heights and crowns measured. Tree heights were measured to 1 cm using a measuring pole. Crowns were measured to 1 cm in north-south and east-west directions, using a compass and an 8 m tape.

In 1997, sandalwood seed enrichment trials were repeated on the same four land types, for both stations. Sandalwood seeds collected on Burnerbinmah and Thundelarra in October 1996, were used for seed enrichment in 1997. Seeds were sown beneath

some of the hosts selected in 1996 (mulga, curara and jam), as well as some new species: Wilcox bush (*Eremophila foresttii*) and wanyu (*Acacia ramulosa*).

Sandalwood seeds were sown beneath two separate hosts for each of the four land types (Table 2). Sandalwood seeds were sown beneath mulga and curara on LT 4, Wilcox bush and mulga on LT 12, mulga and wanyu on LT 13, and jam and Wilcox bush on LT 17. At each site, 15 trees of each species were seed enriched. Beneath each tree, four seeds were sown on the north and four seeds were sown on the south, using the same procedures used in 1996. Treatments were replicated four times, and sites spaced at least 500 m apart (Figures 1&2).

Table 2. Unfenced sandalwood enrichment plots sown on Burnerbinmah and Thundelarra in 1997. Sandalwood seeds were sown beneath mulga (*Acacia aneura*), curara (*Acacia tetragonophylla*), Wilcox bush (*Eremophila forrestii*), wanyu (*Acacia ramulosa*) and jam (*Acacia acuminata*), in February 1997.

Land type/system	Host species	Seeds sown	Reps	Total seeds
Burnerbinmah				
4. Sherwood	Mulga, curara	240	4	960
12. Kalli	Mulga, Wilcox bush	240	4	960
13. Woodline	Mulga, wanyu	240	4	960
17. Ero	Jam, Wilcox bush	240	4	960
Total				3840
Thundelarra				
4. Sherwood	Mulga, curara	240	1	240
12. Kalli	Mulga, Wilcox bush	240	1	240
13. Woodline	Mulga, wanyu	240	1	240
17. Roderick	Jam, Wilcox bush	240	1	240
Total				960

Fenced plots

To quantify the effects of grazing on Burnerbinmah and Thundelarra, three fenced plots were established in 1996, and two plots in 1997. The fenced plots were constructed on Kalli (LT 12), next to unfenced plots. In 1996, a single large fenced plot of 410 m^2 was constructed on Burnerbinmah, while two small fenced plots of 100 m^2 and 200 m^2 were constructed on Thundelarra. In 1997, a 400 m^2 fenced plot was established on Burnerbinmah and also on Thundelarra.

The fenced plots were constructed to exclude rabbits, sheep, goats and kangaroos. The fence consisted of 90 cm high rabbit proof netting attached to 5' 6" steel posts. The rabbit proof netting was buried to a depth of 25 cm, and two strands of barbed wire and fencing wire were attached to the steel posts above the rabbit proof netting.

Three different host species were selected for sandalwood seed enrichment in the 1996 fenced plots. The three hosts were mulga (*Acacia aneura*), currant bush (*Scaevola spinescens*) and Wilcox bush (*Eremophila forrestii*). Seeds were also sown in the open, where there were no hosts within 2m. On Burnerbinmah seeds were sown beneath 9 mulga trees, 10 currant bushes and 10 Wilcox bushes (Table 3). Beneath each plant, 4 seeds were sown on the north and 4 seeds were sown on the south side. An additional 20 spots within the Burnerbinmah plot were also seed enriched on bare areas of ground. A total of 320 seeds were sown within the Burnerbinmah fenced plot

In the two 1996 fenced plots on Thundelarra, sandalwood seeds were sown beneath 10 mulga's, 10 currant bushes and 10 Wilcox bushes. Twenty-two spots of bare ground were also enriched with 4 sandalwood seeds per spot. A total of 328 sandalwood seeds were sown in the two fenced plots on Thundelarra (Table 3).

In the 1997 Burnerbinmah fenced plot, sandalwood seeds were sown beneath 20 mulga's, 20 Wilcox bushes and 10 wanyu's. On Thundelarra, sandalwood seeds were sown beneath 18 mulga's, 15 Wilcox bushes and 7 wanyu's. Four seeds were sown on the north and south of each host. A total of 400 seeds were sown in the Burnerbinmah plot, and 320 seeds sown in the Thundelarra plot (Table 4).

Table 3. The number of sandalwood seeds sown in fenced plots on Burnerbinmah and Thundelarra. Fenced plots were constructed on Kalli (LT 12) and the seeds were sown in March 1996. Sandalwood seeds were sown beneath mulga, currant bush and Wilcox bush, and also on bare ground.

Plot	Host				Total
	Mulga	Currant	Wilcox	No host	seeds
1. Burnerbinmah	72	88	80	80	320
2. Thundelarra	-	80	48	28	156
3. Thundelarra	80	-	32	60	172
Total seeds	152	168	160	168	648

Table 4. Number of sandalwood seeds sown in fenced plots on Burnerbinmah and Thundelarra, in February 1997. Sandalwood seeds were sown beneath mulga, Wilcox bush and wanyu.

Plot	Host			Total
	Mulga	Wilcox	Wanyu	seeds
1. Burnerbinmah	160	160	80	400
2. Thundelarra	144	120	56	320
Total seeds	304	280	136	720

Figure 1. Sandalwood seed enriched sites on Burnerbinmah in 1996 and 1997.

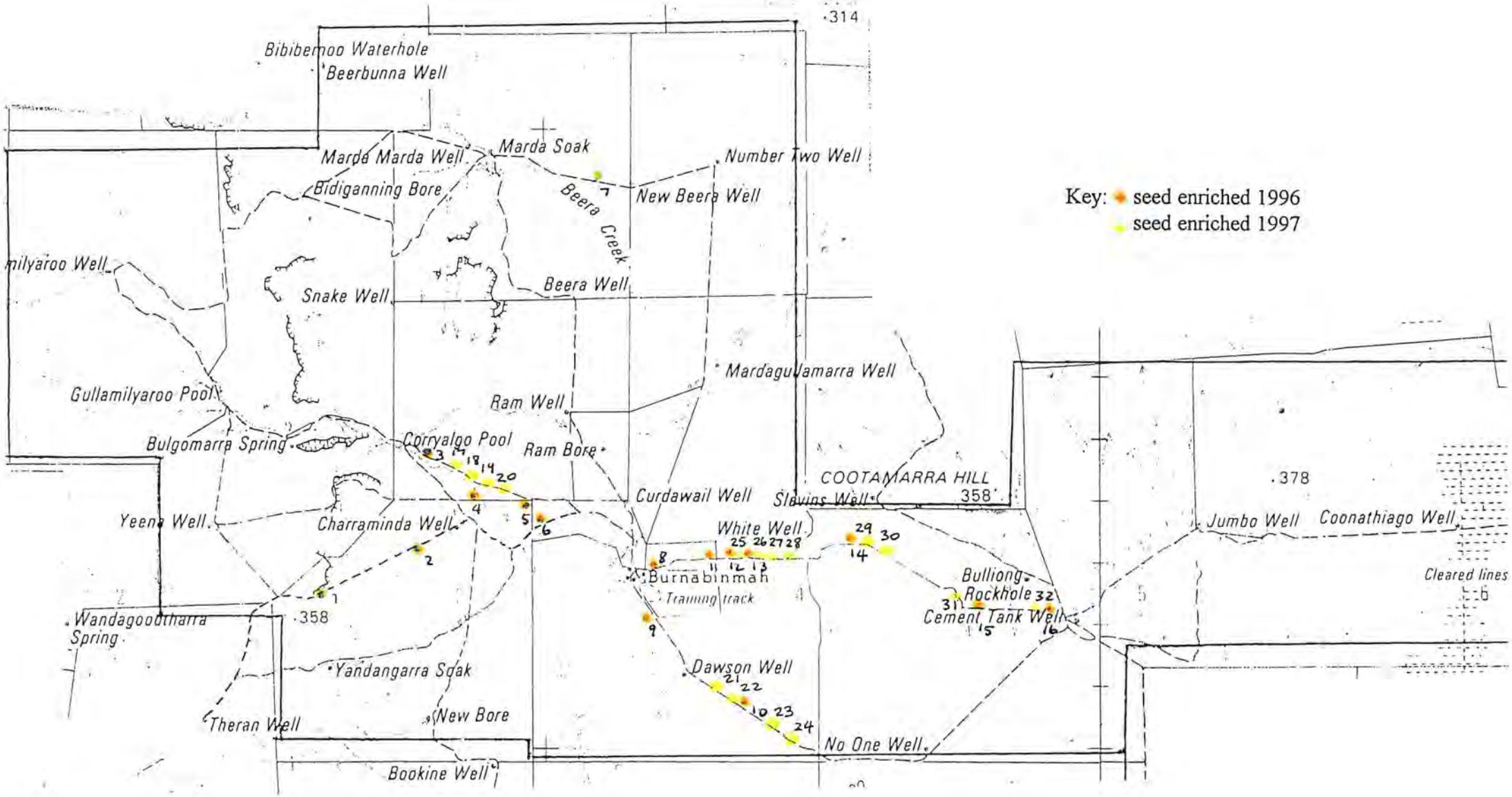
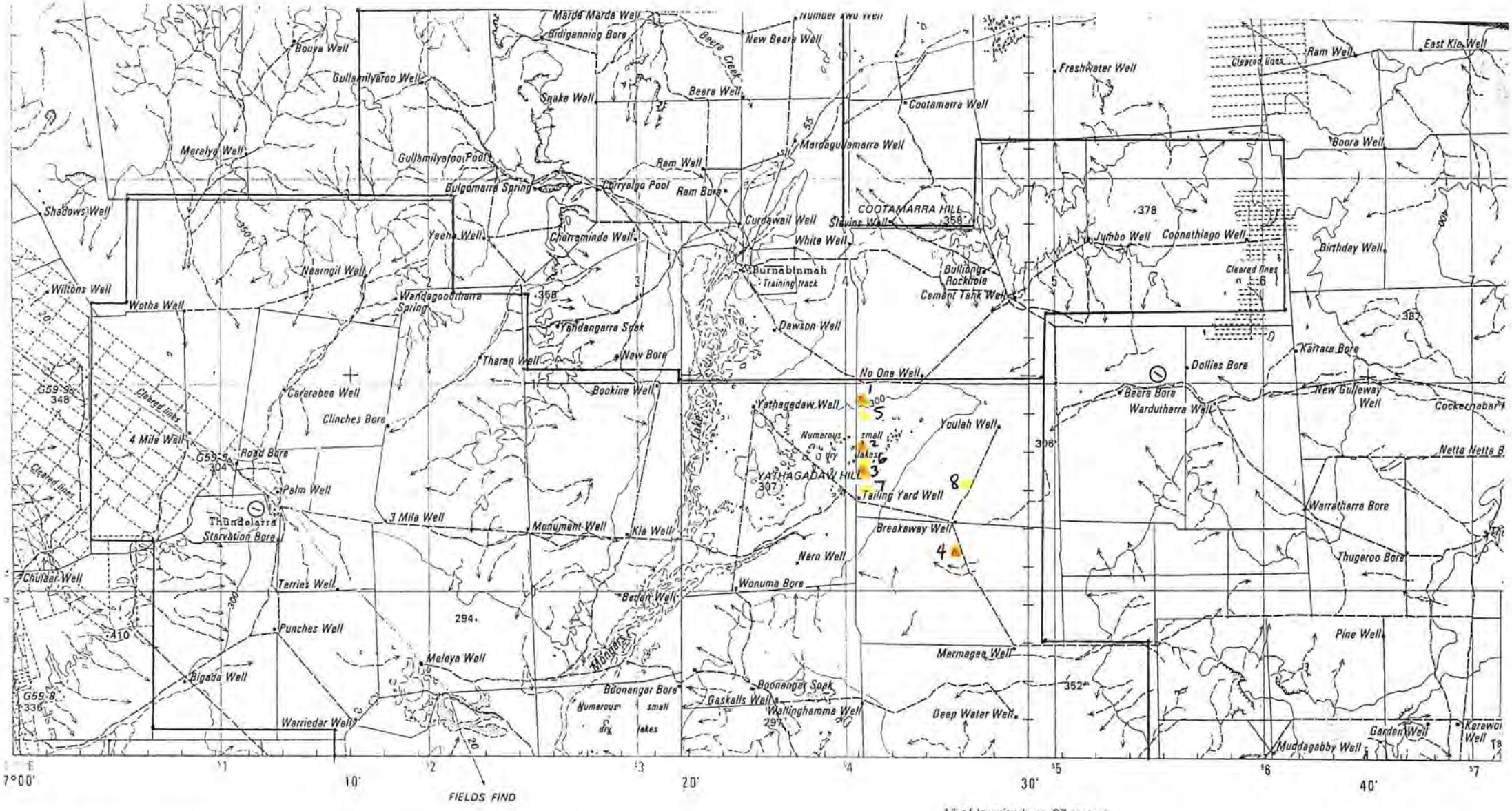


Figure 2. Sandalwood seed enriched sites on Thundelarra in 1996 and 1997.



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Topographic information shown
ect to 1984

Key: seed enriched 1996
seed enriched 1997

1" of longitude = 27 metres

SCAL

Kilometres 0 5 10 15 20

HEIGHTS IN METRES. C

Horizontal Datum: Au
Vertical Datum: Au