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Swamp Sheoak (Casuarina obesa) use in Farm Forestry

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Introduction

This is an overview of the characteristics, management and use of *Casuarina obesa* as a farm forestry species.

Casuarina obesa is not a new 'miracle' species for farm forestry. Rather, it has strengths in particular situations on farms in Western Australia.

Casuarina growers, and documented information based on WA and eastern states experiences provide the sources for this publication. You should seek advice from farm forestry advisers before establishing this species for commercial purposes.

Species Description

Casuarina obesa is commonly known in Western Australia as swamp sheoak, Western Australian swamp oak, swampy oak, salt sheoak, grey sheoak, Kuli and Cooli.

Swamp sheoak is a small tree growing to 14 metres, and has a dominant stem for much of its height when growing in closed stands on favourable sites and has a life span of more than 60 years. Generally, swamp sheoak trees have an erect trunk with erect, but sometimes spreading, branches. The bark is thick, fissured and darkish grey in colour.

Natural Distribution

Swamp sheoak grows widely in southern Western Australia, with limited occurrence in central South Australia, north western Victoria and south western New South Wales.

In Western Australia, swamp sheoak naturally occurs in the 275mm to 700mm per annum rainfall zone, growing around the margins of salt lakes and along saline creeks and rivers throughout the Wheatbelt and Goldfields. Swamp sheoak is found on sand plains, flats, gently undulating land and, occasionally, on the slopes of low hills.

Site Preferences

Usually associated with drainage lines, floodways, river systems, edges of salt lakes and seasonally inundated fresh-water depressions. It has been recorded growing in a range of soil types including saline loams, red and yellow earthy sands, calcareous and sandy earths, and grey cracking clays.

Open grown swamp sheoak near Northam WA.

The species is adaptable to most soils from sands to clays within its natural rainfall zone. Optimal growth will occur on moist clays and loams lower in the landscape where average rainfall is 400mm and above. The species will survive and grow well in areas receiving 350mm of rainfall per annum where the trees will have access to groundwater.

Swamp sheoak can tolerate highly saline conditions and will grow in soil with electrical conductivities (EC_e) of greater than 1600 mS/m (equivalent to an EM38 reading

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of greater than 200 mS/m[1]), however reduced growth can be expected between 800 and 1600 mS/m. In salt concentrations of greater than 800 mS/m (EC_e), long term survival is reduced, and establishment and growth of seedlings is also reduced. [2]

It is tolerant of waterlogging and will survive in sites that are permanently waterlogged, however growth and survival will be effected in areas that are frequently inundated with saline water.

Swamp sheoak can tolerate poor drainage, saline soils, frosts, exposed sites, and to a degree, drought. However, tough sites exhibiting all of the above features will restrict growth and hence commercial opportunities.

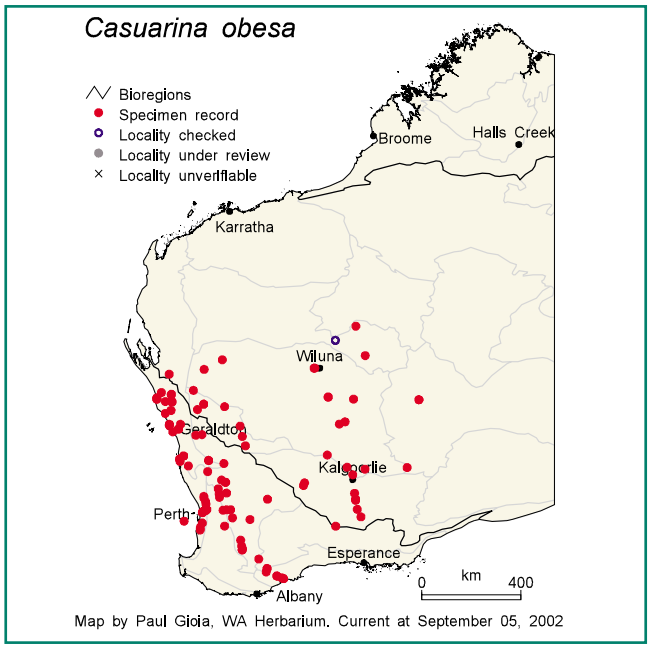
Species Use

In southern Western Australia, swamp sheoak has been used extensively to revegetate saline and waterlogged areas and to achieve land and nature conservation outcomes. The species is useful as a soil stabiliser, as a windbreak and can provide livestock shelter.

Swamp sheoak has been used in farm forestry in Western Australia only on a small scale. Other *Casuarina* species are grown in southern Australia and overseas on a larger scale for commercial purposes.

Planning and Management

Identifying primary and secondary objectives for growing swamp sheoak will assist the selection of suitable designs, and management regimes. If you are planting trees solely for commercial purposes, compare other farm forestry options suited to your area. The comparative economics of farm forestry and grazing/cropping enterprises needs to be considered, as does the likely impact on land protection, shelter and other values.



Distribution of swamp sheoak in WA based on the specimens in the Western Australian Herbarium.
Acknowledgment: FloraBase (www.calm.wa.gov.au/science/florabase.html) and the Western Australian Herbarium, Department of Conservation and Land Management.

A Joint Venture Agroforestry Program publication called 'Design Principles for Farm Forestry – a guide to assist farmers to decide where to place trees and farm plantations on farms', provides a good planning framework for a range of farm forestry and revegetation objectives.

1. Site Preference

Rainfall:
Prefers greater than 400mm per annum winter rainfall zones. With access to ground water, it can be grown on less than 350 - 400mm per annum.

Topography:
Natural occurrence is along streams and riverbanks, swamps, around lakes and in valleys and flats. Can be grown well on sites and soils that are not very dry.

Soil type:
Adaptable to most soils from sands to clays. Best growth is on moist clays and loams lower in the landscape. As rainfall reduces, growth is better on loams and soils where moisture accumulates or groundwater is accessible.

pH Range:
Prefers a pH of neutral (7) to very alkaline (>8.5).

2. Tolerances and Susceptibility

Drought:
Moderate drought tolerance.

Browsing animals:
Swamp sheoak is very palatable to native and introduced browsers. Grazing must be restricted more so than for other species. Fencing would be required to exclude livestock and a management program needed to control rabbits and kangaroos.

Frost:
High frost tolerance.

Pests and Diseases:
Particularly susceptible to damage by the Australian Plague Locust. Susceptible to damage by the Australian ringneck parrot, which can damage good tree form. [3]

Salinity:
Very tolerant of soil salt: electrical conductivities of up to 150 mS/m soil salinity (measured with an EM 38 meter operating in horizontal mode). Extremely saline sites will reduce survival and growth.

Waterlogging:
Very tolerant of seasonal waterlogging. However the combination of prolonged waterlogging and high salinity will result in reduced survival and growth.

Wind:
Suitable for exposed conditions.

3. Limitations

Growth rate:
Recorded data of yields and growth rates in plantation situations are not available. Swamp sheoak is considered to be relatively fast growing (REX 96). Rotation lengths to produce large diameter sawlogs will be dependent on site productivity factors and adopted silviculture regimes.

Improved seed:
No information is currently available on superior

Silviculture is a powerful and important tool in farm forestry. Pruning and thinning is required to produce knot-free timber and large diameter logs.
Top: Unmanaged trees Bottom: Managed trees.

provenances for commercial applications. Collect seed from trees with desirable traits (healthy, dominant trees with acceptable form).

Silviculture:
Limited silvicultural information is available for swamp sheoak. Information is available for other *Casuarina* species (eg. *C. cunninghamiana*) and may be applicable to swamp sheoak. Also, in lieu of established information, basic silvicultural principles can be applied.

Weed potential:
Swamp sheoak has potential to invade areas outside its natural distribution.

4. Establishment and Management for sawn timber production

Please Note – This information should be used as a guide only. For a more detailed consultancy on the establishment and management of swamp sheoak contact Greening Australia (WA).

Size of planting:
For on-farm value adding, single-age woodlots of about one hectare may be adequate. However, commercial harvesting and sawmilling will require much larger areas. Marketing can be difficult with small (less than one hectare) woodlots, as this is a small resource, and a one-off supply. Continuity of supply is important to achieve orderly, stable marketing. Establishing an annual planting regime can assist with producing a continual supply, without which a market cannot be developed or sustained.

Forming networks or cooperatives with other growers in your region is beneficial, to build a resource base, assist with future marketing, and add to industry confidence in the continuity of supply necessary for capital investment in processing equipment. One such cooperative is the 'Western Timber Cooperative' operating in the south west of WA.

Factors to consider are:
- buyer requirements for volume and continuity of supply,
- labour requirements of the woodlot,
- capital investment,
- break-even time, and
- local infrastructure and cooperatives.

Stocking rate:
High stocking densities may be required to provide adequate selection of crop trees and to assist with maintaining form.

However, there are trade-offs with the differing strategies that a grower should consider:

Advantages of low stocking densities:
- reduced site preparation and establishment costs,
- thinning can be delayed compared to a more dense stand,
- increased access between rows, and
- grazing opportunities (once trees are > 3 m tall) may be prolonged, due to less shading and competition from trees.

Disadvantages of low stocking densities:
- reduced selection of crop trees,
- increased risk (if poor establishment, parrot damage, or browsing damage is experienced, selection opportunities are reduced further), and
- lateral branching may occur, due to increased space and available sunlight.

Advantages of high stocking densities:
- increased selection of crop trees,
- inter tree competition can assist with maintaining tree form, and suppress lower branches, due to shading, and
- reduced risk of having to replant if some mortality is experienced.

Disadvantages of high stocking densities:
- increased site preparation and establishment costs,
- earlier thinning required, or risk tree mortality or reduced growth rates, and
- reduced access between rows.

Initial stocking density options;
1,000 stems / ha (5m between rows, 2m between trees)
1,111 stems / ha (3m between rows, 3m between trees)
1,600 stems / ha (2.5m between rows, 2.5m between trees)
1,667 stems / ha (3m between rows, 2m between trees).

Weeds:
Weed control in the first two years is essential for commercial production. Chemical weed control with a combination of knockdown and residual herbicides controls weeds effectively. [4]

Site Preparation:
All sites should be ripped to at least 30 cm. Saline and waterlogged sites need to be mounded for successful seedling establishment. [5]

Grazing:
If planning to graze sheep beneath the trees, restrict access until the smallest trees are at least 3 metres tall. Grazing may compromise nature conservation values, so identify your objectives in the planning stage.

Form Pruning:
Form pruning directs new growth to produce a single, strong, straight and erect stem. This is required in swamp sheoak as early as one year of age. Remove large forks and branches and obvious double leaders, leaving one straight single stem, taking no more than 50% of the foliage at one time. Early form pruning will reduce the amount of pruning required in later years.

Clear wood pruning:
Clear wood pruning restricts defects to a minimum sized knotty core to maximise clear wood. With most *Pinus* and *Eucalyptus spp.*, clear wood pruning is not advised until stem diameter is greater than 9 cm. For swamp sheoak, prune for clear wood when branch diameter approaches 25mm, or stem diameter is approx. 5cm. Remove all branches on the stem below the point of stem target diameter (eg: 5 cm), retaining at least 50% of foliage on the top section of the tree.

Take care not to damage the branch 'collar', and do not leave 'coat hangers' or strip off the bark. Grazing sheep beneath the trees following pruning can assist with reducing fuel load (ensure smallest trees are well over 3 metres tall)

Thinning:
The primary objectives of thinning include maximising growth of selected trees by reducing competition, obtaining an earlier return on investment and reducing the risk of trees in a dense woodlot dying. Secondary benefits may be to maintain pasture production in the woodlot for grazing benefits. When thinning, the dominant trees with the most desirable form are retained, depending on the spacing of these dominant trees. A recommended final stocking density to produce large diameter (40cm +) sawlogs is 150 – 200 trees per hectare. Timing of thinning will be dependent on growth rates of crop trees, availability of labour, and availability of markets for thinning material. Thinning should not be delayed if growth of final crop trees is being compromised. [6]

5. Other Issues

Pasture Growth:
Pasture grows better under swamp sheoak than it does under eucalypts. This may be due to increased sunlight available through the canopy, less root competition, and nodulation with *Frankia bacterium*. *Frankia* colonises *Casuarina* and *Allocasuarina* roots and can fix atmospheric nitrogen in the soil. *Casuarina cunninghamiana* does not compete vigorously with pasture within the first 10 years. When pruning and thinning, stack debris in alternative rows to maintain pasture production, and maintain access.

Economics:
Swamp sheoak should have a place in the farming system wherever it is more profitable than other species. Its overall profitability is the total of all the benefits minus all the costs, summed over the life of the trees. To assess whether to grow swamp sheoak on a particular site requires a realistic estimate of log volumes and grades, stumpage ($/cu m), age at harvest, the value of other benefits (e.g. shelter, understorey grazing, etc etc), the costs of growing and managing the trees, and indirect costs, if any. All these projections should be built into a budget. Sensitivity analysis is important to test the effect of varying assumptions about the most uncertain factors. [7]

Form pruning one year old swamp sheoak. Left: Before Right: After.

Timber Use

In WA, swamp sheoak timber has been used for fence posts and tool handles. The timber of swamp sheoak and many other *Casuarinas* also produce excellent fuel woods.

Sheoak timber has been used Australia wide. The main commercial sheoak species in Western Australia is *Allocasuarina fraseriana*, commonly known as West Australian sheoak. This species occurs in the greater than 700 mm rainfall areas of south-western WA, and is harvested from native stands.

In eastern Australia, *Casuarina cunninghamiana* (commonly known as river sheoak), is a widely used species; cultivated in Australia and overseas for timber production. *Allocasuarina fraseriana* and *Casuarina cunninghamiana* are used to manufacture furniture, decorative woodware and turnery, roofing shingles, flooring, parquetry and panelling.

Casuarina species appear to have broadly similar wood characteristics, and therefore swamp sheoak may have similar applications.

Timber Properties and Market Potential

Swamp sheoak timber is described as being straw to creamy-brown in colour. The *Casuarinas* and *Allocasuarinas* have prominent medullary rays, which make for attractive specialty and appearance grade products. Swamp sheoak timber has a moderately fine and even texture and the medullary rays are evident.

A report produced by the Department of Conservation and Land Management assessed the timber properties and market potential of swamp sheoak using a sample of ten logs from a 20-year-old plantation near Katanning. This report found the timber was easy to work, with good sawing, sanding and planing properties.

Swamp sheoak does not have as pronounced medullary rays and as distinctive features as W.A. sheoak *(Allocasuarina fraseriana)* and rock sheoak *(A. huegeliana)*. This reduced visual appeal may limit the marketability of swamp sheoak timber in high value furniture and turnery applications. However the lighter coloured timber may improve its acceptability in other applications, such as flooring or panelling.

The medullary rays restrict the amount of radial shrinkage and are readily seen on the face of a quartersawn board. Sheoak timbers generally have radial shrinkages of less than 2 per cent and tangential shrinkages between 4 and 5 per cent, giving a very stable product when dried and dressed. Sheoaks also have large vessels (or pores), allowing moisture to readily diffuse through the timber. The large vessels and low shrinkages allow the timber to dry efficiently and produce a stable product. Air-dry densities and drying rates similar to jarrah have been recorded.

Sheoak logs are often quartersawn (radially cut) to expose the medullary rays on the face of a board, which can give an attractive appearance. The backsawn (tangential cut) face of sheoak boards can also give an attractive appearance with a large amount of feature exposed. Often it is more practical to quartersaw sheoak logs, because of their irregular shape.

Swamp sheoak has potential as a commercial species in the WA wheatbelt because:

- its timber appearance suits the specialty timber market,
- wood working characteristics are good to reasonable, and
- there is a large area capable of growing this salt and waterlogging tolerant species.

Delaying pruning results in large wounds and increased effort.

Conclusion

Swamp sheoak occurs naturally in southern Western Australia, and has a history of being utilised in non-commercial revegetation within this region. The timber has similar characteristics to other *Casuarinas*, and has potential to be used in the production of flooring, panelling, roofing shingles, fence posts and firewood.

Although data for managed *Casuarina obesa* is limited, management should be tailored to achieve the timber, landcare and nature conservation objectives set before planting.

Swamp sheoak tolerates extremely saline and waterlogged sites, but commercial production will be reduced in these conditions. It is advantageous to identify how other benefits can be achieved from the planting, such as combating land management issues, to obtain the most from a planting.

Always seek further advice, and work with other potential growers in your region, to increase the likelihood of success of your own project.

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Footnotes

1 *Measured in the tree root zone and up to 1.5 m depth with an EM 38 electromagnetic induction meter in horizontal mode.*

2 *See Department of Agriculture Farmnote No. 105/2001 Salinity Series 'Measuring Salinity on the Farm' for methods to measure salinity.*

3 *For more information on parrot control, refer to Department of Agriculture, Department of Conservation and Land Management (1998) 'TreeNote No. 26 Parrot damage on agroforestry' or contact the Department of Conservation and Land Management Farm Forestry Unit).*

4 *For more information on weed control, refer to Department of Agriculture, Farmnote No. 47/98 'Weed Control for successful revegetation for agricultural regions with less than 600mm rainfall', or contact you local Department of Agriculture or Department of Conservation and Land Management.*

5 *Refer to publication: Mullan, G.D., (2001)'Revegetation site-preparation in the Central Wheatbelt of WA Ripping and mound ploughing' Department of Conservation and Land Management.*

6 *For more information on pruning and thinning refer to Chapter 12 of Bird P.R., (2000) 'Farm Forestry in Southern Australia – a focus on clearwood production of speciality timber' or Department of Agriculture, Department of Conservation and Land Management (1998) 'TreeNote No. 4 Pruning Trees for Sawlogs' & 'TreeNote No. 3 Thinning for Sawlogs'.*

7 *For information on economics refer to Reid, R., & Stephen, P., 'The Farmer's Forest – Multipurpose Forestry for Australian Farmers' RIRDC Publication No. R01/33. An Agroforestry Calculator can be down loaded from the Department of Agriculture's web site which can aid in assessing farm forestry economics; www.agric.wa.gov.au/environment /tools/trees/agroforestry_calculator For more information regarding farm forestry economics contact Peter Eckersley from the Department of Agriculture on (08) 9780 6204.*

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