

Salmon Gums (*Eucalyptus salmonophloia*) in the Moore Catchment

Grandfathers of the Wheatbelt



Health check – how are they doing and what can we do to stop their decline?



R. Walmsley



TABLE OF CONTENTS

Salmon Gums (*Eucalyptus salmonophloia*) in the Moore Catchment Grandfathers of the Wheatbelt

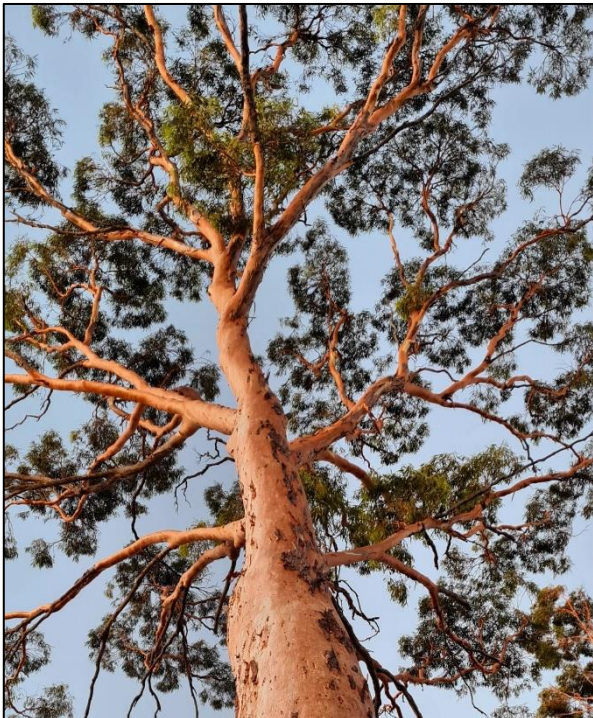
<u>Introduction - Health check – how are they doing and what can we do to stop their decline?</u>	1
What can we do to protect these ancient trees?	2
Where are Salmon Gums found?	3
Revegetation	4
Growth rates	4
Habitat trees	4
Salmon Gums and Natural Regeneration	5
Talking to the Wheatbelt Woodland advisors	5
Benefits of Salmon Gums trees	6
Research	7
Disturbance is a vital part of Salmon Gums recruitment strategy	8
Recommended techniques to encourage natural regeneration of Salmon Gums	9
Conclusion	10
References	11
Special thanks to the following for their input	122
APPENDIX 1 – Trees of Western Australia – Salmon Gum	133
APPENDIX 2 - Salmon gums photographed in Moora roadside surveys 2012	155
APPENDIX 3 – Salmon Gum Clearing – media article	166
APPENDIX 4 - Management Planning and Features of a Healthy Woodland	19
APPENDIX 5 - Healthy Woodland Checklist	200

Salmon Gums in the Moore Catchment – Grandfathers of the Wheatbelt

Health check – how are they doing and what can we do to stop their decline?

Eucalyptus salmonophloia or Salmon Gums as they are commonly known, are the kings, the ancient trees of the Wheatbelt. They are iconic with their salmon-coloured trunks which glow in the sun looking up to the blue sky above.

Their glossy green leaves and foliage create the impression of an umbrella shading and protecting the landscape. They also have the tiniest gumnuts and seed which grow to produce the magnificent awe-inspiring trees.



Salmon Gum reaching for the sky
Photo: Rachel Walmsley

Years ago, avenues of them used to be found along numerous roadsides but these are gradually being removed for 'safety' reasons (see Appendix 3).



Roadside Salmon Gum
Photo: Richard Cumming

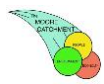
Surely there is another way to make the roads safer without destroying these ancient trees which provide on farm and biodiversity benefits including shade and shelter for animals, water and wind erosion protection, habitat and food for numerous birds, insects, reptiles and mammals and social, health, economic benefits for us as humans, including eco-tourism, mental health benefits and the list goes on.

In many Wheatbelt shires the amount of remaining remnant vegetation is less than 15% (DBCA, 2018) and roadsides and small remnants are often the only remaining corridors of vegetation in the landscape. However, sadly this is diminishing even more to allow room for bigger trucks and machinery and for safety concerns.

In 2015 the Wheatbelt Eucalypt Woodlands were listed as a Threatened Ecological Community (TEC) under the Environmental Protection and Biodiversity Conservation (EPBC) Act. *Eucalyptus salmonophloia* are a major part of this critically endangered community. It was hoped national listing would help to increase awareness that this landscape is heavily damaged and retaining native vegetation is important for both conservation and productivity (Department of the Environment, 2023).



Salmon Gum avenue on a roadside near Coorow –
hopefully these still remain

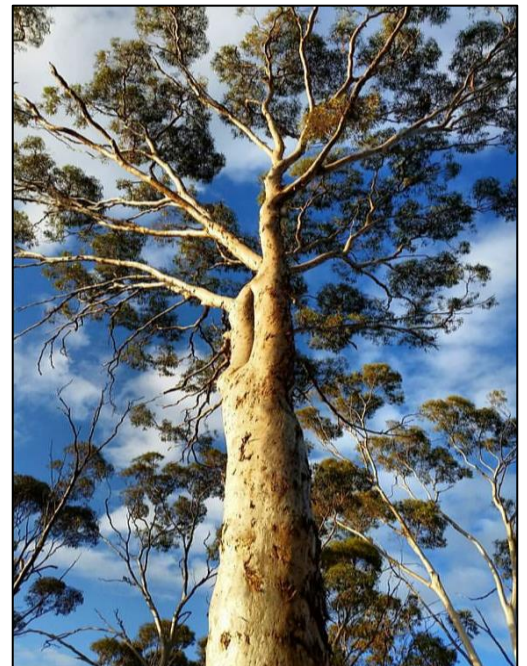


What can we do to protect these ancient trees?

While some Wheatbelt eucalypts such as (*Eucalyptus loxophleba*) York gums seem to readily regenerate after rain, fire and disturbance, for largely unknown reasons Salmon Gums do not. There has been extensive research undertaken on Salmon Gum regeneration in the late 1990's but not a lot since then.

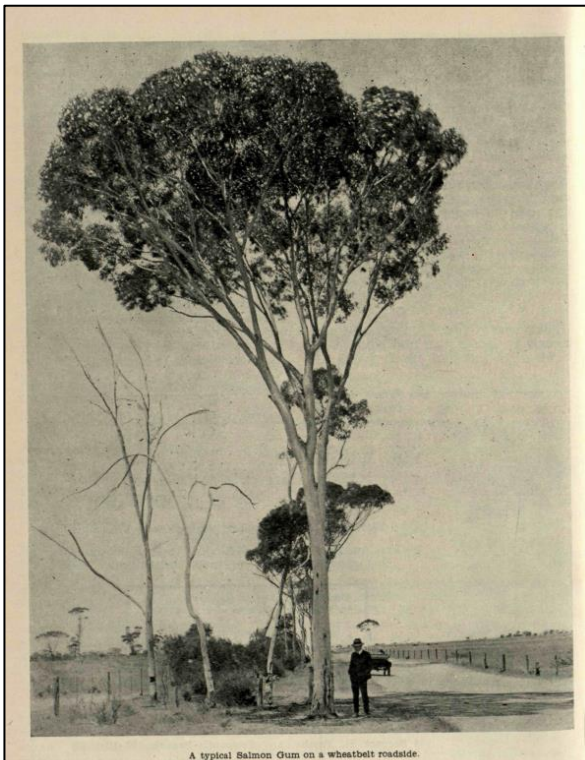
Consequently, since they are such an iconic and declining species in the Moore Catchment, it was decided we should take another look at this majestic species and try to get a better understanding of why the natural regeneration of Salmon Gums in the catchment is limited.

So, with consultation with leading Eucalypt woodland advisors, local landholders, the Aboriginal community and online research, this report aims to discuss the factors required for regeneration including factors which inhibit natural regeneration and create recommendations and some techniques to trial to encourage Salmon Gum natural regeneration.



Eucalyptus salmonophloia
Photo: Rachel Walmsley

History



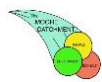
Salmon Gum on a Wheatbelt roadside
Source: Gardner, 1952

Eucalyptus salmonophloia (Salmon gum) was first described in 1878 by the botanist [Ferdinand von Mueller](#) in his book [Fragmenta Phytographiae Australiae](#). using from samples collected by [Ernest Giles](#) east of [Kalgoorlie](#) in the [Great Victoria Desert](#). (Wikipedia, 2023)

The Yued Noongar people know the tree as 'Wurak'. The First nations people regard them as magnificent icons, the big fellas and note that there are nowhere near enough of them. They are a very important tree to the old people and to all Noongar people. They have name and standing in many stories. Clearing, burning and salinity has largely contributed to the decline of them. They are part of what's needed for healing country – we need to plant as much as what country needs for cultural survival. We need ceremony, song, dance and language (Oral McGuire pers com, June 2023).

Fred Mogridge, Yued Elder remembers there were heaps of them around as a child and the old people never cut them down as they were too big and too hard. He remembers there were a lot of salmon gums around. They lined the roads and the railway lines, there were heaps of them down Mogumber way. They used to walk down the rads and railway lines and put their initials on the old trees. (Fred Mogridge Yued Elder, pers com, June 2023).

Eucalyptus salmonophloia were once widespread across the Wheatbelt and Goldfields. However, the open, grassy, salmon gum woodlands were favoured by early settlers for grazing and were extensively cleared for cropping. The hard native timbers were used for fencing, construction and firewood. Salmon Gums played an important role in establishing farms and towns of the growing colony. But the enthusiasm and hard work of our forefathers has left an unwanted legacy. An estimated 96 percent of salmon gum woodlands have been cleared and the remaining areas are now fragmented and vulnerable (Piggot, Landscape, 1999).

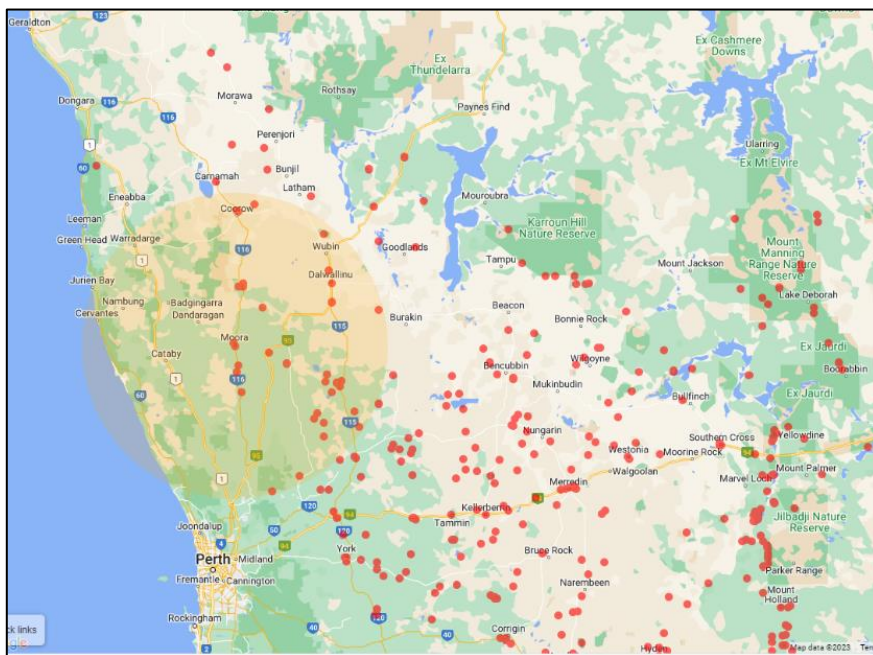


Where are Salmon Gums found?

Eucalyptus salmonophloia is a very widely distributed species, one of the most widely distributed eucalypts in WA.

The Moore Catchment is the north western edge of its distribution, with only small remnant populations remaining due to the extensive clearing for agriculture.

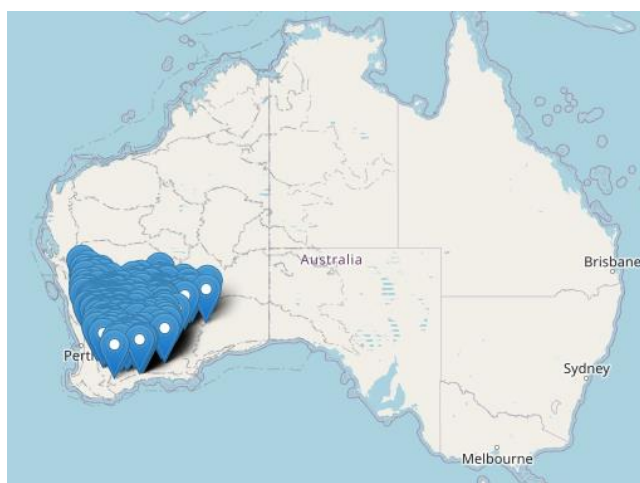
Eucalyptus salmonophloia grows in alkaline loam and red clay soils in broad valleys and low hills which are also ideal soils for growing crops. Consequently, Salmon gums are not well represented in Wheatbelt conservation reserves. Most remnants are found on private property, roadsides and town reserves set aside for townsites and water catchment.



North western distribution of *Eucalyptus salmonophloia*

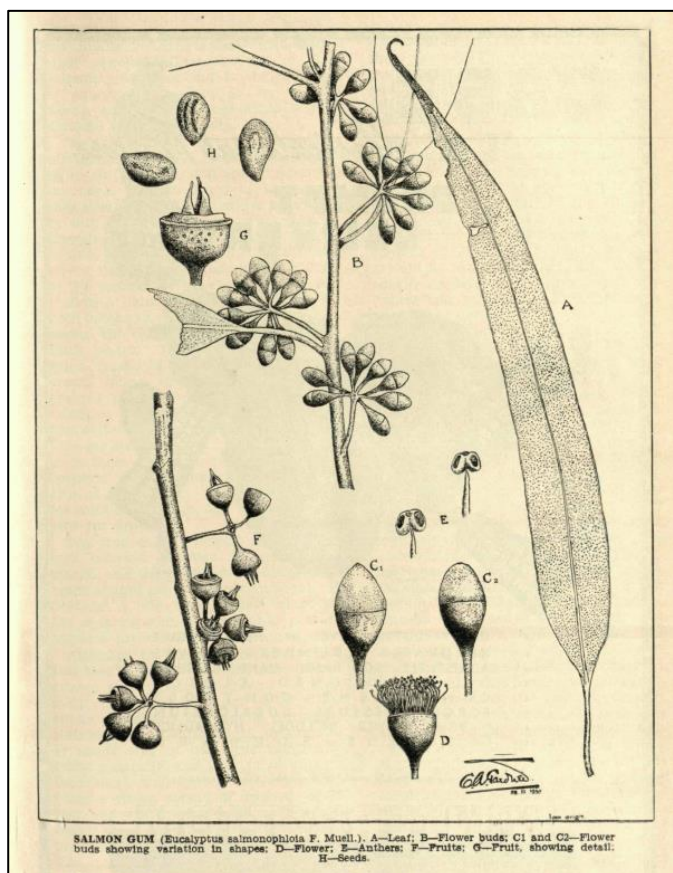
100km around Moora is highlighted

Source: Atlas of Living Australia



Distribution of *Eucalyptus salmonophloia*

Source: FloraBase



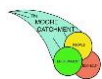
Eucalyptus salmonophloia – leaves, buds, flowers, fruit and seeds

Source: Gardner, 1952



Eucalyptus salmonophloia –buds and fruit

Photos: Centre for Australian National Biodiversity Research



Revegetation

Eucalyptus salmonophloia is an excellent species for rehabilitation and for areas requiring soil stabilization as it is drought tolerant, frost resistant and able to grow in poor soils.^[13]

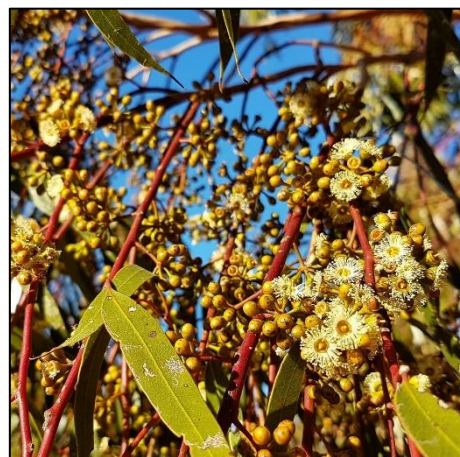
Salmon gums are relatively easy to propagate and will establish fairly quickly initially.

The mystery is in why they don't naturally regenerate.

Growth rates

Eucalyptus salmonophloia are very slow growing and slow to mature compared to other *Eucalyptus* species. While they will shoot up initially, the girth increase is minimal:

- Richard Hobbs noted about 3mm girth growth a year and 1mm for those crowded out with other trees in the lower rainfall Goldfields area (Richard Hobbs)
- Kingsley Dixon noted that in 35 years in a farm at York, they are about 1/3 of the height of a fully grown salmon, about 6-8m tall and 150mm maximum in girth width (pers. comm. Kingsley Dixon – 35-year-old salmon gums planted on farm at York)



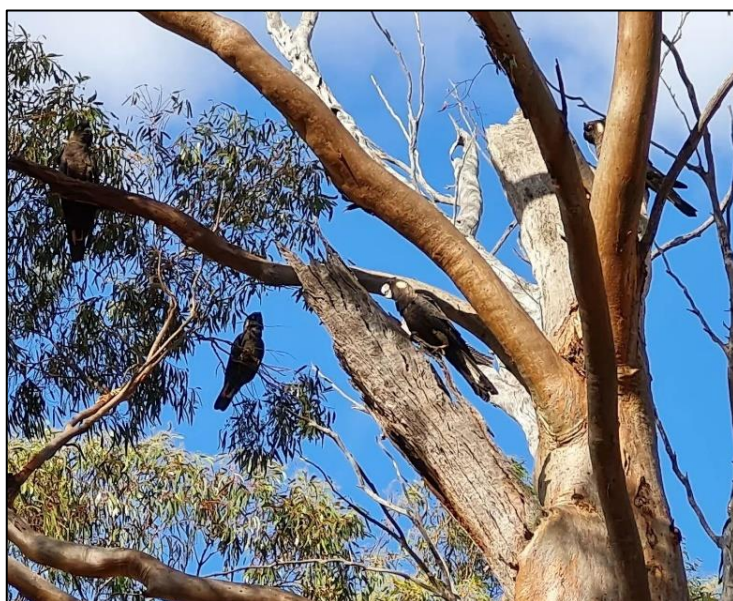
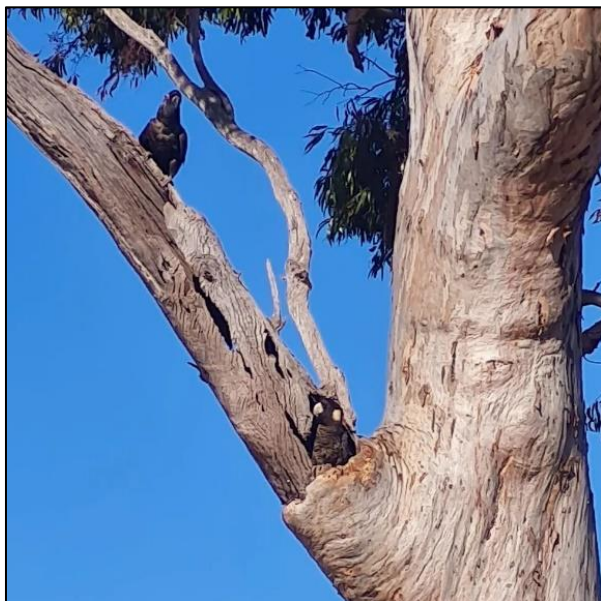
Planted Salmon Gum flowering
Photo: Rachel Walmsley

Habitat trees

As the largest of the Wheatbelt trees, salmon gums provide crucial nest hollows for many birds including the endangered Carnaby's Black Cockatoo (Piggot, Landscape, 1999).

Old trees provide habitat which will take over 100 years to replace. By measuring the diameters of trees to estimate the age of the Salmon Gum, Hobbs noted that first hollows were formed when the tree was approximately 130-150 years old and 50% of the hollows were formed when the tree was about 200-220 years old. (Hobbs, 2000 Salmon Gum Conference)

Some of the really big trees are likely to be 300 to 350 years old or more. These cannot be replaced quickly.



Salmon Gum with Carnaby's Black Cockatoo hollows – trees would be hundreds of years old
Photos: Rachel Walmsley



Salmon Gums and Natural Regeneration

Wheatbelt Eucalypt experts and landholders spoken to agree that Salmon Gum regeneration is minimal and rare. Most say they have never seen it or only seen once or twice and seldom, if ever, on roadsides. Unlike York Gums (*Eucalyptus loxophleba*) which readily come up along roadsides after rain or disturbances. A few landholders have seen a small amount of regeneration along the railway reserves due most likely to disturbance and weed control.

Talking to the Wheatbelt Woodland advisors

Professor Kingsley Dixon – internationally acclaimed botanist for work in fire ecology, seed restoration and threatened species research, founding Director of Science at Kings Park and Botanic Gardens, currently Professor Curtin University – conservation and restoration sciences

- “The large salmon gums are ancient survivors of once great forests and are irreplaceable” Kingsley Dixon
- Survivors of last great forests should not be cut down in the name of road safety - slow the speed limit, install railing/wire rope barriers
- Salmon gums tell us the past and are beacons to the future, they remind us of the past and remind us they can do it better
- Salmon gums might think, “We don’t need to regenerate because we have longevity” – *not if we keep cutting them down*
- Large hot summer fires creating an ashbed may have had a stimulating effect eg. Large fire in Peak Charles, north of Esperance.

Malcolm French - Author of two WA eucalypt books, taxonomist, research associate, volunteer WA Herbarium

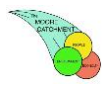
- Concerned about the serious decline of single paddock trees due to large machinery and farmers wanting to sow and harvest in straight lines. Salmon Gums are also affected by spray drift (*which was brought to the fore a few years ago when the railway lines were sprayed with metsulfuron*).
- Malcolm plants 120 *Eucalyptus salmonophloia* each year and has done since 2001, he plants in clumps. Plants are supplied by Chatfields. They are planted without water, and he is lucky to get 15% success, very slow growing, flowered for the first-time last year.
- “If a single tree is cleared in a paddock or on a roadside, 100 should be planted elsewhere nearby”.

Emeritus Professor Richard Hobbs – internationally renowned Ecologist, Murdoch University Chair of Environmental Science, most recently UWA School of Biological Sciences - leading ecosystem restoration research

- “The main thing about salmon gum woodlands is that they basically represent a worst-case scenario, where pretty much everything needs to be sorted to have successful regeneration - grazing, soil compaction, weed competition, lack of viable seed, a disturbance cue, the whole shebang. Unlike, say York gum, you can’t just put a fence round a patch and expect regeneration”.

Colin Walker - President, The Tree Society, Coordinator - Salmon Gums Conference Quairading 2000

- “A tall elegant tree that dominated the native ecology over wide areas, this species was the one that most competently managed the conditions – using the last drop of rain and controlling the salt. In all likelihood, its capacity to control the water resources of our land will never be matched by any annual production system.
- We have a responsibility to look after this wonderful species. We need to get to know it – its needs and relationships – and how to help and use it to greatest effect. Perhaps through understanding the trees we will become better stewards of our planet.” in Introduction to Conference



Benefits of Salmon Gums trees

Ecosystem services for farms from paddock trees and other small remnants including:

- **Provide shade and shelter from wind, rain and weather extremes for stock** *Energy expended by livestock to maintain a regular body temperature diverts valuable energy away from desired production gains, such as live weight gain, milk production or wool growth.*
- increased quantity and diversity of **insect pollinators**
- **reduced pressure from insect pests** - native bats, lizards, birds including owls will prey on common farm pests and many of these animals use scattered paddock trees for roosting and foraging
- **improves soil** - structure, organics content, water infiltration, moisture and quality
- **Increased pasture growth and reduced desiccation** in hot, dry periods, due to the shelter provided by paddock trees.
- **Control of Salinity** – can reduce waterlogging and dryland salinity
(Sustainable Farms, 2023)

Increase biodiversity on farms

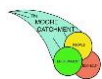
- Paddock trees are often the older trees in the landscape and can be over 100 years old, so they **provide nests and hollows** for breeding birds including the threatened Carnabys cockatoo
- Large old trees also flower more prolifically than younger trees **providing nectar** for v birds including honeyeaters, and small mammals and insects
- **Connect habitat** between native vegetation patches providing stepping stones for wildlife to move across the landscape.
- **Dead trees are important too** providing hollows for nesting
(Sustainable Farms, 2023)

Other Environmental Benefits

- Moderate climate
- Improve air quality
- Erosion control – wind and water, and windbreaks
- Reduce impacts of climate change

Aesthetic value and social/health benefits

- **Provide mental health and wellbeing benefits** for farmers and the rural and wider community – **seeing trees in a landscape brings feelings of peace and calm, strength and safety**
- **Shade and shelter**
- **Eco tourism** – tourists come from all over Australia and the world to see our avenues of salmon gums, other native trees and wildflowers



Research

Dr Colin Yates undertook a significant amount of research on Salmon Gums and natural regeneration in the late 1990's and it seems that not a lot of research on salmon gums has been undertaken since.

Factors to be considered for regeneration

There are a number of conditions and factors that are needed for a *Eucalyptus salmonophloia* to regenerate

1. Tree has to flower
2. Flowers have to be pollinated
3. Flowers/gumnuts need to disperse viable seed
4. Seed has to escape being eaten so it can become a soil seed bank.
5. The right conditions are required to stimulate germination to allow the seedling to grow and establish

(Yates, 2000 Salmon Gum Conference)



Scoliid wasp pollinating Salmon Gum flower
Photo: Rachel Walmsley

Dr Colin Yates looked into these life history stages and found that:

Flowering and Insect Activity

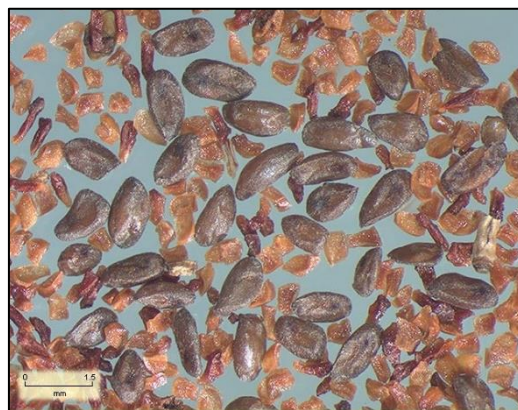
- All trees flowered only once in two years and flowering was very patchy in *Eucalyptus salmonophloia*, within a tree and within a population.
- When flowering intensity was greatest, there was high number of insects around them.
- **Findings:** *Eucalyptus salmonophloia* may take multiple years for them to initiate flowers. Buds develop and may sit there for up to 3 before they all decide to flower. They are highly variable and seem to have episodic flowering.

Seed

- There were 2 crops of fruit in canopy (plus the new buds which hadn't flowered):
 - 1. fruit from the most recent flowering event,
 - 2. older crop of fruit from previous flowering
- so can be 5-6 years of stored seed in canopy
- There could be up to half a million seeds in a Salmon Gum trees canopy

(Yates, 2000 Salmon Gum Conference)

- It takes 4-6 months after flowering for the seed to mature.
- The energy expenditure on seed production for Salmon Gums is very low unlike Banksias, Hakeas etc. so the seed has to be a winner
- Tiny seeds emerge before or immediately after a fire (Dixon, 2003 pers. Comm.)
- Nursery's note it is quite hard to obtain *Eucalyptus salmonophloia* seed and it is expensive.



Salmon Gum seed
Photo: Centre for Australian National Biodiversity Research

Insect attack & bird seed stealers

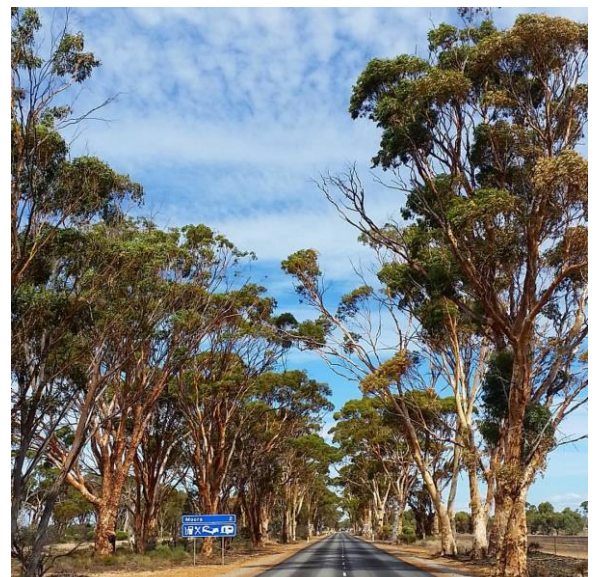
- 60-80% *Eucalyptus salmonophloia* seeds eaten by ants (Yates, 2000 Salmon Gum Conference)
- In an ecosystem that is already out of balance, insects will frequently attack - devouring new foliage and seed (Piggot, Landscape, 1999)
- Green Parrots steal a lot of the seed (Ian Pulbrook pers. comm. June 2023)



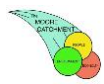
Remnant Salmon Gums along roadsides
Photo: Centre for Australian National Biodiversity Research

Disturbance is a vital part of Salmon Gums recruitment strategy

- **Grazing soil compaction is an inhibitor** to natural regeneration
- **Ripping or scarifying soil may encourage** regeneration
- Salmon Gums **require** some kind of **natural disturbance** before there is regeneration – fire, flood or windstorm but still don't regenerate as readily as other species after disturbance
- **a fire followed by summer rainfall can be a good stimulus**
- A Case Study showed good Salmon Gum regeneration on a dam wall - seed production in nearby tree, dam wall provides uncompacted, weed free, rough surface, less ants (seed predation) and appropriate microclimate (McQuoid, 2000, pg. 13 Salmon Gums Conference paper.)
- Fiona Falconer (landowner in Coorow) has found natural regeneration of *Eucalyptus salmonophloia* in a corridor of disused cropping land beside some remnant bushland. Salmon gums have naturally regenerated the area corridor. It's been about 10 years since the last cropping ceased.
- A few landholders have seen a small amount of **regeneration along the railway reserves**, most likely due to disturbance and weed control.



Salmon Gum avenue alongside the road and railway line on the road into Moora
Photo: Rachel Walmsley



Recommended techniques to encourage natural regeneration of Salmon Gums

- **Remove weeds** around remnant Salmon Gums to allow space and light for natural regeneration
- **Remove stock** which will have eaten understorey and compacted soil
- **Scarify or shallow rip if soil under trees has been compacted** - *be careful not to rip too deep as Salmon Gums are quite shallow rooted - their roots extend radially for a substantial distance from the base of the tree, keep on top of weeds after ripping, Salmon Gums don't like any weed competition*
- **Check when trees are flowering and might be dropping seed and follow techniques above and below**
- **Creating an ashbed** to sow seed or seedlings into. *This has been trialled recently with Tuarts (*Eucalyptus gomphocephala*) with a good success rate.*
- **Check for regeneration signs after fires, floods, windstorms and any other natural or human induced disturbances.** *Summer rainfall could be a trigger for regeneration if other favourable factors also exist.*
- **Make use of wet years** for trialling regeneration techniques and planting seedlings eg. this year.
- **Make use of seed from fallen trees** – collect seed and/or disturb ground around and protect from stock, weeds to allow natural regeneration



Koojan Reserve - Small Salmon Gum reserve with compacted soil surrounded by weeds and cropping paddock

Photo: Murray Fagg



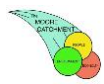
Salmon Gum seedling

Photo: Sue Jaggard



Salmon Gum sunrise

Photo: Westgrow Farm Trees



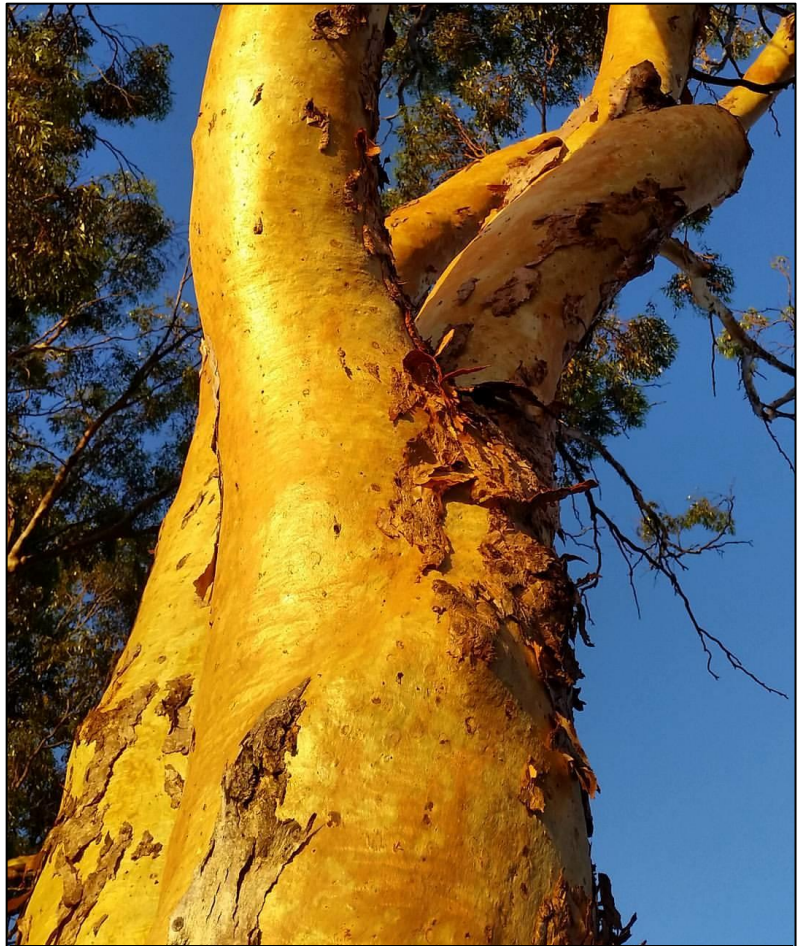
Conclusion

The survival of remaining Salmon woodlands in the Wheatbelt is threatened due to fragmentation, poor recruitment, changed fire regimes, drought, weed invasion, grazing stock, rising water table, increased soil salinity, compaction and road widening (Yates & Hobbs 1997a; Yates, Hobbs, et al. 2000).

Since there is very limited natural regeneration of *Eucalyptus salmonophloia*, it is paramount that we:

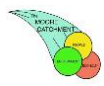
1. **Protect the remaining grand old Salmon Gum woodlands, road reserves and paddock trees in the Moore Catchment at all costs.**
Eucalyptus salmonophloia need a significant amount of disturbance and favourable seasonal conditions to regenerate so we need to preserve the existing trees we have left.
2. **Revegetate - plant as many more *Eucalyptus salmonophloia* as we can.**
They propagate well and are relatively easy to grow but are very slow growing. Consequently, we need to plant them now so future generations can enjoy and benefit from these majestic trees which take over 100 years to produce a breeding hollow.
3. **Regenerate** – although its challenging, seize opportunities to encourage *Eucalyptus salmonophloia* to regenerate. **Refer to the recommended techniques on Page 8.**

The results will be worth it if the magnificent towering Salmon Gums can remain one of Western Australis most impressive sights and the protective grandfathers of the Wheatbelt and Moore Catchment.



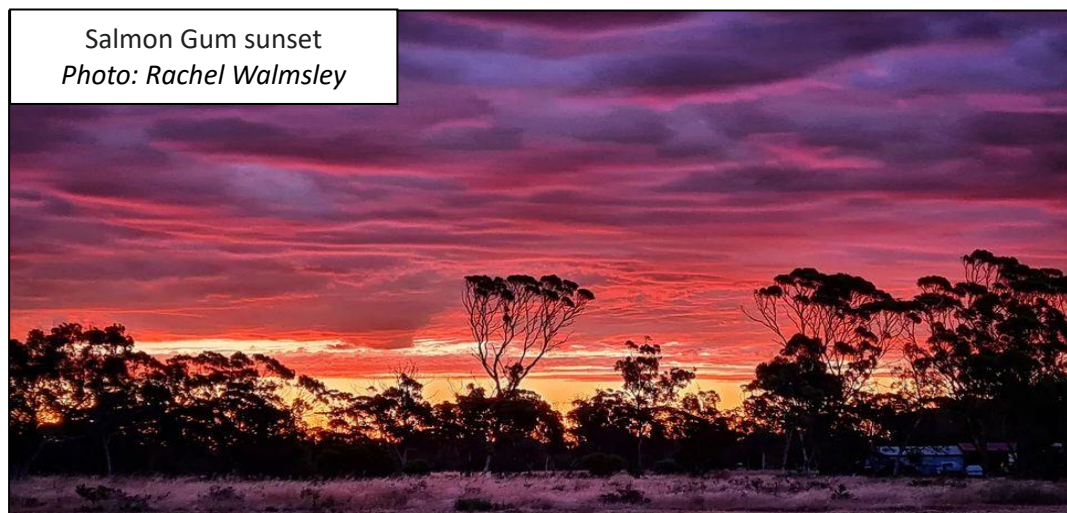
Salmon Gum sunlight - reaching for the sky
Photo: Rachel Walmsley

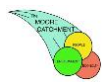




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Special thanks to the following for their input:

Prof Kingsley Dixon - founding Director of Science at Kings Park and Botanic Gardens, Professor Curtin University

Malcolm French – author of two WA eucalypt books, taxonomist, research associate, volunteer WA Herbarium

Emeritus Professor Richard Hobbs – internationally renowned Ecologist, Murdoch University Chair of Environmental Science, most recently UWA School of Biological Sciences - leading ecosystem restoration research

Fred Mogridge - Yued Nyungar Elder (Moora Mogumber area)

Oral McGuire - Noongar leader and landholder - extensive experience in traditional land and fire management practices

Dr Carole Elliott - Research Scientist - Kings Park Science

Dr Katinka Ruthrof - Forest Ecosystem Scientist, Department of Biodiversity, Conservation and Attractions - ecologist undertaking research on forest health and restoration

Dr Colin Walker – President, The Tree Society, Coordinator - Salmon Gum Conference 2000

Rob Boase – Dowerin farmer, landcarer, rare and native plant propagator

Ian Pulbrook – Greenoil Tree Nursery

Andrew West- Westgrow Farm Trees

Dustin McCreery -Chatfield's Tree Nursery

Fiona Falconer – Moore Catchment landholder

Will Easton– Moore Catchment landholder

Jennifer Jackson – Goldfields, Conservation Officer, Botanist and Consultant

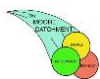
And anyone else I missed who has provided information



Seasonal Salmon Gum trunks
Photo: Centre for Australian National Biodiversity Research



Salmon Gum sunset
Photo: Rachel Walmsley



APPENDIX 1 – Trees of Western Australia – Salmon Gum

From: Gardner, C A. (1952) *Trees of Western Australia - salmon gum and scarlet pear gum*, Journal of the Department of Agriculture, Western Australia, Series 3: Vol. 1: No. 4, Article 10.

Available at: https://researchlibrary.agric.wa.gov.au/journal_agriculture3/vol1/iss4/10

TREES OF WESTERN AUSTRALIA

By C. A. GARDNER, Government Botanist

No. 5—SALMON GUM (*Eucalyptus salmonophloia* F. Muell.)

THE name salmonophloia, meaning salmon-barked, was given to this tree in 1878 by Ferdinand Mueller, the famous Australian botanist. The title of "Salmon-Barked Gum-Tree" had already been bestowed upon this tree by the early settlers, a name which apparently referred to the colour of the bark in fracture when it resembles the colour of cooked salmon flesh. The external colouration varies from a brownish pink at the end of summer to almost white in winter, usually with greyish-purple patches.

From the early days of agricultural settlement in Western Australia, the presence of Salmon gums has been taken as an indication of a good class of loamy soil suitable for wheat growing.

Where it is associated with the Gimlet tree the soil is of a close texture and a heavy clay; where the Salmon gum occurs in pure stands, the soil is of a lighter nature. Early land classification was often based on the presence of one or both of these trees as indicating first-class agricultural soil.

In the agricultural areas today the Salmon gum is becoming rare except for its occurrence along roadsides, and even here many trees are being sacrificed to make way for telephone lines. One sometimes sees clusters of trees or isolated examples which have been left to provide shade and shelter for stock, and where this occurs one sees the Salmon gum at its best.

Perhaps no other *Eucalyptus* tree is more attractive than the Salmon gum which is noteworthy for its clean seasonal-changing bark combined with a heavy, deep green foliage, the lustre of which has a burnished appearance. Seen in the woodland the crowded trees possess relatively small crowns of an umbrella-like appearance, but when

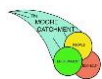
well-spaced, the trees branch widely and provide good shade. Of all the trees of the drier areas none is more suitable for planting or more decorative than the Salmon gum, if we except *Eucalyptus Brockwayi*, the "Red Mahogany" of the Norseman district.

HABITAT

The habitat of the Salmon gum extends from the Mullewa district southwards to the vicinity of Ravensthorpe and the Oldfield River. Its western boundary extends through Carnamah and Moora, thence to Seabrook, Brookton, Wagin and Gnowangerup, thence eastwards to Borden and Ravensthorpe. Its eastern limits are not well defined.

At Mount Gibson, in the Ninghan district, forest areas occur, and the tree is found commonly around Southern Cross and Kalgoorlie, and perhaps as far east as Goddard's Creek. It does not extend into South Australia. The township of Salmon Gums appears to be its southern limit on the Coolgardie-Esperance Railway, and it is found some little distance to the east of Norseman.

The tree occurs usually in pure stands forming open woodland formations in red loamy or light clay soils, sometimes mixed with gimlet, sometimes mixed with morrell and yorrel, or, in the East-



ern Goldfields districts mixed with many other species. Characteristic of the Salmon gum woodland is the absence or paucity of mallees as an understorey, and the open low scrub which provides the ground flora.

The Salmon gum is a tree attaining a height of up to 75 feet, with a trunk up to 40 feet long, and spreading-erect branches. Its burnished or lacquered, dark green foliage is a feature possessed by but few other trees. The bark is smooth throughout and rather thick, friable, and yellowish-pink. Its outer layers, then white or pale grey are shed in the months of March and April, revealing a light red new bark which in time fades to a pale pink or almost white colour, the old bark shedding in rather thick plates. The timber is deep red when fresh, but fades to a reddish-brown when dried. It is straight-grained and strong, and is used for domestic structural purposes, but will not withstand the ravages of termites. The sapwood is almost white. Trunks up to three feet in diameter are not uncommon in the southern regions of its area of distribution. The timber is used for mining purposes, and to a lesser extent for firewood.

The tree usually flowers in the summer months, between November and March, and the nectar of its blossoms is much sought after by birds and bees. It provides a fine, clear honey valued by the apiarist, and hollow trunks provide suitable hives for the naturalised bees.

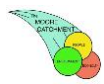
Although in the woodland formation this tree has a narrow, umbrella-shaped crown, given space for lateral development, cultivated trees are of value for shade purposes. The tree is eminently suitable for cultivation as an ornamental or shade tree in the agricultural districts generally, and is of rapid growth. Individual, well-spaced trees may develop a crown spread of upwards of 30 feet, and such trees provide much shade. Under these conditions the Salmon gum provides superimposed leafy branches. The tree is shallow-rooted, and its roots extend radially from the stem for very

considerable distances. The presence of these roots in the superficial layers of the soil after the trees have been destroyed, has provided farmers with excellent firewood for many years after the destruction of the trees during clearing operations.

In common with a number of other inland *Eucalyptus* species the Salmon gum foliage yields an oil which is rich in cineole (Eucalyptol) of the cineole-pinene type. Yields of 3.6 per cent. have been obtained, the oil having a cineole content of 77 per cent., but some give a yield as low as 1.4 per cent., with a cineole content of 46.4 per cent. Its commercial exploitation has not been extensively developed.

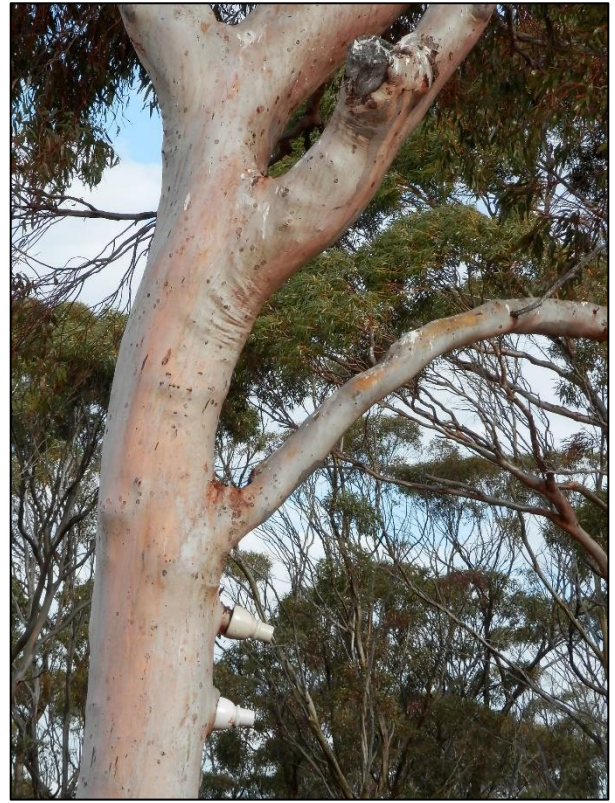
BOTANICAL DESCRIPTION

An erect, smooth-barked tree up to 75 feet tall, the trunk up to 40 feet, and three feet in diameter; bark, thick, smooth and friable; timber, deep red, strong and straight-grained. Branches spreading-erect, the branchlets reddish, somewhat angular. Leaves on slender petioles, alternate, lanceolate or oblong-lanceolate, 3-5 inches long, thick, the same colour on both surfaces, dark green, lustrous, somewhat sickle-shaped, copiously oil-dotted, the midrib fine, the lateral nerves inconspicuous and diverging from the midrib at a wide angle, the intramarginal nerve close to the margin. Flowers in axillary or lateral umbels of usually 5-7 flowers, the peduncle slender, and less than one inch long; pedicels (individual flower-stalks) short and slender. Buds obovoid. Calyx-tube almost hemispherical, tapering shortly into the pedicel, smooth. Operculum hemispherical, about as long as the calyx-tube, smooth, obtuse. Stamens all fertile, the filaments white, sharply inflected in the bud, the anthers short and broad, opening in parallel longitudinal slits. Fruit small hemispherical, the capsule 3-4-valved, the valves prominently exerted within the narrow, flat, annular disc. Seeds small, ellipsoidal, reddish-brown. Cotyledons V-shaped.



APPENDIX 2

Salmon gums photographed in Moora roadside surveys 2012

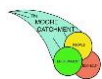


Remnant Salmon Gums
along roadsides
Photos: Kylie Payne



Below: roadside with
Salmon Gums being cleared
Photos: Kylie Payne





APPENDIX 3

Anger as 'ancient' Wheatbelt trees targeted for clearing in York-Merredin Road upgrade

By [Laura Gartry](#)

Updated 11 Jan 2017, 4:58pm



Photo: [Margaret Owen, John Salmon and Eddy Wajon](#) want the trees saved from clearing. (ABC News: [Laura Gartry](#))

York residents and environmental groups are appealing to the West Australian Government for an urgent reprieve to stop more than 600 native trees from being felled as part of a road widening project.

Main Roads has

begun clearing almost 40 hectares of native vegetation lining the York-Merredin Road, known locally as Cathedral Avenue.

The area includes 15 hectares of critically endangered eucalypt woodlands and old salmon gums and is also a key potential feeding and breeding habitat for the red-tailed phascogale and a foraging habitat for the Carnaby's black cockatoo.

Main Roads is upgrading the road by sealing the shoulder and widening it 9 metres, with audible edge lines to reduce the risk of road run off fatalities.

The project has outraged local pilot Gary Sargeant, who owns White Gum farm along the road.



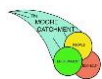
Photo: [Farm owner Gary Sargeant](#) says locals have not been properly consulted. (ABC News: [Laura Gartry](#))

"We get to fly over the whole Wheatbelt and see what trees are left, and when you see how many trees aren't left it's just terrible," he said.

"You've heard of Roe 8 in Perth — well, I think we are going to call this York 8. It's crazy."

The Department of Environment Regulation found the clearing permit application by Main Roads was "at variance" with five of its 10 clearing principles, including those relating to biodiversity, fauna and threatened ecological communities.

However, an appeal against the clearing permit by the Wilderness Society, Urban Bushland Council and Wildflower Society was dismissed late last year by Environment Minister Albert Jacob.



1. 'No consultation with people who live here'

The road is a local tourist attraction with buses often stopping for people to take photos with the trees, which locals say also help to reduce soil salinity in the area.



Photo: [These native trees along York-Merredin Road are due to be cleared under the project.](#) (ABC News: Laura Gartry)

Resident John Salmon said road safety could be improved along a particular 300-metre stretch of larger trees, by lowering the speed limit or erecting barriers around significant trees.

"We know there's a problem with the mortality from road deaths in the Wheatbelt, but there has to be some recognition of the value of these trees," he said.

"There are very few stands of

ancient trees left like this and they really need to be conserved.

"It's a huge failure of the Department of Environment who were required to give permits to Main Roads ... they don't recognise the value of these trees and there was no consultation with the people who live here."

Shire President David Wallace said the Shire of York was not involved with the decision.

"It's unfortunate that a lot of those big old trees will have to go but it's a safety thing. I would hate to see someone's child or grandson, or granddaughter run into one of these trees," he said.

2. Upgrade needed to improve safety: Main Roads

Main Roads declined to be interviewed, but in a statement said roadside vegetation contributed to more than 37 per cent of road deaths in the Wheatbelt.



Photo: [Some trees along the road have already been cleared ahead of the upgrade.](#) (ABC News: Laura Gartry)

A spokesman said crash rates on the section of York-Merredin Road were already up to five times higher than the state average.

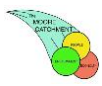
"Main Roads has complied with all due diligence and environmental legislation for this project," the spokesman said.

"All steps have been taken to minimise the impacts of the project including the

avoidance of mature trees where it would not result in a significant safety concern.

"Main Roads environment officers attended site and each individual tree was assessed ... with the aim of retaining as many trees as road safety design would allow."

The agency also said the area had been checked for the presence of endangered species prior to clearing.



3. Offsets not enough: conservationist

Conservationist Eddy Wajon said environmental offsets planned elsewhere in the region would not compensate for the loss of the trees.

"These trees are 200 to 400 hundred years old, and you just can't replace that by planting a tree that's maybe six months old," Dr Wajon said.

"I think there is an opportunity for a win-win here ... we could improve safety on this road, that's a definite plus, but we also could protect these trees which are basically irreplaceable in the Wheatbelt."

The Environment Minister said in a statement that his decision was final, and there was no avenue under the legislation for appeal.

Mr Jacob said the Department of Regulation (DER) had updated the way it advertised public comment periods, communicating with people online.

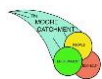
Local MP Mia Davies said she had passed on concerns from her constituents about the consultation process to Mr Jacob.

"The response I received from the Minister in January was that they had followed all of the appropriate processes but did acknowledge they needed to update the way that they kept stakeholders involved," she said.

"I would certainly support any updates to the way that they notify residents and interested stakeholders."

The road widening between Osborn Road, Leeming Road, Station Road and Needling Hills Road is planned to be completed by the end of March, and further widening will be undertaken each year.

First posted 10 Jan 2017, 6:23pm

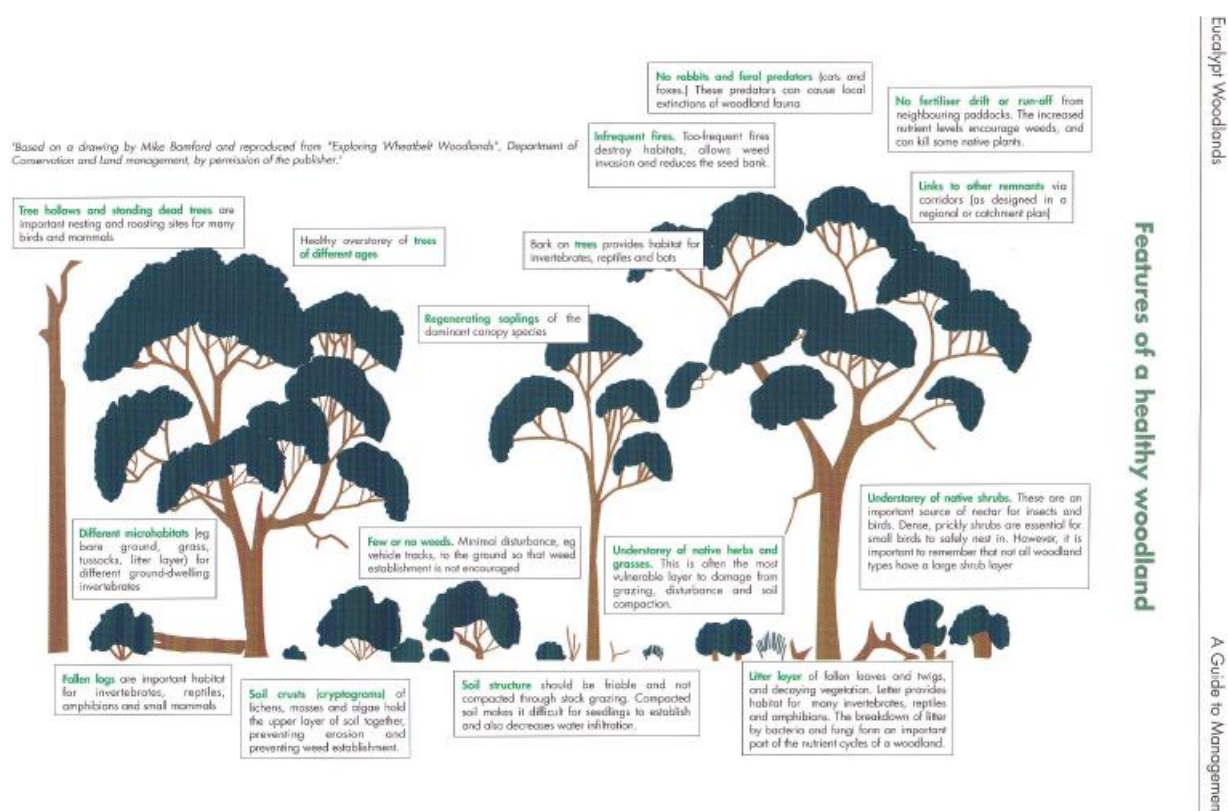


APPENDIX 4

Management Planning and Features of a Healthy Woodland

The following questions should be considered before developing the management requirements of your woodland, as they will influence your activities.

- What sort of woodland is it? Eg. Are the trees reseederers or resprouters? Is it a young woodland?
- What soil is it on? Eg. Is the soil sandy and susceptible to weed establishment?
- Where is it and what are the climatic/ rainfall conditions? Eg. The recruitment and seedling establishment time becomes shorter the further east that you go.
- Is there understorey? Should there be understorey? (Woodlands do not have to have a shrubby understorey, and often don't have understorey for most of their "mature" life).



From: Brown, L. and Holt, C. (2000) *Eucalypt Woodlands - A Guide to Management*. World Wide Fund for Nature, Perth and Agriculture WA, Narrogin

**APPENDIX 5****Healthy Woodland Checklist**

From: Brown, L. and Holt, C. (2000) *Eucalypt Woodlands - A Guide to Management*. World Wide Fund for Nature, Perth and Agriculture WA, Narrogin

Eucalypt Woodlands

A Guide to Management

Healthy Woodland checklist

(Developed for a 'mature' tree woodland)

Healthy woodlands provide vital habitats for native plants and animals by having healthy ecological processes occurring within them. This checklist will help identify them in your woodland.

This checklist can be completed as an informal monitoring sheet at the same time every year. Comparison from year to year will give an indication of how the woodland is changing.

Main eucalypt species present: _____

Features of good woodland health	Write: None Few Some or Many	Features damaging to woodland health	Write: None Few Some or Many
Woodland contains mature trees that are producing seed		Perennial and annual weeds present	
Old trees with hollows		Ground flora predominantly weeds (>20% cover)	
Saplings less than 4m tall present		Widespread dieback in trees	
Native shrub understorey present		Evidence of rabbits	
Native grasses and herbs present		Evidence of feral cats/foxes	
Evidence of plants regenerating		Soil surface eroded	
Litter cover, leaves, bark or twigs present on ground		Soil compacted	
Fallen timber, logs left on the ground		Feral bees present (these may compete with native bees and honeyeaters for nectar)	
Lichen and moss crusts on ground		Herbicide damage to plants	
Spring annuals present - eg lilies, daisies, orchids		Signs of human impact - litter, tracks etc	
Birds present (other than those commonly seen in paddocks)			
Evidence of native mammals (eg diggings)			
Evidence of native reptiles			
Range of invertebrates present (insects, spider etc.)			
Impact of edge effects on woodland			
Woodland connected to other remnants			