wheatbelt natural resource management

Bunuru - Djeran

Issue 27, Autumn 2017

Quarterly newsletter

How to grow habitat gardens

Lime trial favours deep ripping

Trees help Wheatbelt weather the storms

Native seed dispersal

Building soils for the future

and more...

Contents

Lime trial favours deep ripping 1

Trees help Wheatbelt weather the storms 2

How to grow habitat gardens 4

Native seed dispersal 10

Registering a site of cultural significance 14

Central long-eared bat 16

Building soils for the future 18

wheatbelt natural resource management

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

Written and designed by Wheatbelt NRM.

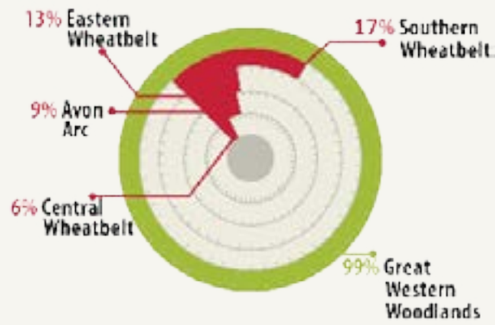
This publication is produced by Wheatbelt NRM through funding from the Australian Government's National Landcare Programme.

Australian Government | National Landcare Programme

Cover image: Western bearded dragon, taken by Graeme McConnell near Corrigin

Dashboard watch

Remnant Patch Size



Thresholds of Potential Concern (TPC) causing fundamental system change looks at each sub-regions intact bushland patch size< 10ha2

The condition of remnant vegetation is an important aspect of its contribution to ecosystem health. The size of remnant vegetation patches is a key indicator of the condition and resilience of an area of vegetation and contributes to its ability to support biodiversity. That is, as patch size increases, the habitat continuity and diversity, ability to resist invasive species and ability to maintain ecologically important fire regimes is increased.

The fragmentation of native bushland reduces the availability of habitat and resources, the ability of organisms to move, colonise and reproduce and makes communities susceptible to disturbances such as fire, drought, grazing, feral animals, weeds, clearing and climate change. Many organisms are considered threatened in our region as they only occur in, or rely on, small fragments of remnant vegetation. The number of threatened species in our region can be influenced by managing for these threats by; creating vegetation corridors and buffers, fencing bushland fragments and waterways to reduce grazing pressure, reducing weed and feral populations, implementing sustainable fire regimes and designing replanting areas to be resilient in a drying climate.

Data Source: Department of Environmental Regulation

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

Lime trial favours deep ripping

The results are starting to trickle in post-harvest on a trial to find the best way to apply lime on Wheatbelt farmer Stephen Dolton's Bruce Rock property.

Early results show deep ripping incorporating a lime application have some yield benefits at the trial site.

Throughout the Wheatbelt, soil acidity has been identified as costing WA grain growers nearly $500 million in lost production, or about nine per cent of the annual crop.

With nearly 60 per cent of his farm affected by soil acidity, the scale of the problem was one of the biggest motivators for Stephen Dolton when applying for funding to help carry out a liming trial on his farm..

He is implementing a trial with Wheatbelt NRM, to help research the best way to incorporate lime into the sub soil, rather than just the top soil.

"Like many other farmers, we've been spreading lime for decades, trying to fix the soil acidity issue," he said.

"In some instances we've spread up to six tonnes of lime per hectare.

"But it's the sub soil that we now want to address, which means using a mechanical means of incorporation.

"We needed the lime to start moving down the profile, by mixing the A and B horizon."

Soil types on the farm range from light duplex soils, to sandy loams and salmon gum gimlet country.

Stephen Dolton broke the trial down into seven plots, replicated three times.

The plots varied from a nil treatment to two tonnes of lime sand incorporated using a combination of a deep ripper and a one-way disc plough.

"We didn't want to use a rotary hoe or spader, because they would have been too cost prohibitive, and the work needs, eventually, to be carried out on a large proportion of our farm," he said.

The treatments were undertaken in the first week of June last year, with two crops now harvested from the trial plots.

"The first crop of Mace wheat we harvested from the trial yielded around two tonnes to the hectare on the deep ripped plots," Stephen Dolton said.

"That was an improved yield of about eight per cent compared to the trial plots that had nil treatment.

"In the second year, we couldn't see the same standout results from a single treatment but we think this had to do with the excellent rainfall throughout the growing season.

"We do know the ploughing treatments performed the best out of all the trial plots."

While the trial is only two years into the three-year time frame, Stephen Dolton said the results using the deep ripper were becoming clearer.

The Dolton's trial is one of 32 on-farm trials being implemented through Wheatbelt NRM's Trials and Demonstrations program, funded by the Australian Government's National Landcare Programme.

Helping to monitor the site has been the group's project manager Dr Fiona Brayshaw.

"Soil testing is an important criteria and will be carried out on each plot twice, at the start and completion of the trial," Dr Brayshaw said.

"Improving soil management is one of the four themes funded under this program and the results of the trials are generating a great deal of interest amongst the farming community."

Trees help Wheatbelt **weather the storms**

A decision more than 50 years ago not to clear precious vegetation growing along the creek lines of his Holt Rock property is still paying off today for Jim Sullivan.

This summer, the Wheatbelt NRM chairman witnessed his single biggest rainfall event since he began farming in the district, and the damage it caused.

While there were environmental benefits with a surge in bird and insect life and the rejuvenation of wetlands, the downpour resulted in thousands of tonnes of topsoil being washed away.

“We have three river systems that drain from the Great Western Woodlands in the east, through our farm, and then into the lakes system west of us,” Jim Sullivan said.

“When we cleared part of the farm in the late 1960s, we left vegetation along these waterways and as a result they coped with the summer deluge, with no wash outs of any significance through the paddocks.

“But as the water moved from our place and through areas that had been cleared, the amount of soil erosion was horrendous.

“The lesson here is either plant more trees along the main water channels or leave the existing trees standing to offer protection from both water and wind erosion.”

These comments were echoed by Wheatbelt NRM’s chief executive officer Natarsha Woods, who said while there were short-term benefits from the record summer rain, the costs were significant.

“A recent visit to Lake Yearlering revealed just how water can inject life into our river systems,” Natarsha Woods said.

“Standing at the banks of this waterway was like being in Kakadu National Park, the noise from the insects and birds was amazing.

“But while the flooding does help some of our native species, the consequences of erosion plus the movement of weeds through the Avon River Basin can’t be ignored.”

Natarsha Woods said while the cost of fences being washed away and weed control on farms was easier to quantify, the long-term impact on loss of topsoil was more difficult.

“Because trees have been removed from riparian areas, sediment flowed into the creeks and rivers which made the flooding even worse,” Natarsha Woods said.

“These events remind us to pay attention to the environment and that vegetation and even contour banks play an important role in preventing widespread erosion.

“We may only get a rainfall event like this every ten years, but it takes decades to rebuild the valuable topsoil that is lost.

“We need to work on protecting the riparian zones, and not just the big river systems but our little creek lines as well.”

Ring Wheatbelt NRM for information and support on how you can improve your local creek lines and tackle erosion.

“The lesson here is either plant more trees along the main water channels or leave the existing trees standing to offer protection from both water and wind erosion.”

How to grow **habitat gardens**

What is a habitat garden?

A habitat garden is a privately-owned yard or public space designed to attract and support native birds, bees, butterflies and other wildlife. The type of garden will depend on where you live, and the animals naturally found in your area, but anyone, anywhere, can make changes to their backyards and local area to attract more wildlife.

Western bearded dragon, taken by Graeme McConnell near Corrigin

Tip #1

Reduce pesticide use in the garden to provide birds and small bats with a safe food source

Designing your habitat garden

Spending time planning your garden design can help improve its suitability for wildlife and overall functionality.

Map your property according to characteristics such as sun, shade, slope and soil type, to help select plants and place features such as ponds.

Plant in groups according to the water, sun and soil needs of different plant types.

Plan your garden for low water use, including the types of plants and grasses planted.

Add design features to capture water runoff, such as mounds, trenches and dry creek lines. These will also add interest to your garden.

Estimate how much waste (e.g. lawn clippings, prunings) your garden will create, and plan how to manage it on-site (composting or mulching).

Replace concrete with gravel so more water soaks into the ground.

Design your garden to suit your family's needs, e.g. socialising areas, washing line, space for pets and play, specific wildlife areas.

Include habitat for soil microbes, insects and other invertebrates, as they provide food for other wildlife and keep your soil healthy.

Include some features that appeal to a wider range of wildlife. Even if you're only interested in attracting one group of animals (e.g. birds).

Some wildlife species will survive entirely on what is in your garden, while others will pass through as part of a regular network of gardens, or a habitat corridor between remnant vegetation patches, using only what they need. Structure your garden to provide a range of habitats for different wildlife at all times of year. For example, some bird species use trees for nesting, but need shrubs and ground covers for food, while other species prefer nesting in bushy shrubs.

“Some wildlife species will survive entirely on what is in your garden, while others will pass through as part of a regular network of gardens, or a habitat corridor between remnant vegetation patches, using only what they need.”

Ground covers, grasses and shrubs provide essential habitat for butterflies and other invertebrates, but some types are important for adults and others for larval stages such as caterpillars. For nectar-feeding birds and pollinating insects (e.g. butterflies, native bees), choose a range of plants that provide food throughout the entire year.

Areas of bare ground or rocks that receive plenty of sunshine offer habitat for reptiles and dragonflies, who need sun to warm themselves up. Birds also use bare ground for dust baths.

Even a small garden can supply important resources that will attract wildlife, especially if there are large trees nearby. However, adding trees and large shrubs to your garden design will significantly improve the available habitat, and be more attractive to a range of species.

Wheatbelt waterwise gardening

Water is a limited resource in Wheatbelt gardens, and needs to be carefully planned for. Many Wheatbelt towns are also salt-affected, which can affect gardens. Soil characteristics will impact your garden’s design, as clay, loam and sand have very different properties for retaining and making available water and nutrients, and each type supports different plant species. To have a waterwise and saltwise garden, choose plants with the same requirements that your site provides, as well as matching the local climate. In the Wheatbelt, this means long, hot, dry summers and cool, wet winters with the occasional frost. Native plants are generally the best option.

You should water just enough to penetrate the top 30cm of soil where the feeder roots are. Water in the late evening or early morning, so water soaks the roots and is available to plants throughout the daytime.

Soil health

Organic matter improves the soil’s structure and ability to retain water and nutrients, making these more readily available, while reducing fertiliser and water needs. It also encourages the development of soil microbes, including bacteria, fungi and nematodes, which are very beneficial to soil health.

Earthworms are important

Tip #2

Providing water during summer will attract many wildlife species

Tip #3

Many small birds only fly short distances (up to 50m) between plants

(top) Echidna by Lyn Phillips, (middle) tree planting in Toodyay, (bottom) Wongan Featherflower (Verticordia staminosa)

for recycling decomposing materials and maintaining soil structure. Use a worm farm or compost bin to turn your household food scraps, garden waste, vacuum cleaner bag contents, and newspaper into a rich, moist soil for your garden. The 'tea' produced by worm farms is also a great liquid fertiliser. While animal manures are good sources of organic matter, their high nutrient levels can affect some plant species, so compost well before using.

Mulching your soil imitates how leaf litter accumulates in nature. Good mulch, one that has large, uneven pieces that let water through, can reduce evaporation from soil by up to 70%. Chipped wood and garden prunings provide the best mulch, but gravel and crushed stone are also very effective. Don't allow mulch to become so thick that it suffocates the soil or creates a fungus problem.

Soil microorganisms:

- **release nutrients from organic matter**
- **increase phosphorous availability**
- **fix atmospheric nitrogen**
- **degrade pesticides and other toxic substances**
- **control pathogens**
- **improve soil structure.**

Domestic Pets

Pets are important in our lives, but they can affect local wildlife. The presence of pets can cause other animals to avoid your property. Cats and dogs hunt a range of animals, including birds, lizards, frogs, bats and other small mammals. Dogs also kill large mammals, and will chase wildlife, causing significant stress.

There are many myths about cats:

- **Cats are happiest outdoors.** Cats can live very happily indoors, especially when raised that way. Even a cat used to ranging outside will adjust to living inside.
- **Bells on collars stop cats from hunting.** Unfortunately, cats easily learn to move silently so bells do not make a sound.
- **Well-fed cats don't hunt.** Cats are instinctive hunters, and will chase wildlife for play or to bring 'gifts' to the family, even if they are not hungry.

Tip #4

For a list of waterwise and saltwise plants for the Wheatbelt, visit the DAFWA website: http://bit.ly/2oQsi3z

Click here

While keeping cats and dogs in at night does prevent them from hunting at this time, it doesn't stop them from killing wildlife during the day. Create a safer relationship between pets and wildlife in your garden by:

- keeping cats indoors, or creating an outdoor enclosure attached to your house for them
- training dogs not to chase wildlife
- providing refuge areas for birds, small mammals, lizards and frogs, including fencing off areas with chicken wire, and adding log and brick piles
- planting dense groups of native shrubs as hiding places for small birds and mammals
- placing bird baths beyond the reach of pets, e.g. hang from a tree or use tall baths.

Further Reading

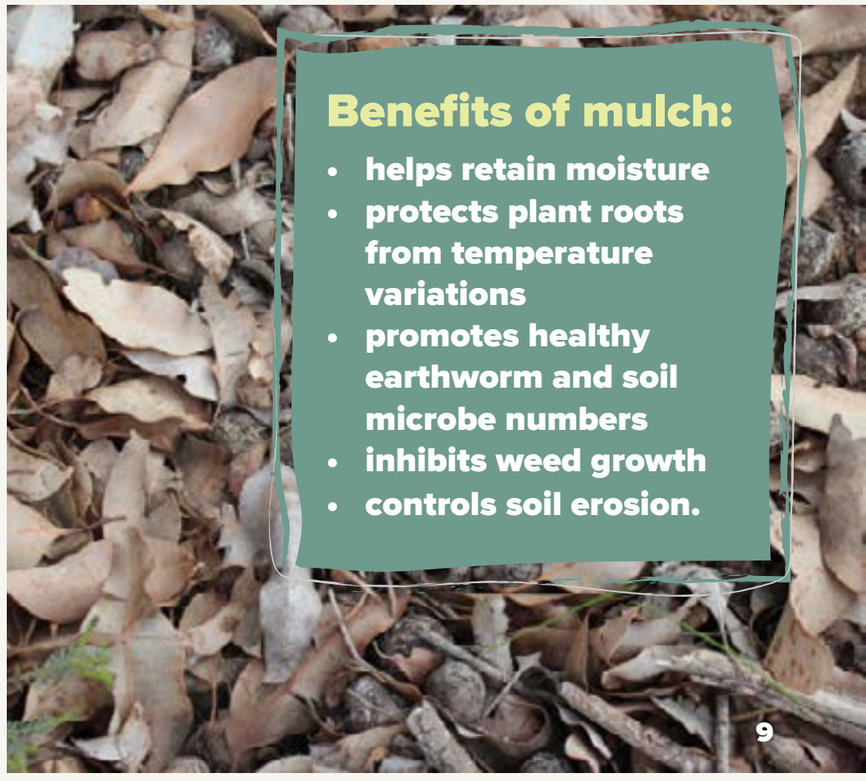
http://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1038&context=bulletins

http://s3.amazonaws.com/soilquality-production/fact_sheets/65/original/Biol_-_Soil_Biological_Fertility.pdf?1391657382

http://www.birdsinbackyards.net/Domestic-Pets-0

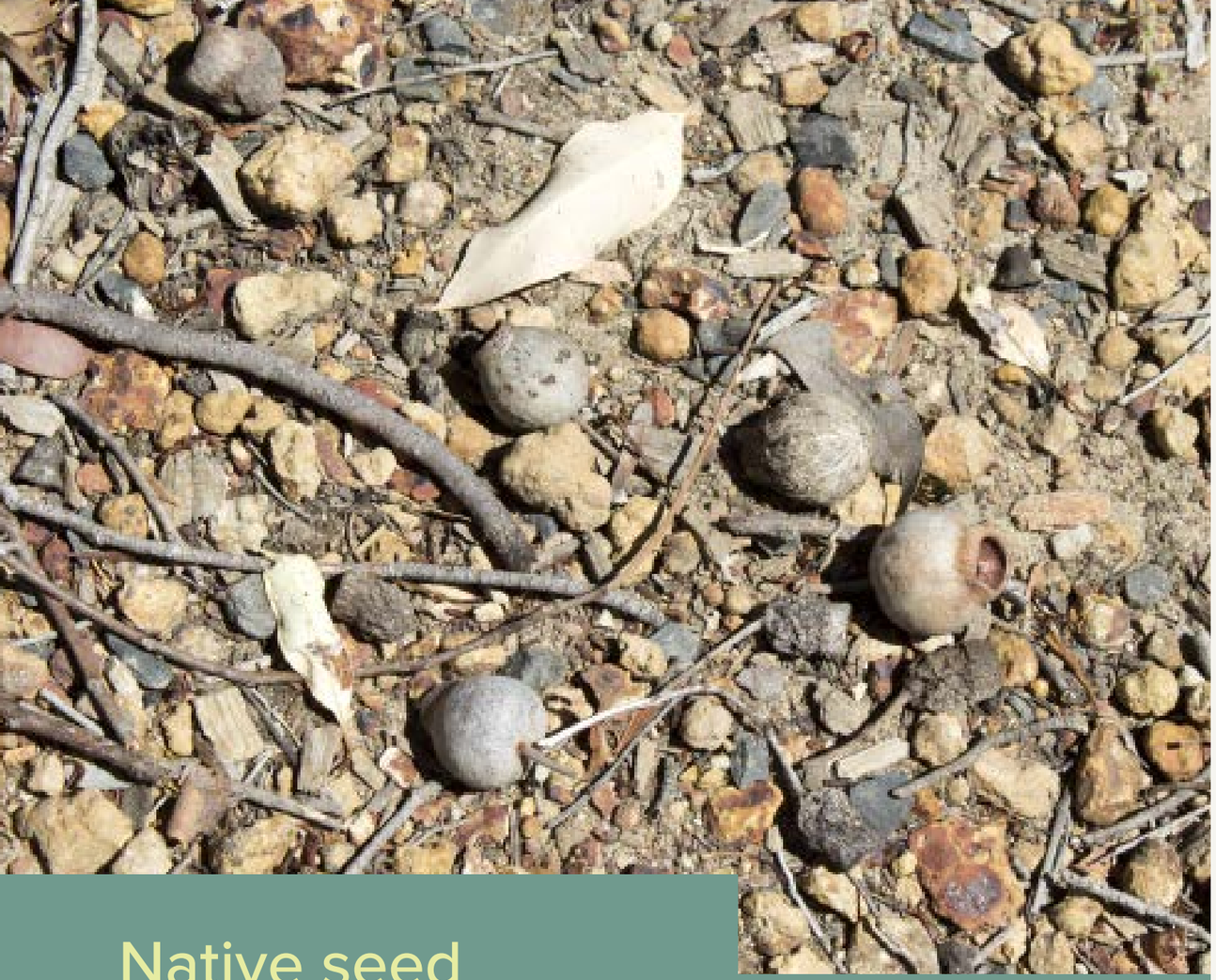
http://www.birdsinbackyards.net/Bird-Baths

Cat caught in a cage trap



Benefits of mulch:

- **helps retain moisture**
- **protects plant roots from temperature variations**
- **promotes healthy earthworm and soil microbe numbers**
- **inhibits weed growth**
- **controls soil erosion.**



Native seed **dispersal**

Plants can reproduce in different ways. Some plants produce new generations via underground structures, some via runners or stolons, some clone themselves and some use spores, but a large proportion reproduce by seed. Seeds are found within the fruit of a plant. Some fruits (such as those we commonly eat, like apples or oranges) are fleshy, however fruits may be hard and woody instead, such as Banksia cones or the native woody pear. A fruit may contain few or many seeds, depending on how many ovules of the fruit have been fertilised with pollen. The fruit serves to protect the vulnerable seed, and can also provide nutritious organic matter to support the germinating seeds if the fruit falls to the ground.

Different plants also disperse their seed in various ways. The method is usually aided by the design of the seed, which has in each case evolved to give it the best chance of ending up in a desirable location for growth. Dispersal may also be influenced by the shape of the fruit or pod containing the seed.

Methods of natural seed dispersal:

Gravity

Heavy seeds, or seeds within heavy fruits, may be dispersed effectively via gravity alone. Spherical fruits can roll for some distance particularly if they are encased in a hard exterior shell. Gravity will usually carry fruit/seed to low-lying valley floors (often characterised by richer more fertile soils) or into pits or depressions in the soil where water collects after rain. Rolling away from the parent plant can also give the seed more space to grow once it germinates. Softer fruits may burst when they hit the ground, scattering seed. This is especially the case if fruits fall from higher branches. Sandalwood, Quandong and Marri ('honky nuts') are native examples of spherical fruits that utilise gravity to disperse their seeds.

Wind

Some seeds are most easily spread by wind. It is usually small lightweight seeds that use this mechanism to disperse, however some adaptations such as 'wings' or feathery attachments can help even heavier seeds to catch an air current. There are numerous plants of the Asteraceae (Daisy) family which take advantage of wind to distribute seed, including Everlastings. Their small seeds are formed in the central florets and as they mature, a feathery 'pappus' forms which catches the wind and carries the seed away, often floating some distance. This technique works very well for light-seeded plants growing in open areas where there is no dense understorey to block the breeze.

Many Proteaceae species like Banksias, Hakeas or Woody Pear have somewhat heavier seed, often kept in the closed pod/cone until weather conditions are right for germination. At that point the dry fruit splits open and the seed which has a wing-like membrane is blown out by the wind and will typically flutter through the air a little way from the parent plant before reaching the ground.

Other wind-dispersing plants have their seed in a cup-like structure at the top of a long stalk, and a small scattering of seed is tipped out now and again when the stalk bends in the wind (or pushed by a passing animal). Yet another method of harnessing wind is the formation of tumbleweeds by plants like Salsola, where the entire above-ground portion of the plant dries and breaks off at the base, then rolling along pushed by the wind and taking its seeds with it to wherever it ends up.

Water

Vegetation along river banks or on the edge of waterbodies can improve dispersal of seed by utilising the water itself, especially flowing waters, to transport seed.

(top) White Everlasting Rhodanthe chlorocephala.

(bottom) Vegetation along the river bank.

Banksia seed pod after fire.

Typically this relies on the seed being lightweight so it floats on the water surface, or having modifications to increase buoyancy such as wing-like membranes, air-trapping tufts or air-filled bladders. In saline or coastal areas the seed or pod sometimes has an extra tough shell to protect it from the saltwater, and Mangroves even germinate in place on the parent plant before they drop off into the tidal waters as young seedlings/germinates.
In tropical regions some flowers may also rely on the force of falling raindrops to splash seed out of their cup-shaped centres.

Propulsion

For those plants that can't take advantage of the elements but intend to scatter seed away from the parent plant, they may create their own force to physically eject the seed. Wattles and many other plants in the Pea family Fabaceae have specially adapted pods that will pop open explosively when the atmosphere is suitably dry and hot. This happens because of the way the pod dries, and tension that builds up before the pod splits, and can scatter the seeds some distance from the parent plant. You may even sometimes hear the popping or rattling sounds of the pods opening if you are around these plants on hot days.

Dispersal by animals

Hitching a ride with animals is another way for seed to move across the landscape. Ants are well known to collect and store certain seeds (especially Wattle seed) underground, giving the seed protection from fire or seed-eating animals and provides perfect germination conditions. The ants feed on only a part of the seed (the elaiosome) and the main part of the seed is left intact and able to germinate. Some plants even add chemical attractants to their seed to entice ants to collect them. Seeds or pods with burrs or hooks are often tracked around by animals in their fur or footpads before being dislodged some distance from the parent plant. Most of us would be familiar with finding grass-seeds in our socks or in our dog's fur from time to time. In terms of distance however, birds are often the greatest dispersers of seed, and seeds which are packaged in a tasty fruit snack and have a hard seed casing which can pass through the bird's gut and still be viable are developed to make the most of birds. Native mistletoes are a great example of this, as they are reliant on birds like the Mistletoe Bird eating and transporting the seed to establish populations on new hosts.

Retained seed

For some native species, hard woody fruits are retained on the parent plant for a year or even longer. You can often see this on plants such as Bottle Brush, Teatree or Melaleuca species, where the fruits of previous seasons are visible further back along the branches. The seeds themselves may be held within the fruit until conditions are right for the seed to germinate, at which point they are released. Some parent plants will even hold on to their seed until they are nearing the end of their life (senescing) and then release all the seed at once to start a new generation.

Reveg tip

One of the best ways to revegetate your property is through natural regeneration; this gives seeds the best opportunity for growth as they propogate in areas they were meant to.

Stiff bottlebrush (Callistemon rigidus)

Fire as a trigger

Although seed release from retained fruits may be triggered by senescence of the mature plant or certain weather conditions, many Australian plants are stimulated to release their seed by the presence of fire, responding either to the heat, ash or smoke. In some cases this is because the adult plants are easily killed by fire, so for the population to continue there has to be fresh seed available in the soil bed once the fire has gone through. Another reason fire may stimulate seed shed is that after a fire has occurred there is typically less competition for light and space, as well as fertile nutrients provided by the ash and extra woody debris.

Natural threats to seed

Of course fire can also present a threat to those seeds not evolved to cope with it. Other threats that seed is vulnerable to are insect damage (many insects deposit eggs inside seeds which are then eaten out by the developing larvae), seed-eating birds and mammals, and harsh environmental conditions. Prolonged drought can dehydrate even tough seed past the point of viability, and waterlogging or humid conditions leave seed prone to fungal disease and rotting. Residual chemicals remaining in soil or water systems will also pose a threat to seed, or the developing seedlings once they start to grow and take up nutrients and water.

If you are interested in encouraging natural regeneration of vegetation on your property, or even collecting seed to propagate seedlings for planting, it is worth taking note of what dispersal mechanisms are utilised by your local plant species. Seed dispersal is key to the way vegetation spreads, and how it can revive itself after destructive events. By minimising threats to seed and taking advantage of dispersal methods, harvesting seed or supporting bushland regeneration can be a much more efficient and successful process.

Further Reading

http://theseedsite.co.uk/dispersal.html

http://anpsa.org.au/APOL14/jun99-6.html

http://australianmuseum.net.au/seed-dispersal

http://www.seed-dispersal.info/glossary.html

https://www.sciencelearn.org.nz/resources/103-seed-dispersal

Registering a site of **cultural significance**

There are many sites of cultural significance throughout the Wheatbelt that have been used by Aboriginal people. Whether it's a gnamma (water hole) or a women's birthing site, once the Aboriginal Elders have passed on, these places can be forgotten and become damaged.

It's up to us and the next generation of people to help look after these places.

Registering a culturally significant site with the Department of Aboriginal Affairs (DAA) is an important step towards helping protect a site and record its location to make it easier to find later.

The steps for getting a site of cultural significance registered with DAA are explored on the following page – from collecting field data about the site, to submitting the registration with the Aboriginal Cultural Materials Committee (ACMC) for approval.

Research site and collect data

Once you have identified a site, you will need to collect specific data about it, including:

- landform/surrounding vegetation
- purpose of the site (e.g. gnamma or tool making)
- site condition
- GPS location (measuring boundary and specific location)
- importance of site
- who the related knowledge holders are, e.g. an Elder
- how you want to protect the site

Check heritage registration

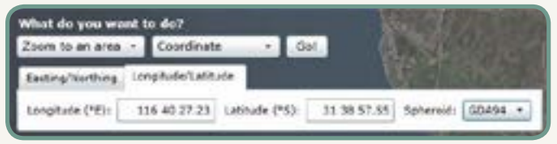
After you've collected the data, head to the DAA website using the Firefox website browser. You might need to install the Silverlight program too.

Then, click here: **https://www.daa.wa.gov.au/heritage/place-search/**

And click on Aboriginal Heritage Inquiry system on the left. There are several ways to check if the significant site is registered yet. First click on the Registered Aboriginal Sites on the right

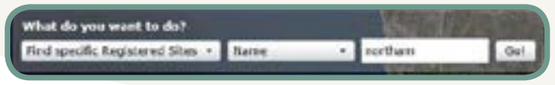
Zoom to an area

- Choose Local Government Authority and pick your shire
- Or enter the site's GPS Coordinate



Find a specific registered sites

- Choose Name and enter the area name (e.g. Northam), click Go!
- Click Continue
- It will give you a list of all registered sites in the area



Submit to DAA

If you find your site listed on the DAA website then it's already registered.

Site Registered

If the site is registered submit the data you collected to the DAA. The more information you have on a site the easier it is to validate its significance.

Site Not Registered

If the site hasn't been registered yet, lodge it with the Registrar via the DAA sites submission form on their website.

Lodge with Registrar

The registrar will lodge your application into the DAA system and create a file for the site.

Request for assessment

The registrar requests assessment development or protection with the site assessment team.

Ensure procedural fairness

If the site is already registered the site assessment team will ensure procedural fairness & inform all stakeholders & knowledge holders that additional information will be added to the site file.

Aboriginal Cultural Materials Committee

The site assessment team will present the application to the Aboriginal Cultural Materials Committee (ACMC) for approval.

Site is registered

Congratulations! The site is now listed under the Aboriginal Heritage Act 1972. In future, any changes made to the site will need to be discussed with & approved by the knowledge holders

The site is now protected!

Central long-eared bat

Nyctophilus major

Identification

The central long-eared bat is a compact, chunky bat with a large head, large ears and a broad snout. It has only recently been recognised as a distinct form and was previously classified along with populations in eastern Australia as the greater longeared bat (N. timoriensis). The central long-eared bat is smaller than similar longeared bats from eastern Australia and the populations are separated geographically. It is much bigger than the lesser longearedbat (N. geoffroyi), which occurs in the same area, and lacks the Y-shaped nose leaf. It is separated from the western long-eared bat (N. gouldi) by having more widely spaced canine teeth at the gum line. Its fur is dark grey-brown on top and slightly bi-coloured, being slightly paler brown on the ends of the hairs. Females are larger than males and fly faster.

Habitat and distribution

This species is widespread in the semi-arid and arid environments of southern and western Australia. It roosts in hollows in trees, in foliage, under bark and in split branches. The central long-eared bat favours woodlands with salmon gum, gimlet and other small eucalypts and an understorey with dense thickets of flowering shrubs, as well as the edges of wattle and sheoak thickets around granite outcrops. It occurs in semi-arid parts of the Avon but much of its preferred habitat has been cleared for agriculture.

Diet

The central long-eared bat hunts low down in the canopy and around shrubs, gleaning invertebrates from foliage and from the ground as well as catching insects in flight. This species is sometimes caught in pitfall traps, probably as a result of scampering across the ground in pursuit of invertebrates. One study in Banksia woodland in Western Australia found that they ate mostly beetles. The flight is slow and fluttery and the bat uses its large ears as rudders to help manoeuvre it through dense foliage in pursuit of prey. It is believed that the size difference between the sexes may result in them targeting different prey species, thereby reducing competition for resources in an environment with limited food supplies.

Reproduction

Breeding begins in autumn and the young are born in late spring and early summer. Their life history is probably similar to other long-eared bats in southern Australia but more research is required.

Threats

Land clearing has affected this species' distribution and abundance in the Avon and in other agricultural and urban areas. Grazing and trampling by introduced animals degrades dense thickets and may have an impact on central long-eared bat populations. Cats and foxes prey on this species.

Management actions

Protection of remnant vegetation in conservation reserves, road verges and on farms is important to maintain populations of numerous species that occur in the Avon region, including the central longeared bat.

Size (head and body length)
55 – 60 mm (males)
61 – 65 mm (females)

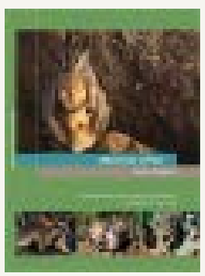
Size (tail)
45 – 48 mm (males)
47 – 50 mm (females)

Weight
9.5 g (males)
12.7 g (females)

Habitat
Arid and semi-arid WA and SA in forests, woodlands with dense thickets and edges of granite outcrops. Roosts in hollows, under bark, in foliage and in split branches of trees.

Diet
Feeds low in the canopy and in shrubs. Eats flying and non-flying invertebrates, caught in flight, gleaned from bushes and on the ground.

Reproduction
Breeding begins in autumn. Young are born in late spring and early summer



Click here

This article is reproduced from the Mammalsof the Avon Region, available for download at :

www.wheatbeltnrm.org.au/mammals

Building soils for the future

A Wheatbelt NRM Trials and Demonstrations Project

Name: Living Farm Grower Group
Location: York
Annual Rainfall: 450mm
Soil Type: Sandy quartz loam
Time Frame: 2014-2016

Trial results indicate that chicken manure mixtures can potentially be used as an equal replacement to the traditional inorganic fertiliser - Sulphate of Ammonia (SOA).

The manure mixtures trialled could return some nutrients and carbon back into the regions where they were originally sourced from and provide a market for:

- **currently non-utilised forestry products; prunings and thinnings**
- **the disposal of chicken manure and bedding from poultry farms**

Low concentrations of mineral and organic nitrogen compounds in many WA soils limit plant growth and productivity. Industrial production and use of N-fertilizers relieves this constraint, however, landowners have increasingly tight profit margins and large proportions of annual farm budgets are spent on synthetic fertilisers.

Synthetic N-fertilisers are readily available, nutrient dense and produce instant results; however, they are susceptible to leaching, are retained in the soil for short periods and are energy intensive to produce.

Finding cheap, effective and more sustainable sources of nitrogen for soils, which require fewer applications, could potentially assist landowners to improve their profit margins.

The Poultry Industry in WA roughly produces 100,000 cubic meters of bedding/manure each year as a waste product. Chicken manure contains high levels of organic nitrogen and useful levels of phosphorus and potassium with a good micronutrient profile. It is also a slow release fertiliser which results in less soil leaching. Most chicken litter in Australia is used within 150km of its source (Wiedemann 2015)

Likewise biochar is a product created from forest thinnings which, for this trial, are a by-product from biofuel production by WA Biofuels. Biochar is useful as an addition to organic fertilizers, compost teas or other soil ameliorants as it can add stability and a mineral rich environment for soil microbes to thrive. It also helps with retaining soil moisture (Lehmann & Joseph 2009).

Trial Objectives

The purpose of this trial was to see if waste products from the poultry industry (chicken manure and bedding material produced from forest thinnings) and biochar, also from forest thinnings, would be able to provide an alternative source of N-fertilisers in WA.

The objectives of this trial were to:

1) Show that chicken manure (with or without additives) can be used as a nitrogen source for growing broadacre grain crops

2) Assess the effect or otherwise of combining biochar produced from forestry thinnings with the manure.

Trial Design

Two forms of manure were trialled:

1) A standard form of manure obtained from the bedding materials of chicken broilers. This product was a mixture of sawdust and chicken manure.

2) A mixture of urea, manure (as above) and biochar. Urea was added this mixture to increase the nitrogen component.

Sulphate of Ammonia (SOA) was chosen as the standard form of nitrogen as it is often applied prior to planting of a crop. Given chicken manures low bulk density it is also most likely to be applied prior to seeding the crop and therefore most comparable to SOA. The nitrogen was applied for the growth and yield of wheat (2014 cv Corack 70kg/ha and 2015 cv Mace 80kg/ha).

Four replications of 11 treatments were arranged in a complete randomised block design. Plots were 15m x 2m. All treatments received P+K starter fertiliser at seeding

Tmt #	Fertiliser	Rate (kg/ha)	Units	Timing
1	None Applied	-	-	-
2	P + K starter	100 + 50	20 + 20.5	At Seeding
3	P + K starter Sulphate of Ammonia	100 + 50 110	20 + 20.5	At Seeding Spread prior to seeding
4	P + K starter Manure/Char/Urea Mix	100 + 50 200.	20 + 20.5 23	At Seeding Spread prior to seeding
5	P + K starter Manure Only	100 + 50 657	20 + 20.5 23	At Seeding Spread prior to seeding
6	P + K starter Sulphate of Ammonia	100 + 50 110	20 + 20.5 23	At Seeding Spread 6 weeks after seeding
7	P + K starter Manure/Char/Urea Mix	100 + 50 200	20 + 20.5 23	At Seeding Spread 6 weeks after seeding
8	P + K starter Manure Only	100 + 50 657	20 + 20.5 23	At Seeding Spread 6 weeks after seeding
9	No Starter Sulphate of Ammonia	- 110	- 23	- Spread prior to seeding
10	No Starter Manure/Char/Urea Mix	- 200	- 23	- Spread prior to seeding
11	No Starter Manure Only	- 657	- 23	- Spread prior to seeding

Normalized Difference Vegetation Index (NDVI), crop stand counts, vigour, yield and grain quality were measured. Crop vigour and NDVI were measured at 4 and 9 weeks after sowing. Crop stand counts were collected at 6 weeks after sowing.

Results and Discussion

In 2014 and 2015 there were no significant differences in plant establishment or NVDI between any of the treatments. Vigour results were also similar for all treatments; however, there was slightly lower vigour in the no fertiliser treatments (Treatment 1).

Grain yield results closely correlated with NDVI and vigour results. The lowest yields occurred in the No fertiliser treatment (2.02 t/Ha) and SOA-only treatment (1.96 t/Ha). Highest yield occurred in the P, K + SOA spread 6 weeks after spreading (2.86 t/Ha). However, was not significantly greater than the P + K alone or any of the Manure treatments.

Protein results varied and did not follow the anticipated pattern. It was anticipated that treatments with applied nitrogen (be it from SOA or the manure treatments) and P + K would retain the highest protein concentration within the grain. However, this was generally not the case and actually showed an inverse relationship in several of the treatments (Tmt 1, Tmt 9, Tmt 10 and Tmt 11). These were also the lower yielding plots, so a possible reason for the higher protein may be that proteins were not being “diluted” by higher

Tmt #	Fertiliser	Timing	Yield (t/ha)	Protein (%)*	Hectolitre Weight (kg/hL)	Screenings (%)*
1	None Applied		2.02	9.96	83.33	4.17
2	P + K starter	At Seeding	2.42	9.34	82.89	3.94
3	P + K starter Sulphate of Ammonia	At Seeding Spread prior to seeding	2.65	9.23	83.17	3.79
4	P + K starter Manure/Char/Urea Mix	At Seeding Spread prior to seeding.	2.55	9.48	82.74	3.82
5	P + K starter Manure Only	At Seeding Spread prior to seeding	2.50	9.34	82.95	3.36
6	P + K starter Sulphate of Ammonia	At Seeding Spread 6 weeks after seeding	2.86	9.41	82.5	3.93
7	P + K starter Manure/Char/Urea Mix	At Seeding Spread 6 weeks after seeding	2.64	9.61	82.58	3.98
8	P + K starter Manure Only	At Seeding Spread 6 weeks after seeding	2.67	9.22	82.76	4.07
9	No Starter Sulphate of Ammonia	- Spread prior to seeding	1.96	9.75	83.23	4.54
10	No Starter Manure/Char/Urea Mix	- Spread prior to seeding	2.49	9.76	83.15	3.54
11	No Starter Manure Only	- Spread prior to seeding	2.21	9.64	83.49	3.73

In the two years that this trial was running it has shown that chicken manure can be used as a nitrogen source for growing wheat crops as it demonstrated similar yields as synthetic fertilizers.

No negatives were found from adding biochar; however there were also no additional benefits on the yield or quality from the addition of biochar to the manure.

One of the advantages of using manure as a fertiliser is that it is slow release, the soil microbial population is also a slow building process, therefore it can take much longer than 2 years to see the full effects of the products and differences between the treatments may have become significant over a longer time period.

Landowner interest and feedback

A number of events featuring the trial were run by Living Farm for their members. They found that the level of interest from grower group members, to change their farm management practices based on this project, was extremely high. Approximately 90% of members would look at using chicken manure in their program IF it were available at an economical cost.

Three limitations to using chicken manure are:

1) It has a low density and therefore needs to be spread at a considerable rate (therefore increasing spreading cost and spreading time)

2) Transport costs. Again, because the product has a low density it ends up costing a lot to transport when compared to other forms of fertilizer.

3) Growers are required to have appropriate spreading equipment.

Whilst the limitations are a disincentive, many farmers reported that they would be willing to overlook them should they be able to get the product at a suitable price.

There was less interest from growers for incorporating biochar into their program as this trial showed no additional yield or quality benefits from the addition of biochar.

References

Lehmann, J & Joseph, S. (2009) Biochar for environmental management science and technology. Earthscan: London

Wiedemann, SG (2015) Land Application of Chicken Litter: A Guide for Users. Rural Industries Research and Development Corporation: ACT

Acknowledgements

Richard Devlin, Living Farm

wheatbelt natural resource management

269 Fitzgerald Street
PO Box 311
Northam WA 6401

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

www.wheatbeltnrm.org.au