



[TREES TO FIGHT SALINITY ON FARMS]



INTRODUCTION

The Forest Products Commission is in a unique position to provide trees as tools to fight salinity.

Through a committed research program the Commission has identified trees and shrubs that can withstand defined salt levels and made seeds available for propagation. The emphasis has been on species of potential commercial value.



1. *Acacia saligna* bush
2. Native habitat of *Eucalyptus occidentalis*
3. Commission Seed Centre checking seed viability before the release of seed
4. *Eucalyptus torquata* flowers
5. Screening for salt tolerance levels
6. *Callistemon phoeniceus* flowers



Front Cover - Top Left: *Eucalyptus eremophila* tree
Bottom Left: *Eucalyptus camaldulensis* flowers
Top Right: *Melaleuca uncinata*
Bottom Right: Trees surviving high salinity levels

SALT TOLERANT NATIVE SPECIES WITH COMMERCIAL POTENTIAL

Genus	Species Name	Common Name	Level of salt tolerance	Saw milling	Fire wood	Small timber-poles or wood turning	Honey producing	Essential oils	Cut flowers or foliage	Stock fodder
ACACIA	ampliceps	salt wattle	M							x
ACACIA	acuminata	rasberry jam tree	M		x	x				
ACACIA	redolens	vanilla wattle	M			x			x	
ACACIA	saligna	western wattle	H							x
ACTINOSTROBUS	pyramidalis	swamp cypress	M						x	
BANKSIA	attenuata	slender banksia	M						x	
BRACHYCHITON	gregorii	desert kurrajong	M							x
CALLISTEMON	phoeniceus	lesser bottlebrush	M						x	
CASUARINA	cristata subsp. pauper	black oak	H		x					x
CASUARINA	obesa	swamp oak	X		x					
EUCALYPTUS	angustissima	narrow-leaved mallee	M				x	x		
EUCALYPTUS	annulata	open-fruited mallee	M				x	x		
EUCALYPTUS	astringens	brown mallet	M	x	x	x	x			
EUCALYPTUS	calycogona var. calycogona	gooseberry mallee	M				x			
EUCALYPTUS	camaldulensis	river red gum	M	x	x	x	x			
EUCALYPTUS	campaspe	silver-topped gimlet	M		x	x	x		x	
EUCALYPTUS	cornuta	yate	M	x	x	x	x			
EUCALYPTUS	dielsii	cap-fruited mallee	M				x			
EUCALYPTUS	diptera	two-winged gimlet	M				x			
EUCALYPTUS	eremophila subsp. eremophila	sand mallee	M				x			
EUCALYPTUS	flocktoniae	merrit	M			x	x			
EUCALYPTUS	gracilis	yorrell	M		x	x	x			
EUCALYPTUS	gratae	Lake Grace gum	M				x			
EUCALYPTUS	kondininensis	Kondinin black butt	X				x			
EUCALYPTUS	kumariensis	Kumari gum	M	x	x	x				
EUCALYPTUS	lesouefii	Goldfield's black butt	M		x		x			
EUCALYPTUS	longicornis	red morrel	M		x	x	x			
EUCALYPTUS	loxophleba subsp. gratiae	Lake Grace gum	M				x	x		
EUCALYPTUS	loxophleba subsp. liosiphloia	smooth barked York gum	M				x	x		
EUCALYPTUS	loxophleba subsp. loxophleba	York gum	M		x	x	x	x		
EUCALYPTUS	loxophleba subsp. supralaevis	York gum	M		x	x	x			
EUCALYPTUS	myriadena subsp. myriadena	snap and rattle	M				x			
EUCALYPTUS	occidentalis var. occidentalis	flat-topped yate	H	x	x	x	x			
EUCALYPTUS	oleosa var. oleosa	red mallee	M		x	x	x	x		
EUCALYPTUS	platycorys	boorabbin mall	M				x			
EUCALYPTUS	platypus var. platypus	moort	M				x			
EUCALYPTUS	ravida	silver-topped gimlet	M			x	x			
EUCALYPTUS	salicola	salt gum	M	x	x	x				
EUCALYPTUS	salubris var. glauca	silver-topped	M			x	x			
EUCALYPTUS	salubris var. salubris	gimlet	M			x	x			
EUCALYPTUS	sargentii subsp. sargentii	salt river gum	H				x			
EUCALYPTUS	spathulata subsp. spathulata	swamp mallet	H				x		x	
EUCALYPTUS	torquata	coral gum	M		x		x			
EUCALYPTUS	transcontinentalis	redwood	M		x		x			
EUCALYPTUS	woodwardii	lemon-flowered gum	M				x			
MELALEUCA	acuminata	scented honey myrtle	M					x		
MELALEUCA	halmatororum subsp. cymbifolia	swamp paperbark	X		x					
MELALEUCA	huegelii subsp. huegelii	chenille honey myrtle	M						x	
MELALEUCA	lanceolata subsp. Occidentalis	Rottneest tea-tree	M				x			
MELALEUCA	lateriflora subsp. lateriflora	oblong-leaf honey-myrtle	M					x	x	
MELALEUCA	nesophila	showy honey-myrtle	M						x	
MELALEUCA	uncinata	broom bush	M					x		

X EXTREME

H HIGH

M MEDIUM

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Trees and Shrubs for Saline Land

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A range of salt-tolerant trees and shrubs can be used to revegetate saline sites, reduce erosion and improve biodiversity. This note is based on research in south west Victoria.

Livestock, fencing and erosion

The main aim of managing saline discharge sites in areas such as the Dundas Tablelands should be to prevent erosion, loss of topsoil and land degradation. Productive use of the land is a secondary consideration. Fencing to keep stock out of salt-scaled, erosion-prone areas is critical. Excluding stock prevents seasonal erosive pugging and sunbaking of bare ground. Natural regeneration of flora is possible over time and improved groundcover further protects the soil. Such regenerated areas also add to farm biodiversity. Some careful short-term grazing may be possible when the site is dry.

Planting of trees and shrubs

Role of tree planting

Tree planting can play a role in control of erosion, improvement of biodiversity and reduction of waterlogging at saline discharge sites. Trees may also be grown for productive purposes, *e.g.*, for firewood, sawlogs or carbon storage, although farm forestry is best suited to high-quality non-saline sites.

Effects on salinity

Tree planting on discharge areas is unlikely to significantly reduce the salinity problem by lowering groundwater levels. Planting of larger recharge areas can be effective in this respect, but this depends on local and regional hydrogeology.

Dense planting directly on discharge sites can potentially increase soil salinity over time because salt can accumulate in the root zone as a result of tree water use. However, salt accumulation depends strongly on site characteristics, rainfall and evaporation as well as transpiration by trees (dependent on tree stocking and growth) and other plants.

Trials on discharge sites in south west Victoria showed increases in soil salinity to age 13 to 15 years. Changes for the 0 to 60 cm soil profile ranged from 0 to 15 dS/m. However, tree stocking and growth appeared to have little influence on these increases, or on salt distribution through the profile. Rather, increased salinity tended to be found where groundwater was more saline and near or above ground level in piezometers.

Nevertheless, substantial increases in soil salinity could affect the long-term health, productivity or survival of trees, and

Planting density

In sensitive areas, planting at relatively low stockings (200-500 trees/ha) may be wise. This is more likely to allow flushing by rainfall. Leaving unplanted spaces can also encourage other groundcover species and help to prevent erosion.

Species selection

Numerous tree and shrub species were included in the trials in south-west Victoria, which were established from 1985 to 1991 and assessed for growth and survival in 2003 and 2004. Table 1 is a shortlist of species and their tolerance of salinity and waterlogging, based on that and other work. Table 2 lists categories of tolerance to root-zone soil salinity.

Table 1. Trees and shrubs for saline land in SW Victoria

Species	Tolerance of		Potential wood use*	Source & other notes
	Salinity*	Waterlogging*		
Trees of SW Victoria				
Acacia mearnsii (Black Wattle)	L	L-M	F	Local, easily direct-seeded
Acacia melanoxylon (Blackwood)	M	M	S	Local, easily direct-seeded
Allocasuarina verticillata (Drooping Sheoak)	M	L	F, P, S	Local, easily direct-seeded
Eucalyptus camaldulensis (River Red Gum)	H	H	F, P, S	Local, natural regeneration
Eucalyptus leucoxylon (Yellow Gum)	M	M	F, P, S	Near-local, habitat
Eucalyptus melliodora (Yellow Box)	M	L	F, P, S	Near-local, habitat
Eucalyptus microcarpa (Grey Box)	M	M	F, P, S	Near-local, habitat
Eucalyptus ovata (Swamp Gum)	M	M-H	F	Local, habitat
Eucalyptus viminalis (Manna Gum)	M	L-M	F, P, S	Local, habitat
Shrubs of SW Victoria				
Acacia retinodes (Wirilda)	M	L		Local, prefers sandy soils

Allocasuarina paludosa (Scrub Sheoak) H H Local, from wet heaths

Bursaria spinosa (Sweet Bursaria) M L Local, habitat

Callistemon rugulosus (Scarlet Bottlebrush) H M-H Near-local, habitat

Leptospermum lanigerum (Woolly Tea-tree) M M Local, dislikes dry summers

Melaleuca decussata (Totem Poles) E H Local, spreads naturally

Melaleuca halmaturorum (Salt Paperbark) H H Wimmera and Portland area

Melaleuca lanceolata (Moonah) M M Wimmera & coastal limestone

Other trees

Casuarina cunninghamiana (River Sheoak) M-H M F, P, S NSW, variable growth

Cas. glauca (Swamp Sheoak) E H F, P, S Qld, suckers, potential weed

Cas. obesa (WA Swamp Oak or Bulloak) E H F, P, S WA, hardy

Corymbia maculata (Spotted Gum) L-M L F, P, S NSW, good for farm forestry

E. cladocalyx (Sugar Gum) M M F, P, S SA, good for farm forestry

E. globulus (Tasmanian Blue Gum) L-M M F, P, S Vic-Tas, tall fast growing

Eucalypt hybrids (e.g. *E. camal.* x *E. grandis*) H? M-H? F, P, S Not tested here, seedlings costly

E. kitsoniana (Gippsland Mallee) M M Vic, good for shelter

E. largiflorens (Black Box) M-H M Wimmera, slow-growing

<i>Eucalyptus polyanthemos</i> (Red Box)	M	M	F, P, S	Central Vic
<i>E. tricarpa</i> (Red ironbark)	M	L-M	F, P, S	Centrai Vic, drought tolerant
<i>E. halophylla</i> (Salt Lake Mallee)	H	H		WA, small tree

Other shrubs

<i>Acacia saligna</i> (Orange Wattle)	H	M		WA, potential weed via seeds
<i>Melaleuca cuticularis</i>	H	H		WA, dense, possibly invasive
<i>Melaleuca ericifolia</i> (Swamp Paperbark)	E	H		Vic, potential weed via suckering

* Abbreviations: L = low, M = moderate, H = high, E = extreme, F = firewood, P = posts/poles, S = sawlogs

Table 2. Categories of tolerance to root-zone soil salinity

Trees		Pastures and crops (for 10% minimum yield loss)	
Tolerance	Salinity (dS/m)	Salinity (dS/m)	Tolerance
Very low	0-2	<1.8	Sensitive, eg. white clover
Low	2-4	1.8-3.8	Moderately sensitive, eg. lucerne, sub. clover
Moderate	4-8	3.8-6.5	Moderately tolerant, eg. ryegrass, wheat
High	8-16	6.5-8.6	Tolerant, eg. puccinellia, tall wheatgrass
Extreme	>16	>8.6	Highly tolerant, eg. saltbush

After Marcar and Crawford (2004) and Norman (1991)

Often the best species to plant are salt-tolerant species that occur naturally in an area. Local species support biodiversity, grow in local conditions and do not create weed problems. However, local species may not be the best choice for productive farm forestry, which requires appropriate tree form, growth rates, log size and timber qualities.

Only species highly tolerant of both salt and waterlogging can be planted directly onto saline discharge areas. Trials in Western Victoria have shown that such species can survive at least 10-20 years.

vegetation. These trees and shrubs can be established easily and cheaply using direct seeding or natural regeneration.

Waterlogging and mounding

Salt-tolerant trees vary in their tolerance of waterlogging, but very few can withstand long periods of 'wet feet' in their first and second years. Planting trees on mounds can dramatically improve early survival rates. Mounding should be carried out in summer or autumn, to allow leaching of salt before spring planting to improve survival.

In the south-west Victorian trials, mounding at two extremely wet sites resulted in early tree survival rates of 87% (across four species) and 40% (across nine species). Waterlogging had a far greater influence on the early death of trees than salinity. Survival was often good under high EC and minor waterlogging, but poor on waterlogged lower slopes of similar EC.

Topsoil

In the south-west Victorian trials, virtually no trees or shrubs survived when they were planted on areas where topsoil had eroded leaving exposed poorly-drained subsoil subject to seepage (from higher up), even though the EC was moderate.

Weed control

Weed control is a critical part of establishment, particularly where high survival or good growth rates are intended, or where competitive species such as Tall Wheat Grass or Phalaris are present.

Strip or spot spraying is the most cost-effective way of controlling weeds. Apply a knockdown herbicide during autumn and spray again before spring planting, when adding a residual herbicide is beneficial. Do not pollute waterways. Aim to keep all areas within about one metre of a planted tree free of weeds until the following autumn. This leaves more soil water for the planted trees during the critical first summer.

Post-planting weed control should also be undertaken where competitive weeds return or fast tree growth is intended. Residual herbicide can be applied before weed germination or knockdown herbicide after germination.

Planting or direct seeding?

Spring is usually the best time for planting on saline sites because the planting zone is less saline after some flushing of salt during the wetter months of winter. Direct seeding of trees and shrubs on saline discharge sites can be successful but is more risky than planting seedlings or seeding non-saline sites. Timing is important because waterlogged topsoil of relatively low salinity (winter or early spring) can quickly become dry crusted and increasingly saline (spring or summer), leaving a small window of opportunity.

Direct seeding is a cheap and viable method of establishment on the lower slopes around a discharge area, above the salt-affected vegetation. Acacias are particularly suited to direct seeding. If residual herbicide is used, a narrow strip of contaminated topsoil must be removed with a disk before direct seeding into the shallow furrow.

Tree guards

shrubs. Most eucalypts are less susceptible and guarding is not usually necessary if rabbit and hare numbers are controlled. Nevertheless, plastic guards generally do help early survival and growth, and using them may be worthwhile, particularly on tough saline sites.

Grazing

When trees are large enough, some careful short-term grazing may be possible when the site is dry. Avoid planting Tall Wheat Grass or Phalaris in the same area as trees and shrubs. These grasses need periodic heavy grazing that damages trees and destroys shrubs.

Weed potential

Several species trialled in south-west Victoria created potential weed problems. In particular, *Casuarina glauca* suckered profusely and some forms of *Melaleuca ericifolia* spread vigorously, choking out other vegetation. Alternative species such as *Casuarina obesa* and *Melaleuca decussata* are better alternatives.

Further references

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Contact us

[Contact us](#) for more information.

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