



Background

Casuarina obesa (Swamp sheoak) is generally promoted as a landcare option on saline farmland that also has potential as a commercial tree crop across the Avon region. The timber of swamp sheoak is suitable for cabinetry, furniture or firewood and recent trials indicate that can be used for CCA treated fence posts.

This native species can be planted on a range of soil types but is preferred on duplex sand over clay to heavy wet clays. As a seedling it is heavily browsed by stock, kangaroos and rabbits, although once more mature it recolonises freely and is often seen as a dense stand of between 20,000-30,000 trees per hectare on farmland or reserves. In time, planted sites if unmanaged will also colonise the site.

Participating land managers, property information

PROJECT	LANDHOLDER NAMES	LOCATION	PROJECT SITE (ha)	RAINFALL (average annual in mm)	SOILS
Management of native <i>Casuarina obesa</i> stands	Ian and Margaret Hall	Aldersyde	0.11	330	shallow sandy loam over clay
Management of <i>Casuarina obesa</i> provenance trials	Tim and Jenine Powell	Goomalling	2	400	shallow duplex sandy loam over clay
Management of <i>Casuarina obesa</i> provenance trials	Andrew and Lisa West	Meckering	2	350-400	shallow duplex sandy loam over clay



Management of native *Casuarina obesa*

Objectives

1. To demonstrate how the benefits of thinning native colonised stands of *C.obesa* can assist landowners;
2. To compare future growth rates of 3 stocking levels of thinned natural regenerated *C.obesa* and compare long term tree health with managed and unmanaged stands; and to
3. Establish demonstration sites for local landowners to learn about managing *C.obesa* in the Avon Wheatbelt region.

This site was planted with swamp sheoak seedlings in 1982 as part of a revegetation project to rehabilitate the saline land adjacent to an existing native stand of the species. These trees were fenced to protect them from browsing by stock and kangaroos. This protection allowed them to grow successfully but also allowed them to regenerate or colonise the site over time.

Prior to thinning the overall site average tree density was 17,407 trees per hectare ranging from 4,444 trees per hectare in plot 1 to 30,000 trees per hectare in plot 3.

Background

On farmland, native stands of swamp sheoak have often been left unmanaged and mostly used by landowners for stock shelter, shade or conservation purposes. There is little or no under-story of native species or pasture under these stands due to a lack of light or high tree competition.

Landowners have an opportunity to manage these native stands providing they meet legislative clearing protocols set out by the Department of Environment and Conservation.

Thinning dense stands of multiple small diameter swamp sheoak could have positive benefits for the landowner such as:

- Additional income from the production and sale of timber for tool handles, wood turning, firewood or fence posts.
- Fodder opportunities from thinned or new foliage (coppice) especially late autumn.
- Increased under-story of native or pasture species and therefore increased grazing land
- Maintenance of long-term tree health and conservation/biodiversity values of the stand.
- Long-term opportunities for larger diameter sawlogs suitable for cabinetry or furniture timber.

Silvicultural management of these stands can produce all the benefits above. Unwanted trees are thinned and remaining bole sections pruned to minimise timber defects from knots.

Soil salinity

An EM 38 salinity meter was used to determine soil salinity (ECe) differences across four plots. Measurements were taken on 18th August as two sub-samples per plot. Average salinity across the site was 90 mS/m in the vertical mode and 72 mS/m in the horizontal mode. Plot 1 (which was closest to the swamp) was more saline than other plots and registered 156 mS/m and 152 mS/m in the vertical and horizontal dipoles respectively.

Soil salinity at this site is not considered to be excessive as to impede adequate tree growth.

Tree growth measurement

Following thinning all trees were measured for diameter at breast height over bark (dbhob) and total tree height. Measurement was carried out on 18th August 2011 on the three thinning treatments of 200, 400, 800 trees per hectare plus an unthinned control. Diameter was measured using a standard diameter tape and total tree height using a digital hypsometer.

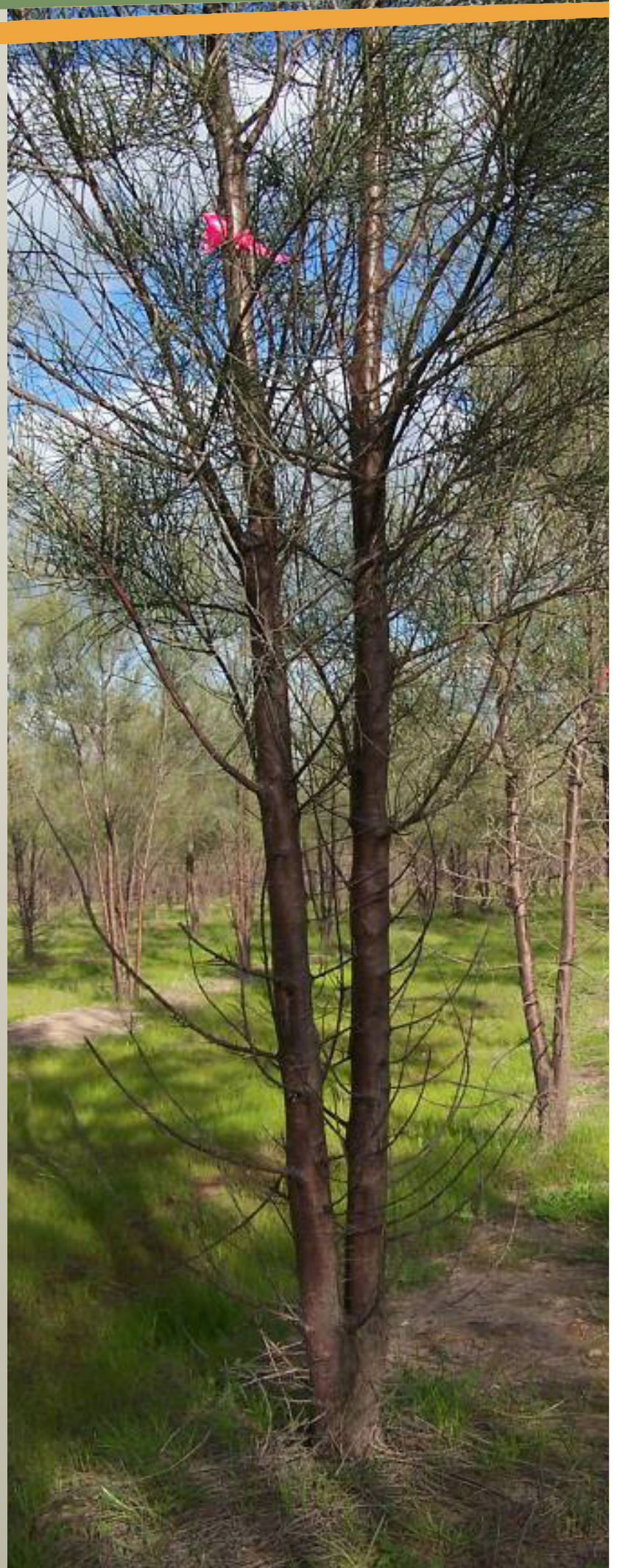
Silvicultural management

Following thinning all retained crop trees were pruned to 2.5 metres. At this stage all lower branches were dead to at least 5-6 metres and this is normal crown recession owing to the high tree density or lack of light. Pruning at age 29 is realistically “window dressing” and considered far too late although it has potential as a future higher value timber option.

Wood products

Firewood was the only commercial product that could be produced from the thinning operation.

All thinned material (logs) were measured by diameter over bark of the butt and crown (to a minimum stem diameter limit of 70mm), and log length. The volume for each log was calculated using Smalian’s (butt and crown) method. Conversion of this green volume to dry volume was calculated using a basic density of 649 kg/m³ (Siemon and Pitcher, 1996) and a valuation of potential firewood for sale was calculated using a local firewood price of \$120/dry tonne.



Management of *Casuarina obesa* provenance trials

Objectives

1. to measure and assess tree form 8 year old established *C.obesa* provenance trials and recommend suitable provenances for future revegetation options on salt affected Wheatbelt farmland;
2. to demonstrate the benefits of thinning planted stands of *C.obesa* to landowners;
3. establish demonstration sites for local landowners to learn about managing *C.obesa* in the Avon Wheatbelt region; and to
4. demonstrate pruning and thinning techniques and equipment for management of private forestry stands of all types.

In farm forestry revegetation, the selection of the best provenances is important for successful commercial activity. A key requirement is that planted provenances should have exceptional growth with a high number of straight trees with minimal forks or malformed trees. With these attributes, its commercial viability is much more secure for product utilization in farm forestry or industry development. Therefore selection of poorly formed provenances may convert the planting into an un-commercial project (unless carbon sequestration is an objective).

Setting up regional demonstration sites is a useful extension activity as they show landowners how to manage swamp sheoak by thinning and pruning as useful land management practice. Providing real local data on tree growth and wood production is another way of giving landowners more confidence and getting more adoption of farm forestry.

Background

Two sites were hand planted in 2003 as part of a Greening Australia revegetation program and included 15 Western Australian provenances consisting of 4 replicates that were planted on a 6 row x 6 tree grid pattern (0.032 ha) at 3 x 3 metre spacing or 1,111 trees per ha. The statistical design of both of these sites was a randomized complete block design with four replicates of each provenance and

was designed by CSIRO.

Wild seed had been collected from the 15 native sites by numerous sources.

Soil salinity

An EM 38 salinity meter was used to determine site differences. Measurements were taken in the centre of each plot in both vertical and horizontal dipoles. Salinity ranged between 107 mS/m and 161 mS/m across the two sites.

Challenges

Goomalling site: The western replicate virtually failed due to waterlogging or stock browsing with only three provenances represented across the site. Waterlogging also encroached replicate three with a further two provenances not represented. Unfortunately this affected two provenances of the Meckering provenance. As a result of these factors a total of 46 plots were assessed.

There did not appear to be any parrot damage as was found at the Meckering site.

Meckering Site: In the early years Port Lincoln parrots caused significant form problems across the site. The form assessment indicated that 56% of the trial had forks or multi-forks. The damage caused by Port Lincoln parrots has affected the growth potential (diameter and height) and therefore compromised the comparison between provenances. This is obvious where many stems per tree are in competition with each other. Parrots have also affected the original growth tip at an early age causing many forks which has subsequently reduced height growth because the original growth tip was knocked out by ring barking.

Tree growth measurement

All trees were measured for diameter at breast height over bark (dbhob) and total tree height (age 8 years) and before any silvicultural work. Diameter was measured using a standard diameter tape and total tree height using 2 metre sectioned aluminium height sticks.

Total volume was calculated by the cone formula. This may not be an accurate method due to the multi-stemmed crowns of swamp sheoak.

Tree form assessment

One of the main differences between provenances is tree form. As stem straightness is a key factor in commercial farm forestry, an 8 point assessment method was devised to assess tree form. This method has the advantage of indicating potential end use whether it be timber products, biomass production or non-commercial use eg, landcare. The assessment is also useful to show landowners how much pruning or workload that is required to improve farm forestry potential or rather, to not manage them.

Tree Form rating system used to assess 8 year old C.obesa

Rating	Form description	Potential end-use *
1	Straight tree (butt log and crown)	A
2	Straight butt log of 1.8m	A
3.1	Forked - pruning can turn it to Ranking No 1	A
3.2	Forked - pruning can turn it to Ranking No 2	A
4	Forked - cannot be fixed with pruning	B
5.1	Malformed - bent or crooked stem	B
5.2	Multiforked	B
6	Stunted or poor growth and or multi-forked,	C

* Potential end-use

A - timber, post or biomass

B - biomass

C - low value biomass or nil

Silvicultural management

Tree management such as pruning or thinning has the ability to turn swamp sheoak into a commercial product as long as it is done on time. We aimed to do this on plots that had at least 30% reasonable tree form.

With a high severity of early parrot damage at Meckering, only 18 plots or 30% (of all 60 plots) had at least 30% of tree form suitable for farm forestry when classes 1-3.2 are added together. This was the criteria used for plots that were thinned and pruned. There had been no attempt to form prune this site at an early age.

At Goomalling tree form was much better and a total 24 plots or 52% had at least 30% of tree form suitable for farm forestry when classes 1-3.2 are added together. Some form pruning had been carried out previously on some plots. This may have been why we saw a slightly overall improvement of tree form at this site although there was no evidence of parrot damage either.

These plots were thinned to half the initial tree density to 556 trees/ha after tree measurement and form assessment. 18 trees were retained on all thinned plots. All retained trees on these well-formed plots were low pruned to: 2-2.5 metres; pruned to retain half tree height of green crown; or were form pruned by removing large branches or forks in the upper crown. No more than 50% of total tree crown was removed at this time as growth would have been retarded.

Wood products

By thinning from 1,125 to 556 trees per hectare it indicated that there was about 3.6 dry tonnes per hectare on these provenance trial sites that could be suitable for firewood. This is not considered an economic yield.

Results

The key findings from this work revealed that there were notable differences in tree form between the provenance trial sites and also between replicates.

At the Goomalling site the best growth was achieved by Murchison River and South Borden and for tree form, the Beaufort Inlet and Mullewa provenances.

At the Meckering site the best growth was the South Coast and Paynes Find provenances and for tree form, Lake Dumbleyung and Paynes Find.

Full details of the results of plot and provenance differences for these two sites can be found in the final report available from Wheatbelt NRM.

A DVD was also produced as part of this project. The DVD explains in detail why, when and how to prune trees for commercial outcomes. The techniques can be transferred to any tree species. Copies of the DVD are freely available from Wheatbelt NRM, clips can also be found on You Tube at: www.youtube.com/wheatbeltnrm



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