wheatbelt natural resource management

Bunuru – Djeran

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Quarterly newsletter

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269 Fitzgerald Street
PO Box 311
Northam Western Australia
WA 6401

Phone: (08) 9670 3100
Fax: (08) 9670 3140
Email: info@wheatbeltnrm.org.au
Web: www.wheatbeltnrm.org.au

@wheatbeltnrm

/wheatbeltnrminc

ABN 61 661 518 664

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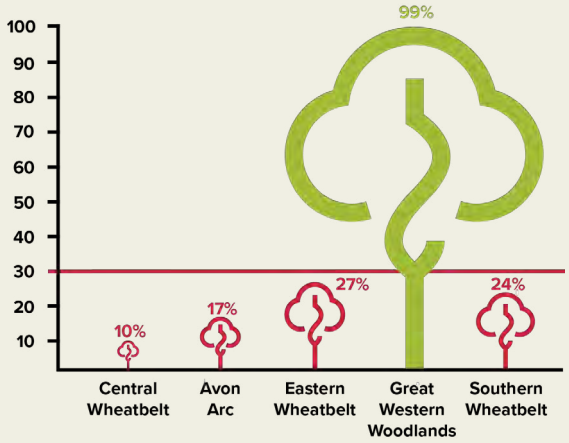
Dashboard watch

Remnant Bushland



Land clearing, primarily for agriculture, has arguably had the greatest impact on species viability in the Wheatbelt region. Around 60% of the native vegetation of the Avon River Basin has been cleared since European settlement (Department of Agriculture and Food) and an average of ~2500 hectares have been approved for clearing per year since 2010. The extent and composition of our native vegetation can also be variously affected by fire, secondary salinity and climate change. As we collate data, we will be increasingly able to comment on whether the area of perennial vegetation cover is increasing or decreasing across the region.

Based on the latest remnant vegetation mapping by the Department of Agriculture and Food, we can see that, with the exception of the Great Western Woodlands which are virtually uncleared, every sub-region of the Wheatbelt NRM region falls well below the threshold of 30% land cover. This threshold has been identified in the literature on biodiversity conservation below, which species numbers rapidly decline. Our challenge is to manage the region to improve species viability by increasing perennial landcover to exceed this threshold. About 34% of our remaining native vegetation is protected in crown reserves and under freehold covenants and non-binding agreements, while revegetation efforts on freehold land continues. In these ways we can protect, enhance, enlarge and connect our remaining bushland.

Data Source: Department of Primary Industries and Regional Development, Department of Environmental Regulation

View the NRM Dashboard online:
www.wheatbeltstrategy.com.au

Kardan
Marri | Corymbia calophylla

Kardan

Marri | Corymbia calophylla

Kardan is a tree to 30m in height with rough grey bark. Flowering has been recorded in January to May and also in September. Flowers are brilliantly coloured mostly white, but there are red, pinkish or orange forms. Kardan grows in red-brown clay loam, orange-brown sandy clay, gravel, grey sand over limestone, granite and laterite soils. They are found in a variety of terrains such as flats, hills, slopes, breakaways, wetlands, fringing salt marches and beside drainage lines. A reddish brown gum can often be seen coming out from the trunk, hence the tree's common name, 'bloodwood'. Large fruit, commonly referred to as 'honky nuts' can readily be seen hanging from the tree. The seeds are prominently winged like those of the desert and northern bloodwoods. The large nuts produced carry large seeds which are also an important food source for native bird species.

CULTIVATION

The tree propagates readily from seeds.

NOONGAR USES

- Noongar people used the blossoms from the trees as a source of honey, which can be sucked directly from the flower or can be dipped into water to make a sweet drink.
- The mayat, red sap or gum, which oozes from the tree, contains tannins that contain antiseptic qualities. Mayat was powdered and sprinkled onto open wounds to prevent bleeding, added to water for a mouthwash or disinfectant, mixed with clay and water and used as a medicinal drink for dysentery, or used to tan kangaroo skins for cloaks or bags.
- Additionally, the blossoms also attract ngoowak (bees) and honey can be found in the hollows of eucalyptus branches. These trees also attract birds which nest in the branch hollows, where eggs can be found to eat.

REFERENCES;

Western Australian Herbarium (1998–). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/

Bush Tucker Plant Fact Sheets, Bush Tucker Education Program 2014, South East Regional Centre for Urban Landcare (SERCUL) http://www.sercul.org.au/docs/bushtucker/

Soil health key to **Wheatbelt sustainability**

Focusing on increasing soil fungi and microbes can help drastically improve the uptake of key nutrients including phosphate and nitrogen.

That was one of the key messages at the Talkin' Soil Health conference in Dalwalinu.

More than 85 people heard from keynote speaker Nicole Masters, director of New Zealand-based Integrity Soils.

"On average, our crops are only utilising about five per cent of the phosphates and nitrogen we apply," Nicole Masters said.

"If we improve our soil health by supporting and feeding microbes and fungi, we can produce a much stronger, efficient, healthier and productive plant.

"By making a stronger root system, a buffer is made against major cropping constraints in the Wheatbelt, which include acidy, salinity, temperature and moisture.

"The problem is, many of our modern farming practices are working against this natural system, including the use of soluble phosphates and not feeding biology."

Also announced at the conference were the 2018 Soil Health champions.

Burracoppin farmer Tony Murfit was named the Wheatbelt Soil Health Champion.

He's turned around acidic soils by using soil identification and zoning, variable rate lime and gypsum applications, fallow to control weeds, deep ripping and a cover crop.

This has helped produce yields of up to two tonne to the hectare on canola crops in the eastern Wheatbelt.

Carnamah farmer Brendon Haeusler won the title of the Northern Agricultural Region's Soil Health Champion.

He's turned around areas affected by salinity through the use of revegetation and W drains for grazing and cropping.

Also launched at the conference was a website show casing farmers who have undertaken sustainable agriculture trials.

These trials vary from wood pellets to increase soil carbon and biology, precision agriculture to improve nutrient efficiency and tackling soil acidification.

The www.agtrialswa.com.au website is a collaboration between the State's seven natural resource management groups.

The Talkin' Soil Health conference and AgTrialsWA website have been funded through the Australian government's National Landcare Program.

The www.agtrialswa.com.au showcases champions of sustainable agriculture across Western Australia. The website is a collaboration between the State's seven natural resource management groups.

The Eucalypt Woodlands of the Western Australian Wheatbelt

A Threatened Ecological Community

Eucalypt woodlands were once the most common type of vegetation across the Wheatbelt landscape of south-west Western Australia. They are woodlands dominated by one or more *Eucalyptus* species with single trunks, a relatively open canopy and a highly variable understorey. Over the past 150 years, these woodlands have been extensively cleared to make way for the prime agricultural land found in the Wheatbelt. As a result, the remaining woodlands have been identified by the Australian Government as a Threatened Ecological Community. This ensures a greater protection for these communities, assisting the future survival of many species who depend on these woodlands.

Salmon Gum (Eucalyptus salmonophloia) dominated woodland

This ecological community is endemic to south-west Western Australia and found primarily within the Avon River Basin, between the Darling Range and the Goldfields.

There are 158 species and subspecies of *Eucalyptus* present in the Wheatbelt region, of which about 50 species are entirely or mostly restricted to the Wheatbelt. They occur as a complex mosaic across the region, with the mix of species present at a particular site, depending on the climate, soils and landform. Not all eucalypt species are characteristic of the threatened ecological community because:

- they have a mallee growth form – where multiple stems sprout from the ground – rather than the single trunk form typical of woodlands;
- they are restricted to landscapes that are not part of the ecological community. For example, eucalypts that are restricted to granite outcrops, lateritic gravel hills and other rocky rises; and
- their main natural distribution is outside the Wheatbelt region.

Of the 158 eucalypt species of the Wheatbelt, there are 31 key eucalypt species that dominate or co-dominate the eucalypt woodlands and are considered iconic within the Wheatbelt landscape. These include Salmon Gums, York Gums, Gimlets and Wandoo.

The understorey beneath the eucalypt woodland tree canopy adds to the diversity of this ecological community, as it is highly variable in both structure and composition across the Wheatbelt. There is a high degree of variation in the plant species below the tree canopy, which can be attributed to soil differences and the variance in water use by the canopy species. Wandoo woodlands are generally associated with a diverse range of shrubs including peas, hakeas, grevilleas, banksias and bottlebrushes, whereas Salmon and York Gum woodlands have understoreys comprised of saltbush plants and daisies.

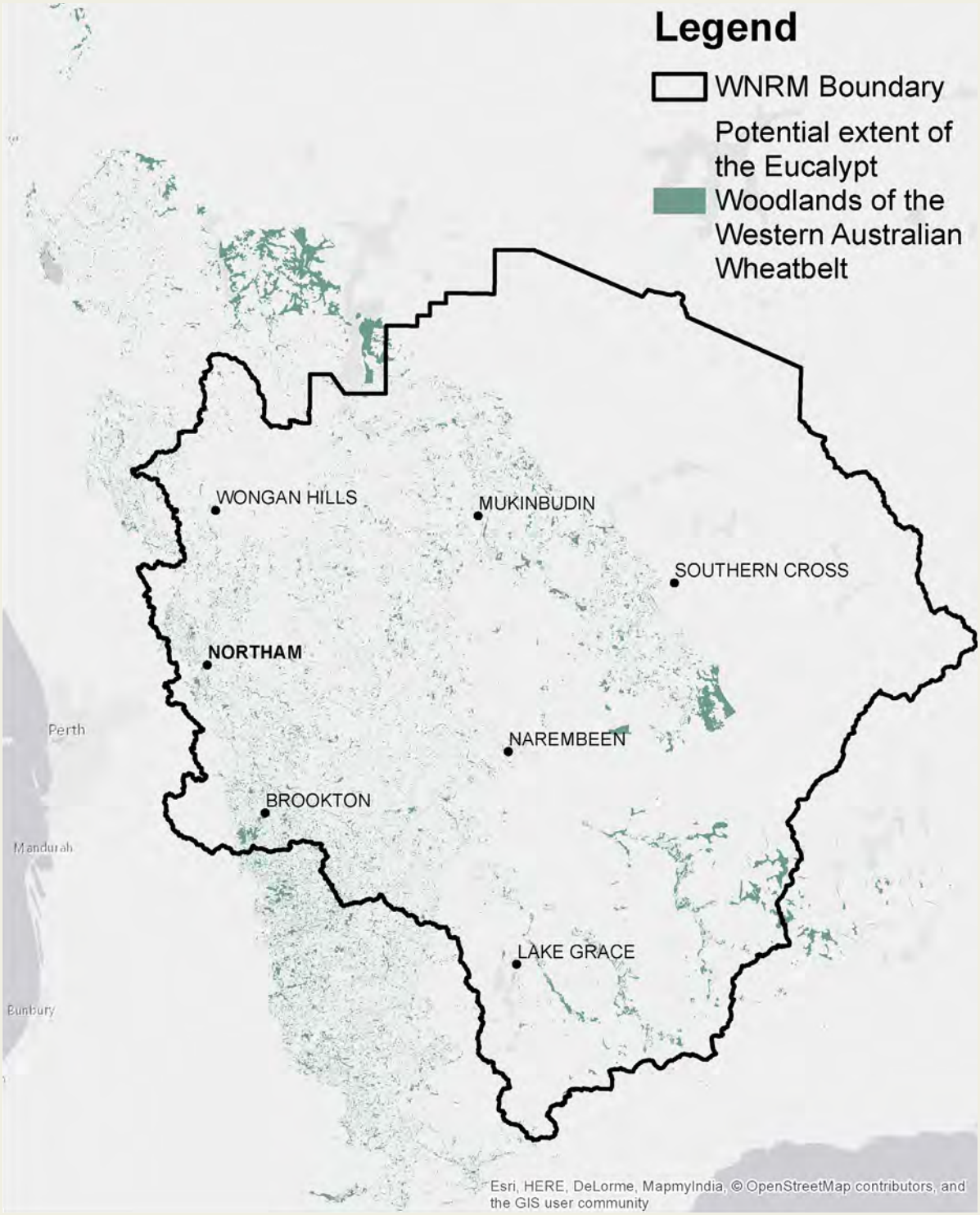
The eucalypt woodland ecological community can be broken down in to several different sub-communities that can be identified by the mix of species found in the canopy and understorey. For instance, if two sites have the same canopy species and a similar understorey they may be considered part of the same sub-community, whereas two communities with different canopy species and understorey structure will be separate sub-communities.

The highly biodiverse nature of the Wheatbelt landscape and this ecological community, where the composition of plant species can vary markedly from patch to patch, means it is difficult to have a distinctive description for the eucalypt woodland. However, there are key characteristics to identify this community, including:

- most of the ecological community lies within the intensive land use zone of south-western WA
- they are generally found within the 300 to 600 mm average rainfall isohyets
- the structure is a woodland, with well-spaced single trunk eucalypt trees, a relatively open canopy and a minimum crown cover of 10%
- a native understorey is present, but is of variable composition, being a combination of grasses, other herbs and shrubs

Biodiversity value of the woodlands

Given the broad extent across south-west Western




Carnaby's Black Cockatoo


Marri nuts chewed by Carnaby's

Australia and the highly diverse and complex nature of the vegetation, the WA Wheatbelt Woodlands ecological community provides habitat and resources to a large number of animal species. One of the key animal groups is the woodland birds and their diversity, which can be attributed to the highly varied eucalypt woodland canopy and understorey. Iconic birds include four species of black cockatoos and the malleefowl. Three of the cockatoo species, Carnaby's Black Cockatoo, Baudin's Black Cockatoo, and the Red-tailed Black Cockatoo (south-western), as well as the malleefowl are listed as threatened under national and Western Australian environmental legislation, due to continued decline of populations and loss of habitat. The loss and degradation of woodlands, as well as other types of native vegetation, has led to a decline in the range and abundance of about two-thirds of the bird species in the Wheatbelt.

The Wheatbelt region provides, or has provided, habitat for many other vertebrates, including 19 frog, 107 lizard, 33 snake and nine bat species, plus 49 other mammals. Sixteen mammal species are now considered to be extinct or locally extinct within the region. Seven species are listed as endangered, including the Woylie, Dibbler and Red-tailed Phascogale, and a further nine are listed as vulnerable, including the Chuditch and Numbat. The invertebrate fauna of the eucalypt woodlands and Wheatbelt region generally, are poorly known. The spider fauna, however, is relatively well known, with 700 species identified across the Wheatbelt. A unique spider group found in the Wheatbelt are the trapdoor spiders. They build distinctive burrows, often in eucalypt woodlands, with about 25% of species being endemic or near-endemic to the region. A number of spider species are listed as threatened under Western Australian legislation and one species is also listed as a nationally vulnerable species under the Environment Protection and Biodiversity Conservation (EPBC) Act. Notably, more than 80 native plants and animals that occur in the WA Wheatbelt Woodland are listed as nationally threatened species under the EPBC Act.

Threats

The WA Wheatbelt Woodlands occur in one of the most heavily cleared and modified landscapes of Western Australia, and Australia as a whole, with at least 85% of native vegetation currently estimated to be lost. The remaining woodland communities exist in small patches that are highly fragmented, which leads to considerable local variation in the natural floristic composition, as well as varying degrees of disturbance and degradation between the patches.

While clearing of native vegetation is the main threat to the extent of the eucalypt woodlands, there are numerous other threats that influence the health and function of the remaining woodland patches, including:

- loss of habitat for key native species
- fragmentation into smaller, disconnected patches
- weed invasion
- impacts from pest animals such as foxes, feral cats, wild dogs and rabbits
- inappropriate application of chemicals, including inorganic fertilisers used to create improved crops and pastures or pesticide/herbicide spray drift from agricultural lands adjacent to a patch
- grazing pressure, including inappropriate grazing regimes by domestic stock and grazing of regrowth by native fauna
- increased salinity and waterlogging of landscape, largely due to modification of the landscape and hydrology through over-clearing
- soil acidification
- altered fire regimes, notably altered fire frequency, but also changes to fire intensity and season, such as occurs during prescribed burning. It covers both wildfires and prescribed burning
- potential impact of plant diseases such as Phytophthora sp. on species diversity and structure
- potential impacts of climate change, including altered fire and flooding regimes, decline in tree health due to prolonged drought and heat stress, and poor regeneration and recruitment

These threats are further intensified by the low level of conservation tenure of the eucalypt woodland ecological community. Only 76,000 hectares, or 8 percent of the total current extent of the ecological community is protected to some extent within formal conservation tenure.

What you can do

The eucalypt woodlands are highly variable in composition, structure and landscape positioning, however they all face the same threats and can therefore be managed and protected through the

same methods. To help improve the health and resilience of the remaining Eucalypt Woodlands of the Western Australian Wheatbelt you can:

- avoid further clearance and fragmentation of this vegetation
- keep livestock out of high quality remnants
- fence of lower quality remnants to prevent stock access and either allow natural regeneration of the bushland or undertake infill revegetation
- avoid removal of large trees that have hollows, regardless of whether trees are living or dead, standing or fallen
- revegetate to:
    - create corridors that connect remnant eucalypt woodlands
    - improve the health and function of the woodland understorey
    - create buffers that protect remnant woodland from the impacts of spray drift, weed encroachment and fertiliser application on neighbouring farmland
- revegetate degraded patches with appropriate native tree, shrub and ground layer species. Try to revegetate with species that are found within remnants with similar over-storey and soil types
- undertake weed control using species appropriate methodology where weeds are encroaching on the remnant
- undertake appropriate feral animal control to protect both the plants and animals of the woodlands
- use particular care to avoid fertiliser and spray drift within or near the ecological community

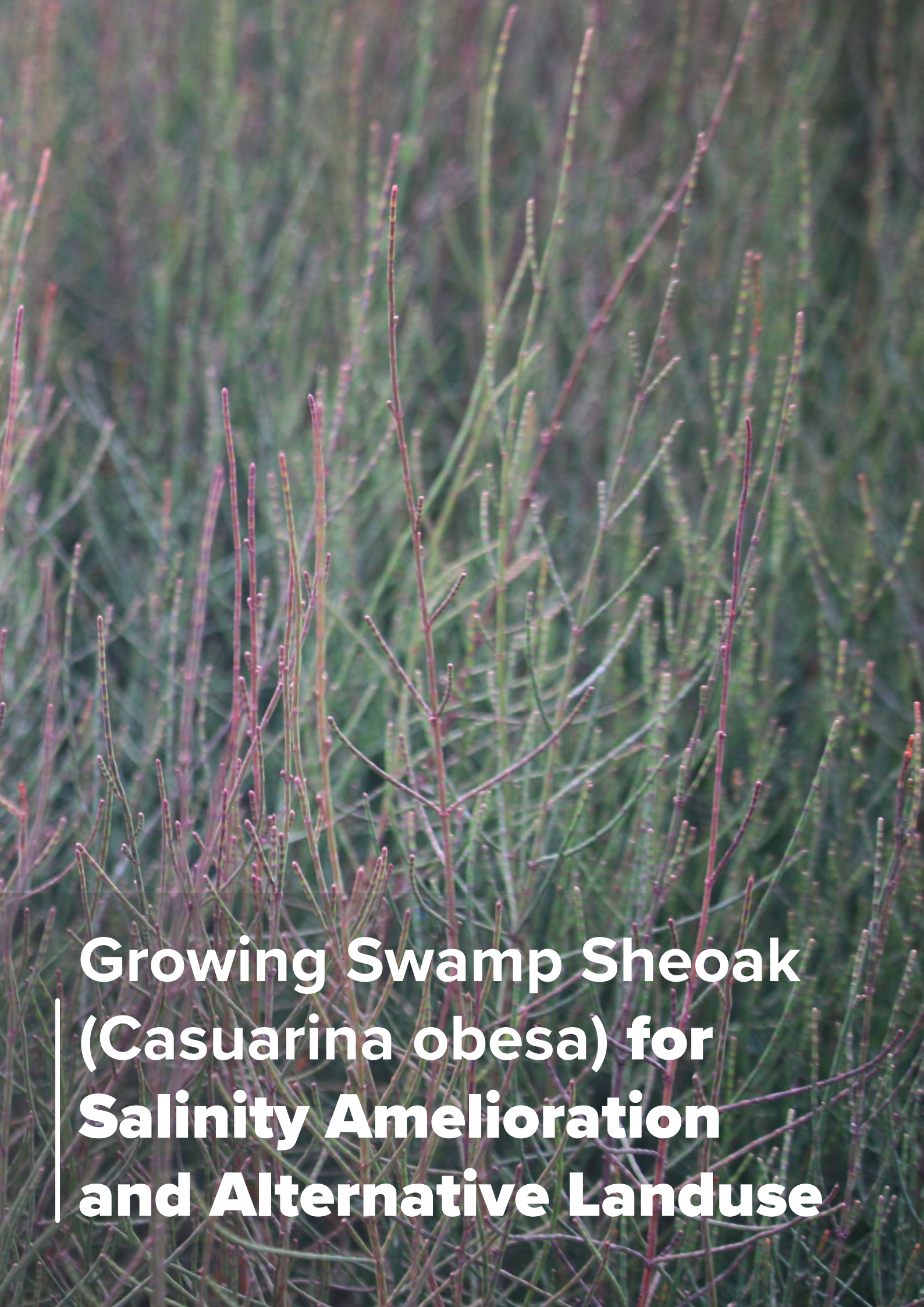
What we don't know

As a very new addition to the Australian Government's Environment Protection and Biodiversity Conservation Act Threatened Ecological Community list, there are a lot of gaps in what we know about these woodlands. Research and monitoring would help us better understand how the WA Wheatbelt Woodland ecological community works and how best to manage it. Some of the areas we would gain significant benefit from researching further include:

- mapping the extent and condition of eucalypt woodlands in the Wheatbelt
- identifying which woodland sub-communities are the most threatened
- finding out how the woodland sub-communities respond to fire and determining whether fire is a beneficial conservation tool
- finding out what actions are necessary to ensure the regeneration of canopy trees, given woodland trees are not regenerating at many sites
- observing how these remnants respond to management activities

The Eucalypt Woodlands of the Western Australian Wheatbelt are an important, distinctive and unique vegetation type across the Wheatbelt. Their rich diversity and high level of endemism, coupled with the significant reduction in extent and low level of formal conservation, means they are a high priority for conservation action and management. There are many activities that can be done at a landscape scale as well as at an individual level that are aimed at restoring the health, vitality and longevity of this threatened community.

York Gum (Eucalyptus loxophleba)



Growing Swamp Sheoak (Casuarina obesa) for Salinity Amelioration and Alternative Landuse

Key Messages

It is too early to know whether inoculating seedling roots with Frankia helps plants grow in saline soils and fix nitrogen.

Tree survival declined dramatically in saline wetter waterlogged conditions.

Project Snapshot	
Land Manager:	Michael and Karen McGill
Sustainable Farming Practice:	Alternative landuse and amelioration of low lying saline soils
Shire:	Goomalling
NRM Region:	Wheatbelt
Property Size:	1538 ha
Annual Rainfall:	350-400 mm
Soil Type:	Duplex sandy loam, sandy clay, clay sand (colours ranging yellow to brown)
Land Use:	Mixed cropping
System Constraints:	Dryland salinity
Funding Partners:	Wheatbelt NRM, Avongro Inc.

Trial Rationale

More than 1 million hectares of agricultural land in the south-west of Western Australia (WA) is severely affected by salt. The lost agricultural productivity from salinity damage is estimated to be worth at least $519 million per year (DPIRD website). 63.2% of privately owned farmland in the Avon region has salinized land at levels unable to support cropping production (ABS – Salinity and land management of Western Australian Farms)

Swamp sheoak (Casuarina obesa), native to the Southwest of W.A. has the capacity to grow in saline areas unsuited to traditional cropping (Hocher et al, 2011).

It also has great potential as a long-term commercial tree crop and may also be suitable for carbon farming opportunities across the Avon catchment. It is an excellent agroforestry species due to its nitrogen fixing ability, has palatable foliage for livestock, provides shelter and its light crown assists pasture growth under plantation canopies.

Previous work around the world has shown the benefits of artificially inoculating Swamp Sheoak with Frankia (Hocker, et al, 2011). It has been shown that the addition of Frankia strains can improve the growth of Casuarina seedlings of 1.8 to 4.2 times for height and similar ranges for basal diameter and 4.3 to 43.6 times greater biomass compared to untreated controls (Lihua, 1996).

Goomalling landowners, Michael and Karen McGill were approached by Avongro Inc. because they were already using swamp sheoak in their fine furniture business Floating Edge Design. The McGill's are enthusiastic supporters of using native timber species to diversify incomes on Wheatbelt farms. Avongro Inc., who oversaw the delivery of the trial, has been a strong advocate of commercial agroforestry across the ARB for many years.

The purpose of the trial was to:

- Compare the growth of five promising swamp sheoak provenances, with and without Frankia bacteria when planted on a saline valley floor;
- Improve biodiversity, soil health and commercial opportunities on Wheatbelt farmland;
- Revegetate a saline site with a long term commercial option; and
- Promote and demonstrate agroforestry for Wheatbelt farming systems.

Steps Taken

Swamp Sheoak Selection

Selecting plants with desirable characteristics is essential for commercial success. Straight trunks with minimal forks or malformed stems provide secure product utilisation in agroforestry whereas poorly formed seedlings may result in an un-commercial project (unless carbon sequestration or biodiversity is the objective).

Seed was collected from five native populations that have exhibited these desirable traits in previous trials. The provenances include:

- Beaufort Inlet;
- Coorow;
- Murchison River;
- Paynes Find; and
- Beaufort River.

Frankia

Previous work around the world has shown the benefits of artificially inoculating sheoaks with Frankia (Hocker, et al, 2011). The Frankia added to this trial was propagated from nodules taken from adult trees and was added to the swamp sheoak seedlings before planting.

Site Preparation

The soil profile at the trial site is characterised by brownish yellow sandy loam over sandy clay. The water table is high with water filling holes at a depth of 160-175 cm. Three weeks before planting, the site was treated with a knockdown and residual herbicide.

There were two site types across the trial plots. These are a.) a slightly elevated drier site on about 52% of the trial and b.) a lower slightly wetter site that was probably part of an old creek system and covers about 48% of the trial site. This enabled a comparison to be made between 'wet' and 'dry' sites.

The trial area was a random block statistical design comprising five sheoak provenances (with and without Frankia); 4 replicates of each and ripped 3 m apart to a depth of about 40 cm. Each plot contained 36 trees spaced every three metres on a grid or orchard style planting arrangement. A double row, two-tree buffer was planted around the edge of the trial using non-Frankia treated seedlings.

Soil Analysis

Salinity readings were taken from the centre of each plot using an EM 38 device, which measures salinity at two depths within the soil profile. The horizontal salinity is taken close to the surface while the vertical salinity is taken at a deeper point, consistent across all plots. Readings taken indicated that the horizontal and vertical salinity of low-lying "wet" plots was higher than for higher "dry" plots as summarised in Table 1.

Table 1: Summary of horizontal and vertical salinity

	Wet		Dry	
	Horizontal	Vertical	Horizontal	Vertical
Min. (mS/m)	135	156	72	110
Max. (mS/m)	189	188	139	174
Mean (mS/m)	174.9	182.7	105.1	146.6

A soil nutrient analysis undertaken of each plot site reported that phosphorous, total nitrogen and organic carbon levels were deficient on all samples. Average soil pH was moderately acidic and averaged 5.5 across the site. Organic carbon levels were low and averaged 0.396%, well below recommended level of >1% for production soils. Potassium levels were adequate and exceeded critical levels of >30 mg/kg. This analysis confirmed that even excluding the salinity, the plot soils were unsuitable for crop production.

Original site on the McGill's property

Lessons Learnt

Seedling Survival

Tree survival was recorded in April 2016, 8 months after planting. The survival of all sheoak provenances minus Frankia averaged 81% across the trial area and those inoculated with Frankia averaged 80%.

Survival rates varied somewhat between each plot site but it is difficult to tell whether this variation was due to uneven distribution between dry and wet plots.

A strong correlation between survival and waterlogging occurred with some plots in wet conditions experiencing 100% mortality. On the higher drier sites, tree survival and growth increased considerably as shown in Table 2.

Table 2: Tree survival eight months after planting (5 April 2016)

Dry site		
Provenance	**Plot No.**	**% Survival**
Beaufort Inlet	1	97.2
	23	97.2
	26	100
	34	100
	Mean 98.6	
Coorow	27	97.2
	33	100
	36	88.9
	Mean 95.4	
Paynes Find	9	100
	11	97.2
	17	97.2
	25	97.2
	29	91.7
	38	100
	Mean 97.2	
Murchison River	22	100
	28	97.1
	32	80.6
	37	100
	Mean 94.4	
Beaufort River	2	100
	10	97.2
	24	97.2
	35	97.2
	Mean 97.9	
	Total Mean	96.8

Wet site		
Provenance	**Plot No.**	**% Survival**
Beaufort Inlet	8	65.7
	14	77.8
	20	61.1
	39	47.2
	Mean 63	
Coorow	4	36.1
	6	86.1
	12	83.3
	18	94.4
	21	44.4
	Mean 68.86	
Paynes Find	3	88.9
	31	0
	Mean 44.5	
Murchison River	5	88.6
	7	47.2
	13	69.4
	16	91.7
	Mean 74.2	
Beaufort River	15	83.3
	19	94.4
	30	25
	40	5.6
	Mean 52.1	
	Total Mean	62.6

with Frankia

without Frankia

Inoculating sheoak seedlings with Frankia - inset Frankia nodules - Bob Hingston

Looking Forward

Salt tolerant swamp sheoak provides an option in addition to forage shrubs to utilise low-lying salt affected areas. Swamp sheoak plantations would allow livestock grazing, carbon farming and unlike short-lived Acacias provide a cash crop for the sale of timber in the long term.

It is too soon for this trial to indicate whether inoculating swamp sheoaks with Frankia will make a significant difference to trees in the long-term but further monitoring in another six to eight years' time should provide answers to the following questions:

- Are there any differences in growth rate between the selected provenances?
- Are there any differences in growth rate between plants inoculated and not inoculated with Frankia?

Tree maintenance will improve long-term profitability including:

- Thinning plots to around 500 trees per hectare to facilitate faster growth of healthy individuals; and
- Prune retained trees to half tree height or form prune, i.e. remove excessively large branches or forks in the crowns.

Nest box project motivates Menshed group

The Wongan-Ballidu and District Menshed Inc (WBDMS) have recently found success with nesting boxes. With the aid of a Wheatbelt NRM grant the Menshed have constructed, installed and monitored a series of nesting boxes for various birds and small mammals, such as Phascogales, Carnaby's Black Cockatoos, possums and bats, which have habitat within the Wongan Hills-Ballidu Shire. The group built a total of 21 nest boxes, consisting of nine Carnaby's Black Cockatoo boxes, five bat boxes and nine hollow log type boxes.

The project aims to encourage a return of some species that have declined or abandoned the district, by providing a useful habitat and improving the local environment. The Men's Shed is feeling the positive benefits of not only gaining knowledge about birds and bat behaviour, but by providing a significant project that encourages the shared responsibility of their environment.

Over a period of two years, monitoring will be conducted monthly up until the start of the nesting season and then fortnightly during the two months of the most likely activity, which is then reported to Wheatbelt NRM. The boxes are installed at Elphin Reserve in Wongan Hills, Wongan Hills District High School and some on private property. The school has incorporated the nesting boxes as a valuable classroom project, with groups of students monitoring bat boxes and bird nests that are located on its grounds.

In a close-up inspection of 14 nesting boxes, prior to the 2017 nesting season, 10 showed evidence of habitation, with not only the walls being chewed, but also the jarrah corner posts which showed signs of attention from a bird with a powerful beak, namely Carnaby's Black Cockatoo.

The men have already been fortunate to sight a Carnaby perching on top of one of the nesting boxes and a Barn Owl, which startled the men when it emerged from a box and flew off just above their heads.

The Menshed group had an amazing response to their recent stall with information about their Nest Box Project. Held in Wongan Hills main street, the members were kept very busy with more than 100 individuals, ranging from children to senior citizens, who stopped to enquire about the project and check out brochures, photos and sample boxes. The children were fascinated with the boxes for the microbats. They were wide-eyed at the prospect of bats in the night, especially the thought of each bat consuming up to a thousand mosquitoes in one evening.

With the generation of so much interest, three new sites on private property have been offered for nests so far and a variety of timber has been generously donated to build the next series of Carnaby's Black Cockatoo nest boxes. Materials are being gathered ready for production of further nesting boxes before the commencement of this year's mating season.

Carnaby's Black Cockatoo in a nesting box built by Wongan-Ballidu and District Menshed Inc

If you know of a likely site for nesting boxes or would like to participate in the monitoring of the nests, please contact Denys Cleveland from the Wongan-Ballidu and District Menshed Inc on 9671 1233 or via the group's Facebook page.

Acidic soils targeted by **champion farmer**

Pioneering a system to turn around unproductive, acidic soils has won a Burracoppin farmer the title of the 2018 Wheatbelt Soil Champion.

Five years ago Warakirri cropping farm manager Tony Murfit, began using strip trials up to three kilometres in length to address the sandy, acidic soils typical of the eastern Wheatbelt.

The trials led to the development of a system using soil identification and zoning, variable rate lime and gypsum applications, fallow to control weeds, deep ripping and a cover crop.

This rehabilitation during the fallow year set him up for growing a profitable canola crop, achieving yields of up to two tonnes to the hectare, followed by several wheat crops.

“The eastern Wheatbelt sandplain country rarely grows profitable canola crops,” Tony Murfit said.

“We owed it to our investor to make this soil type productive, and by introducing multiple soil health practices we’ve turned it around.

“By using a multi-pronged approach, we’ve tackled weeds, soil compaction, low pH, aluminium toxicity, low levels of potassium, non-wetting soils and disease issues.

“Last year we used this rotation on 5500 hectares of the 20,000 hectare property.”

Natural resource management groups from across WA joined forces to search for each of their region’s Soil Health Champions.

Wheatbelt NRM’s Bonny Dunlop-Heague said it was part of a bigger program designed to promote sustainable farming practices.

“Tony Murfit along with his support network, has helped pioneer a system using existing soil health practices for increasing the resilience of sandy, acidic soils,” Bonny Dunlop-Heague said.

DPIRD with GRDC funding have continued research into the property’s sub soil constraints and the outcomes are being presented at this year’s GRDC Crop Updates.

“The sharing of this information with other farmers and grower groups is just one of the reasons he’s been chosen as our Soil Health Champion,” Bonny Heague-Dulop said.

A short film featuring Tony Murfit can be found on the link below:

https://youtu.be/qhvFqJYjzGw

Hemicordula australiae Dragonfly
(Aidan English)

Providing habitat on your **property**

Dragonflies

As one of the first winged insects to evolve, dragonflies have been around for up to 300 million years! Dragonflies were alive at the time of the dinosaurs and fossil evidence shows that some species had an incredible wingspan of 70cm.

There are about 320 species of dragonflies found in Australia, with approximately 42 species found in the south-west of Western Australia. To encourage dragonflies, you need a water source large enough to support all stages of the dragonfly's lifecycle. Ideally, this will be a large pond, but garden pot water features and fountains surrounded by plants will also attract dragonflies. A large portion of the dragonfly's lifecycle as a nymph is spent in water. Some dragonflies stay in the nymph stage for over a year. Dragonflies catch insects on the fly with their incredible versatile flight abilities, whilst aquatic invertebrates, tadpoles and sometimes small fish make up the diet of the nymph stage. Nymphs, conversely, are also an important part of the diet of fish, so it can be necessary to have a pond with no fish in it to successfully breed dragonflies.

Having dragonflies around your pond is a great sign, as they are valuable indicators of environmental well-being. Dragonflies can be an asset to the garden, keeping pest insects such as mosquitoes and flies to a minimum - they consume their own bodyweight in insects every half hour! They are harmless to people and do not sting or bite.

Floating plants will give female dragonfly somewhere to lay her eggs, and tall standing vegetation provides perching spots for warming up, resting, or drying out the wings of a newly-emerged dragonfly. To find out which species you can find in south-western WA, visit:

http://ow.ly/naji30gPf35

Creating a garden for dragonflies

- **It is best to give dragonflies their own pond – introduced fish will eat dragonfly eggs and also larvae swimming underwater.**
- **Include a diverse mix of plants, trees and shrubs, which can provide cover, places for the dragonflies to mate, and attract other insects for the dragonflies to eat.**
- **Fill the pond or water feature with a mixture of water loving plants. It is important to add submerged plants for females to lay eggs.**
- **Emergent plants are also essential for the nymphs to climb up ready for their final transition into adult dragonflies.**
- **The pond should get at least partial sunlight.**
- **Include flat rocks for basking.**
- **As with other animals, beware of the use of pesticides in the garden.**
- **The predatory habits of the dragonfly will help control other insects, such as mosquitoes.**

Mammals

There are a range of small mammals which may be found in and around your backyard in the Wheatbelt, including possums (Common Brushtail, Honey or Western Pygmy), Quendas (Bandicoots), Echidnas, Woylies, Dunnarts, Phascogales (Brush-tailed, Red-tailed), Bats and Antechinuses.

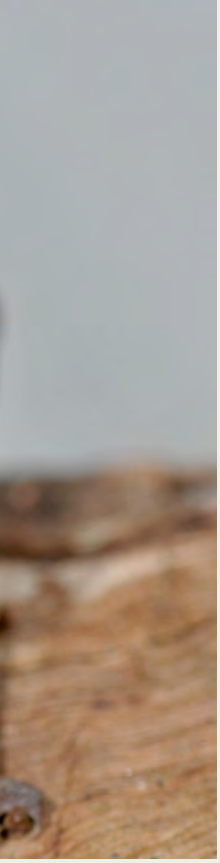
Many of these mammals are active at night, which can make it difficult to know if they are about. To find out who is visiting your garden at night, you can use motion sensor cameras (see the section on sensor cameras later in this article).

Common Brushtail Possums feed on flowers, fruits, buds and leaves of native plants. They play an important role in naturally controlling mistletoe, a native parasite that, if left unchecked, can eventually kill trees. Occasionally, the Common Brushtail Possum eats insects, eggs and meat (in the form of fledglings), and in suburban areas they become an opportunistic feeder, eating whatever they can find.

Microchiroptera (Microbat)

The presence of feral predators – including pet and feral cats, as well as foxes – has had the greatest impact on the decline of small mammals across Australia. The most effective thing you can do to encourage native mammals into your backyard include keeping your pets indoors – particularly cats and encourage your neighbours to also keep their cats indoors and control any feral animals that venture onto your property.

Woylies, Quendas and Echidnas are all digging mammals, and as such play a very important role in the soil health. They were once found throughout the south-west, however Quendas are now restricted to the Jarrah forests and Woylies are only found in a few isolated populations, while Echidnas remain relatively common. They are known as environmental engineers. Their digging creates a range of disturbances such as nose pokes, scratchings, shallow to deep digs, long bulldozing tracts, and in some cases, complex subterranean burrows. These diggings cause changes in the soil's structure, bringing deeper soils to the surface and mixing in surface soils and leaf litter. Through their digging, the mammals affect soil texture, structure, composition, fertility, formation and density.



While it is important not to grow poisonous *Gastrolobium* species anywhere near residential areas, or where domestic animals and children might have access to it, it is interesting to note Red-tailed Phascogales are more common in bushland with *Gastrolobium* species. This is believed to be due to the toxic effect of the *Gastrolobiums* on foxes and the cats, who feed on Phascogales. *Gastrolobium* species may increase the chances of having Red-tailed Phascogales visit your garden.

They mix the soil layers, help to control erosion, create niches for seed germination, increase water infiltration and help reduce surface water run-off. The holes they create are more likely to trap organic matter and moisture, providing a special niche for seeds to grow. A significant example from the Wheatbelt is the Woylie and Sandalwood. Studies have shown that the Woylie is very important in distribution of the Sandalwood seeds. Without Woylies, there is little natural seed dispersal or regeneration of Sandalwood.

Digging mammals also play an important role in the structure of plant communities. Many plants and fungi in Australia have a special relationship, where the plants get extra nutrients from the poor soils via the fungi, which are essential for the plants' survival. Digging mammals such as the Woylie and the Echidna help spread the spores of these fungi, ensuring these relationships can continue.

There are two types of Phascogales in the Wheatbelt, the Red-tailed Phascogale *Phascogale calura*, and the Brush-tailed Phascogale, *Phascogale tapoatafa*. The Red-tailed Phascogale eats a wide range of insects, small birds and small mammals such as mice. Red-tailed Phascogales seem to prefer dense vegetation and require hollows for nesting in.

Isoodon obesulus fusciventer Quenda

To encourage Phascogales into your gardens, provide a nest box and good habitat for a range of insects for them to feed on. These guys will take care of your insect problems, so avoid insecticides in the garden if you're trying to encourage them.

Myrmecobious fasciatus Numbat

The Brush-tailed Phascogale tends to be a solitary creature and requires hollows in trees (or nest boxes) for nesting. It lives in trees, and is an insectivore.

To encourage Phascogales into your gardens, provide a nest box and good habitat for a range of insects for them to feed on. These guys will take care of your insect problems, so don't use insecticides in the garden if you're trying to encourage them.

Honey possums and Western Pygmy Possums rely heavily on the proteaceous plants such as banksias, grevilleas and hakeas for their food sources. The Western Pygmy Possum also eats insects and other arthropods. It is the size of a mouse, weighing between 6-43g. It is a solitary, nocturnal animal, sheltering during the day in tree hollows, natural crevices, bird's nests or dense vegetation.

Depending on plant resources, they may move to different areas during the year. The Honey Possum lives exclusively off nectar. This makes them the world's only true nectivorous marsupial. They have a high metabolic rate, so need a year round continuous supply of nectar to survive. The Honey Possum is mostly tree dwelling, living in banksia woodlands, sandplain heaths and shrublands. While mainly nocturnal, they can be seen visiting flowers on cloudy days.

To encourage Honey Possums, you can plant dense vegetation with a mix of plant species that flower at different times of year to ensure you have some nectar in your garden all year round.

There are four species of dunnart found in the WA Wheatbelt:

- Fat-tailed Dunnart
- Little Long-tailed Dunnart
- Gilbert's Dunnart
- White-tailed Dunnart

They are nocturnal carnivorous marsupials, sometimes mistakenly called marsupial mice. They range in size from 10-45g, making them about the size of a house mouse. Dunnarts are nocturnal and are mainly insectivorous, eating grasshoppers, crickets, termites, beetles and their larvae. Dunnarts have also been known to eat small reptiles, mammals, amphibians and spiders. Some of them eat their own body weight in a single night. Dunnarts sleep in hollow logs, under rocks, in soil cracks or in small nests during the day.

If you have a larger property, you can encourage dunnarts in to your garden by maintaining areas of undisturbed grasses, bluebush and saltbush.

Nestboxes

Many native Australian birds and other animals require hollow trees to reproduce and live in.

Trees take a minimum of 100-150 years to form small hollows, up to 200 years to form medium hollows and up to 300 years to form large hollows such as those suited to Carnaby's Black Cockatoos. Tree hollows are formed due to wind breakage, lightning strike, fire and/or due to insect, termite or fungal attack. They may vary in size in both cavity opening diameter and cavity depth and volume. Some openings are as small as 2-6cm, while others are up to 18-30cm. Tree hollows are important because they provide resources for wildlife for:

- foraging
- shelter
- roosting
- nesting

Hollow using animals are important parts of a functioning ecosystem. They:

- pollinate plants
- transport seeds
- regulate insect populations
- fertilise the soil
- redistribute nutrients through the environment

Some animals have specific requirements for nesting and shelter. They are known as 'hollow-dependent'. Many areas throughout Australia have become depleted of hollow trees through:

- vegetation clearing
- logging
- firewood collection
- grazing
- dieback
- fire

Any decrease in the availability and natural diversity of hollows can lead to significant losses of 'hollow-dependent' species. Around 100 Australian vertebrate species that potentially use hollows, are now listed as rare or threatened in State and Commonwealth Government legislation. The local extinction of species drastically reduces the animal diversity of a region. This can lead to a loss of insect eating species, pollinators and even some plants that rely on those species to reproduce. If natural hollows are not available, you can make and install nest boxes as an alternative. Many hollow-using fauna readily adapt to using nest boxes. Animals will not forage too far from safety, therefore nest boxes need to be placed adjacent to good food sources. Some great resources for constructing your own nest boxes are located here:

http://ow.ly/muWg30gMEFe

http://ow.ly/19Kt30gMEwl

http://ow.ly/2RYu30gMEyU

Sensor Cameras

Sensor cameras, also known as camera traps and trail cameras are a relatively non-invasive way to record the presence/absence of animals and their behaviour. They are triggered by the movement of the animal and can capture either still or video footage, depending upon the cameras setting. A guide on to how to set up sensor cameras can be found here: https://www.youtube.com/watch?v=ULfuw5R0ssY

Tips on how to capture footage of some of the animals which you could find around your property, are shown below. Sensor cameras can be placed near animal tracks, at watering points, burrow entrances and tree hollows, natural bridges over gullies and water courses, or where the scats of the animals have been seen

Animal	Habitat	Sensor camera location
Echidna	Forest floor	Large hollow logs, rocky outcrops and breakaways
Dunnarts	Hunting at night for insects and spiders living on banksias and bottlebrushes	Set camera about 50cm from target flower
Brushtail Possum	Trees	Along tops of logs, hollow logs, base of trees
Western Pygmy Possum	Bushland containing *Banksia, Grevillea, Hakea, Eucalyptus* and *Melaleuca*	Focus on flowers, use a short focal length of 50cm
Red-Tail Phascogale	Tree hollows, grass tree skirts, dense understorey vegetation. Rock Sheoak and Wandoo trees	Set near a hollow log or tree trunk
Chuditch	Woodlands of the Wheatbelt	Large hollow logs, rocky outcrops and breakaways, as with Echidna
Malleefowl	Scrubland and woodland dominated by mallee and wattle species	Near the mound, but not too close, so that you do not disturb the birds

Vulnerability

All of the animals discussed in the past three issues are vulnerable to land clearing, altered fire regimes, Phytophthora and feral predators. By providing animals with habitats within your own gardens and properties, you can increase their chances of survival. Become involved in community groups or assist with revegetation projects. Protect your natural bush by putting cage traps on your properties and engaging in projects such as the Community Feral Control Program, which works to control feral cats, foxes and rabbits.

What we do in our gardens has the potential to benefit or harm the natural environment and enjoying the sight of our unique and precious wildlife visiting or living on your property can be a real pleasure. Providing natural habitats is a generous gift to the future.

Eolophus roseicapilla Galah

Gilbert's Dunnart

Sminthopsis gilberti

Identification

Dunnarts are a complex group of animals and species and are difficult to identify in the field. Gilbert's Dunnart is larger than the Little Long-tailed Dunnart and has longer ears and longer hind feet. The white patches behind its ears and white ventral fur of Gilbert's Dunnart are also distinctive. Like the Little Long-tailed Dunnart, Gilbert's Dunnart is light grey on its back with a slightly grizzled appearance. The tail of Gilbert's Dunnart is less than or equal to the body length whereas the Little Long-tailed Dunnart has a tail much longer than its body length. The tail is grey above and white below. To distinguish the Gilbert's Dunnart from a common introduced mouse you will notice that it larger and has a longer tapered snout with larger ears and eyes with grey fur above and pale fur below.

Habitat and distribution

Gilbert's Dunnart occurs in two separate populations, one in the central and southern Wheatbelt as far west as the Darling Scarp near Perth and the other population on the Roe Plain on the southern edge of the Nullarbor Plain. Near Perth, it is found on sandy loam soils with Jarrah, Marri and Wandoo and shallow granite soils with heath dominated by bottlebrush and other flowering shrubs, zamias and grass trees. In the central and southern Wheatbelt, it occurs on gravelly soils with Casuarina shrubland and mallee heath. Further east, it occurs in mallee shrublands on sandplain, in Salmon Gum (Eucalyptus salmonphyloia) and Giant Mallee (E. oleosa) woodland on loam. It probably makes a nest in a hollow log, dense shrub or grass.

Diet

Little research has been conducted on this species, however, like other Dunnarts from southern Australia, Gilbert's Dunnart hunts at night for a range of invertebrate prey which probably includes beetles, grasshoppers, crickets and spiders.

Reproduction

The breeding season is spring and early summer. Females have eight teats and have been observed with seven hairless babies attached. In October and November the females have pouch young and, like other Dunnarts, not all the young will fit into the pouch so they hang down, still attached to the mother's teats. Juvenile animals are present in February. Adult males are still present in the population after breeding and do not appear to die off after mating as some other species of small marsupials do. However, they may only breed in one season.

Threats

Gilbert's Dunnart has secure populations in nature reserves, so is not under major threat. However, like many species of Dunnarts in the south-west of Western Australia, the species has lost habitat because of land clearing and is susceptible to predation by foxes and cats.

Management actions

The maintenance of suitable habitat in reserves such as Tuttaning, Dragon Rocks, Nuytsland Nature Reserves and Western Australian State Forest will help to conserve Gilbert's Dunnart.

Gilbert's Dunnart facts

Family: Dasyuridae
Conservation status: Not listed

Size (head and body length)
81 – 92mm

Size (tail)
75 – 92mm

Weight
14 – 25g

Habitat
Granite soils with heath, loamy soils with mixed woodland of Jarrah, Marri and Wandoo, Salmon Gum and Giant Mallee woodland on loam.

Diet
Invertebrates.

Reproduction
Breeding season is in Spring and early Summer, 8 teats, 7+ pouch young in October – November, independent young in January – February, no male die off after breeding.

This article is reproduced from the Mammals of the Avon Region, available for download at: www.wheatbeltnrm.org.au/mammals

NOONGAR SIX SEASON UPDATE

DJERAN (APRIL–MAY)

Becoming cooler with bulbs and seeds collected for food.

Djeran season at last sees a break in the really hot weather and winds and was used to build, waterproof, and repair mia-mias (tents) for protection in readiness for the deep wintery months to come. Hunting was focused on kangaroos, and kangaroo skins and coats were prepared for winter. The Djeran diet also comprised grubs, frogs and quenda (shortnosed/ southern brown bandicoot). Djeran is a time of red flowers especially from the Red Flowering Gum (Corimbia ficifolia). Banksias start to display their flowers, ensuring that there are nectar food sources for the many small mammals and birds that rely upon them. Traditionally, foods at this time of year included the seeds that had been collected and stored for treatment from the Zamia palm last season, along with the root bulbs of the Yanget (Bullrushes), fresh water fish, frogs and turtles.