



Department of
Primary Industries and
Regional Development

Rangelands Memo

May 2019

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Kimberley Wet Season Summary

Matthew Fletcher, Development Officer, DPIRD, Kununurra

A snapshot:

- The period 1 October 2018 to 31 March 2019 provided generally 'below average' to 'very much below average' rainfall for the Kimberley, Pilbara and Murchison districts: Figure 1. There was little rainfall received in the Kimberley from Tropical Cyclone Veronica in late March however it provided much needed relief in the Port Hedland area.
- In the Kimberley, there is very little monsoonal activity to report with the majority of rainfall received associated with localised thunderstorms. These storms have resulted in patchy rainfall, with a number of managers reporting that while some of their dams have filled, others not far away remain dry.
- Black soil country burnt in 2018 has not had sufficient rainfall to grow a good bulk of pasture, and therefore large areas continue to remain relatively bare; Mitchell grass (*Astrebla spp.*) has only grown to a height of about 100 mm high and is drying off rapidly. Lighter country (sandy soils) has responded well to rainfall received, with soft spinifex and Pindan country producing modest amounts of new growth.
- Annual grasses such as Flinders grass (*Iseilema vaginiflorum*) and limestone grass (*Enneapogon polyphyllus*) are usually quite conspicuous by this time of year. However, reports from the Halls Creek area this wet season suggest that very little Flinders grass has germinated on the black soil and limestone grass on the lighter soils has had very little bulk, with plants lacking vigour and only about 100 mm high.
- The general consensus at the moment is that while cattle are maintaining their condition, there will be little palatable feed left by June 2019 and stock will be forced to walk out to graze a long way from water.

Fitzroy Crossing – putting the current wet season into context

For Fitzroy Crossing, the long-term median rainfall over the wet season (November-April) is 504 mm, as determined from the Patched Point Dataset (Queensland Department of Environment and Science). The median is used here as the preferred measure of 'average' rainfall.

At the time of writing, the 2018/19 wet season is shaping up as one of the driest on record, with 244 mm recorded to the end of March, although more rain could be received during April. The driest wet season on record was the 1952/53 wet season when only 170 mm of rainfall was received. The previous 2017/18 wet season produced 406 mm and

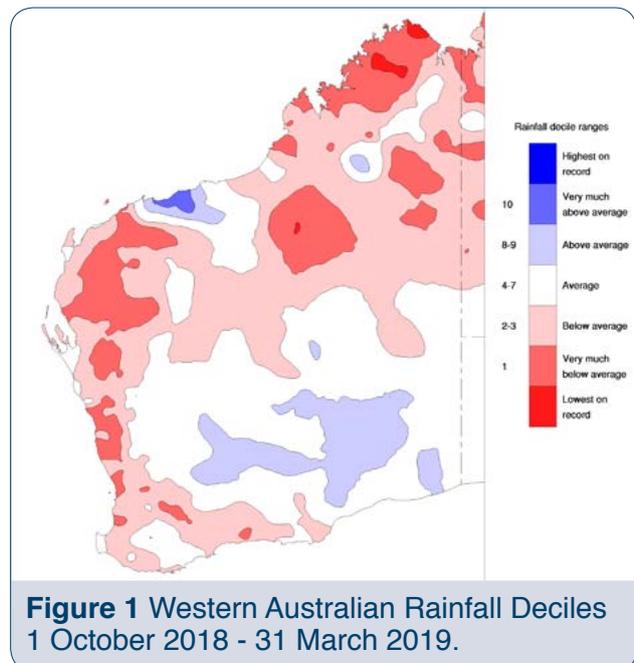


Figure 1 Western Australian Rainfall Deciles 1 October 2018 - 31 March 2019.

would be considered 'average' in the terminology of the Bureau of Meteorology (middle 40% of rainfall totals). With the 2017/18 wet season being average, and the 2018/19 wet season one of the lowest on record, the lack of available forage for stock is of concern.

Managers who stock to the long term carrying capacity will have some residual feed, giving them time to make decisions on how to negotiate their way through the 2019 dry season. Leases stocked in excess of the long term carrying capacity will have had little or no respite over the 2018/19 wet season, so it is likely that there will be little available forage and stock will be beginning to lose condition.

In contrast, two years ago (2016/17), the wet season rainfall total at Fitzroy Crossing was estimated to be the highest on record, 1019 mm. Dorothea Mackellar's poem "My Country" certainly seems to fit the bill for Fitzroy Crossing:

I love a sunburnt country
A land of sweeping plains,
Of ragged mountain ranges,
Of droughts and flooding rains.

(from second stanza)

There has been a good run of wet seasons over the past thirty years in Fitzroy Crossing (Table 1):

- Five have been 'below average' or 'very much below average'
- 11 have been 'average'
- 14 have been 'above average' or 'very much above average' and
- the 2016/17 wet season was highest on record.

Importantly, there have been no instances over this period where one 'below average' or drier season was followed by another poor one.

Management implications

It is common for managers to increase stock numbers to make use of available feed during a run of good seasons and it is likely to be the case with Fitzroy Crossing. This is perfectly acceptable for country in **good condition**, but when the 'tables turn' and a poor season results in pasture growth insufficient for the number of stock on hand, managers need to act swiftly to reduce numbers. This is a big challenge in the Kimberley where the cost of getting cattle to feedlots and saleyards is high.

Managers who have good stock control and align numbers to the carrying capacity tend to negotiate the aftermath of poor seasons more successfully as they have feed reserves on hand, reduce the risk of degrading the pasture resource and maintain a productive herd with a high reproductive rate, low mortality rate and higher sale weight.

Contact the teams in Kununurra or Broome if you would like to check your lease's potential or present carrying capacities.

Table 1 Wet season rainfall at Fitzroy Crossing (station #3006), 1989-2018 (November-April)*

Wet season	Rainfall (mm)	**Wet season category	Wet season	Rainfall (mm)	**Wet season category
1988/89	488	Average	2003/04	724	Above average
1989/90	311	Below average	2004/05	372	Below average
1990/91	878	Very much above average	2005/06	687	Above average
1991/92	226	Very much below average	2006/07	378	Below average
1992/93	643	Above average	2007/08	455	Average
1993/94	362	Below average	2008/09	796	Very much above average
1994/95	846	Very much above average	2009/10	438	Average
1995/96	552	Average	2010/11	905	Very much above average
1996/97	799	Very much above average	2011/12	770	Above average
1997/98	601	Average	2012/13	561	Average
1998/99	714	Above average	2013/14	468	Average
1999/00	818	Very much above average	2014/15	563	Average
2000/01	916	Very much above average	2015/16	538	Average
2001/02	657	Above average	2016/17	1019	Highest on record
2002/03	511	Average	2017/18	405	Average

*Rainfall median and deciles used for categorising wet seasons were calculated for the period 1889-2018. The data presented here will differ slightly from BoM observations at the nearby Fitzroy Crossing Aero site (station #3093, commenced 1997).

**‘Very much below average’ refers to lowest 10% of records, ‘below average’ to next driest 20% of records, ‘average’ to middle 40% of records, ‘above average’ to next wettest 20% of records and ‘very much above’ average to highest 10% of records.

Attend a Grazing Fundamentals or Grazing Land Management workshop and learn more about feed budgeting, decision dates in response to failed seasons, wet season spelling, and how to avoid overgrazing. Register your interest today.

For more information contact Kath Ryan, kath.ryan@dpird.wa.gov.au, Matthew Fletcher, matthew.fletcher@dpird.wa.gov.au, or David Barker, david.barker@dpird.wa.gov.au

Animal Welfare responsibilities in dry seasonal conditions

Warren Lloyd, Compliance Inspector, DPIRD, Kalgoorlie, and Candy Hudson, Compliance Inspector, DPIRD, Geraldton

Many pastoral stations throughout WA are in the grip of a major dry season and producers may be faced with hard decisions over the coming months. Options to manage cattle and sheep include the provision of feed onsite, transport to agistment or sale or, in some cases, humane destruction.

Transport

With any decision concerning livestock, the welfare of those animals is paramount. There is no justification for transporting animals which are too weak to withstand the journey.

If considering the option of transport, producers have a responsibility under the Animal Welfare Act 2002 and Model Code of Practice for the Welfare of Cattle to ensure their animals are fit to be transported.

To assist with this decision, DPIRD has a farm note on welfare decisions for beef cattle, available online at agric.wa.gov.au/animalwelfare/resources-and-publications. Veterinarians can also provide useful advice on a case-by-case basis on the decision to transport an animal.

Ensure animals are well prepared before loading commences. This will reduce stress and avoid any animal welfare issues.

Weaning

Early weaning of young stock will be important to preserve the body condition of adult breeders and the weaned animals will need extra care. A combination of good quality hay, straw and pellets can be a feeding option for weaned cattle that are in holding yards or paddocks, and the use of self-feeders or lick feeders with pellets or grain is also being effectively used by some pastoral stations.

Additives, lick blocks and molasses lick troughs can assist for the conversion of the dry feed. Stress from weaning can also cause problems with disease and parasites, so monitor weaned stock carefully, treat for parasites, and vaccinate against relevant diseases if required.

Managing older cows

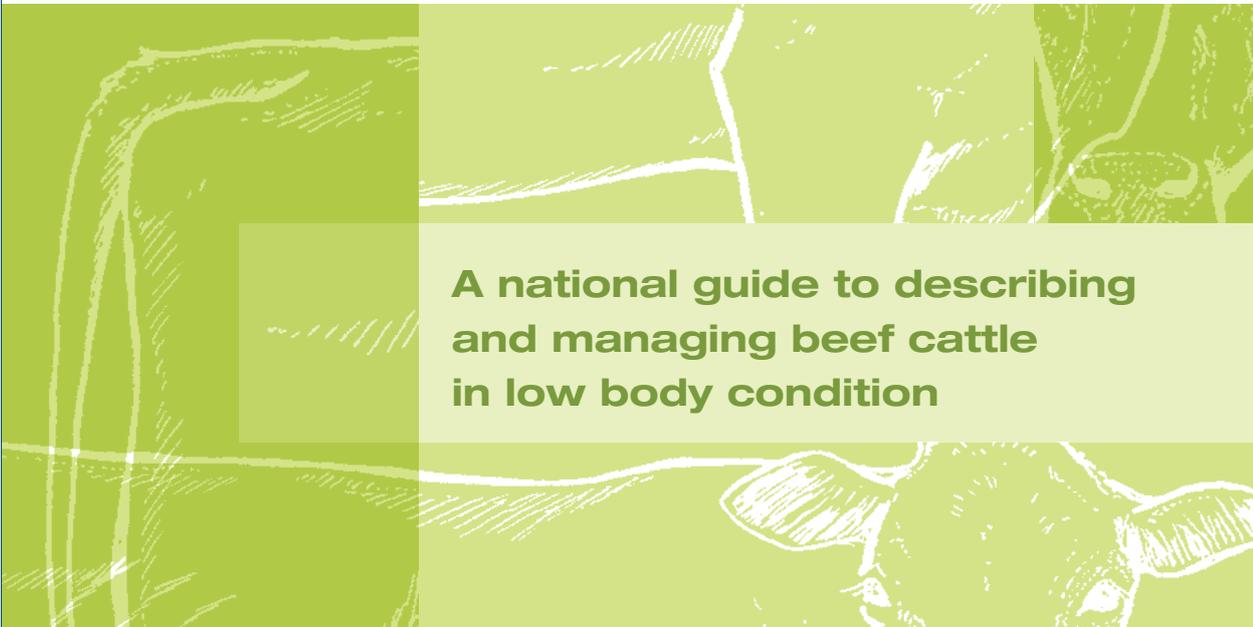
Last year, some producers were faced with the issue of cattle being rejected by live export buyers due to low body weights. This year markets may again be limited for older cows.

Turning cows in body condition score 1 back out onto poor feed creates an unacceptable risk of starvation. These cows must be fed for survival, fed to gain weight or humanely destroyed. See Codes of Practice, available on the department's website, and information on the humane destruction of sheep and cattle at www.agric.wa.gov.au/animalwelfare/resources-and-publications.

Good stockmanship

The importance of having staff who are trained in animal welfare handling techniques is also important. Competent stock people can handle cattle to minimise stress, utilise the cattle's natural behaviour, recognise early signs of distress, are flexible in their approach to handling stock, and can adapt to seasonal changes. Early detection of emerging problems and employing good decision making around the management of animals can mean the difference between a viable enterprise and animals for which there is no commercial value and a risk of committing offences under the Act.

For more information contact the Livestock Compliance Unit at livestock.compliance@agric.wa.gov.au or +61 1300 374 731

A large, light green background illustration of a cow, rendered in a sketchy, white line-art style. The cow is shown from the side, facing right, with its head lowered. The illustration is semi-transparent, allowing the text to be overlaid.

A national guide to describing and managing beef cattle in low body condition

There are a number of resources available to assist with livestock management during challenging seasonal conditions. Contact your local DPIRD office for more information.



Animal welfare

Ensuring all animals receive appropriate care



July 2017

Welfare decisions for beef cattle

In circumstances such as drought, cattle may be subject to dramatic loss in body condition due to reduced feed intake. As cattle lose condition, they become progressively less fertile, milk will dry up and commercial beef value will decline. If they lose condition further, body reserves can become insufficient to withstand mustering, yarding, transport or sale.

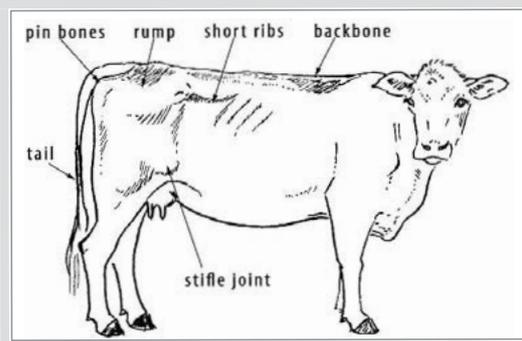
If they become very weak, they are at risk of death during wet or cold weather, or if placed under any form of stress. **Weakened animals cannot be transported.**

It is not acceptable to leave stock in poor condition. Decisions must be made on future feeding, suitability for transport or sale, or in extreme cases whether humane destruction is required.

Making decisions on what to do next can be difficult and stressful. These guidelines can help assess the condition of affected cows, and decide what action to take.

Assessing animals

The diagram below shows the key sites for assessing an animal's condition. Use Table 1 over the page to decide which category the animal fits into and what action needs to be taken.



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Criteria for destruction on property

If not fit for transport or sale, some cattle may require humane destruction on property.

Humanely destroy cattle if they are in poor or very poor condition as described in Table 1 (see over page) and meet any of the following conditions:

- falling down or knocked over easily
- cannot stand without assistance
- very unsteady gait, staggering, or crossing over of hind legs.

Humane destruction should be considered if:

- adequate good quality feed and water cannot be provided, and
- the cattle cannot be transported to agistment or sold.

Cattle must not be allowed to starve to death.

More information

This information sheet is based on Animal Welfare Codes of Practice and applicable Standards and Guidelines. For up-to-date Codes of Practice, and Standards and Guidelines, visit:

- agric.wa.gov.au/animalwelfare
- animalwelfarestandards.net.au

References

Welfare scoring nutritionally deprived beef cattle, dairy cattle and their crosses, sheep and horses - NSW Department of Primary Industries, 2013 (dpi.nsw.gov.au)

Table 1. Welfare decisions for cattle based on animal condition

	Fat score 1	Poor	Very poor
Cow condition	 <p>Lean but strong and healthy and with no significant muscle wastage. Likely reduced reproductive performance</p>	 <p>Healthy but with significant muscle wastage. Unlikely to conceive. Able to recover if adequately fed</p>	 <p>Weak, with very low body reserves. At risk of death from cold, wet weather or other stress. Slow recovery reliant on high-quality care</p>
Backbone	Easily seen	Spines of backbone identifiable	Spines of backbone individually identifiable
Short ribs	Visible. Fairly sharp to touch	Prominent and very sharp to touch	Very prominent and easy to see individually
Inside pin bones	Slightly sunken	Sunken	Deeply sunken to the bone
Muscle wastage	Rump muscle concave (between hooks and pins)	Rump muscle concave. Muscle wastage in loin and leg muscle evident	Muscle wastage over whole body. Rump and leg muscles deeply concave
Stifle joint	Not identifiable	Not identifiable	Identifiable
Tail bones	Individual bones not identifiable	Individual bones just able to be felt	Individual bones easily felt
Skin	Pliable	Less pliable	Tight
Appearance	Bright, alert	Healthy	Lacking energy or dull
Mobility	Normal gait	Mobile, able to lie down/rise with ease	Unsteady gait, may drag or cross over hind feet. Difficulty lying down/standing up
Ability to calve	Some assistance required	Moderate assistance required	High level of assistance required
Transport, sale	Suitable for transport but with minimum time off feed Suitable for sale but must not be kept off feed for extended periods	Unsuitable for transport over long distances Unsuitable for sale at saleyards Suitable for sale only direct to farm or abattoir Suitable for transport direct to agistment	Not fit for transport
Actions required	Must be fed adequately to prevent further weight loss Supervise and be ready to assist during calving	Must be fed adequately to prevent weight loss Supervise closely and be ready to assist during calving	Must be given high-quality feed, water and care or carry out humane destruction Supervise closely and be ready to assist during calving

Early weaning after a failed wet season

Annabelle Coppin, Owner, Yarrie Station, Marble Bar

This article is a follow-up to two articles published by Development Officer Mariah Maughan, on the practice and cost of early weaning pastoral cattle, in the March 2018 edition of the Rangelands Memo.

Annabelle Coppin is a pastoralist from WA's Pilbara region. In the following article, Annabelle recounts the management choices she made after a failed wet season in 2015/16.

With the 2015/16 wet season being so very dry, we chose the option of feeding weaner pellets as a 'dry season' management strategy. Feeding the pellets was expensive and hurt the financials in a year when income from sales was down and therefore I had to do the sums of feeding the pellets based on whether a calf was going to survive or not, and whether a cow was going to survive and get back in calf again.

Having done this early on and seeing that the rain did not come, I was certainly able to justify using the pellets. I knew how many cows and weaners I had to save in order to cover the cost of the pellets and this justified me spending the money.

I spent the money on the pellets and weaned very early, down to 50 kilograms. The calves went onto the pellet well, but animal management still played an important role. We had to keep the animals in their weight lines so that all animals could get access to the pellets and hay.

Without careful animal management right from the start (meaning, as soon as we pulled them off the cows in the bush yard, they were separated from the larger weaners), we ensured the calves had access to clean water, hay and pellets. We also put them through a weaner handling program. I don't think that I would have got the response I did if not for that bit of extra care.

I keep a good track of my cows on a computerized record system and throughout the 2017 mustering season, I was able to tell that most of the previous year's wet cows did get pregnant during the bad dry season in 2016.

A lot of these cows got in calf during October and November which was the worst bit of the year. Weaning hard, putting the calves on pellets and trying to hold cow condition gave me more calves and justified the money that I spent.

While I did my sums on wanting to keep calves and cows alive so that I would have income when the rain did come, another very important factor for me in deciding to feed the pellets was the commitment to animal welfare.

I wanted to look after the cows and their condition, and to get them through a horrible time. In 2016, I did not know that it was going to rain in January 2017. I knew that I had to take care of these cows and the weaners to get them through this dry time, and not risk putting them through a second dry year. Like most pastoralists, I care for my animals and I was not going to let them die.

We trucked all of the weaners to our background farm in Badgingarra where we continued to give them access to the pellets while they grazed on pastures. Good animal management was again important in getting these small weaners adjusted and going ahead.

Small weaners that may not have survived at Yarrie had we not fed pellets, were now 250-300 kgs animals that we were able to background and sell into a range of markets once they made weight.

Nothing is a golden egg and having access to the option of pellets gives us more flexibility in our business.

I want to stress that making the decision to feed pellets and fork out extra dollars when the business is under pressure in a dry time was not an easy decision, but I looked long term at my herd management and my desire to look after my animals.

I certainly don't regret that I paid the money, fed the pellets as part of the dry season management plan and now have cows that are calving with weaners to sell later on.

Having a plan to look after my animals during the dry season also helped me psychologically to get through that tough period. The rain did come in January 2017 and I look back and think that I am happy with the plan that I made to manage in what was challenging two dry seasons.

For more information contact Mariah Maughan, Development Officer, Broome, on +61 (0)8 9194 1441 or mariah.maughan@dpird.wa.gov.au



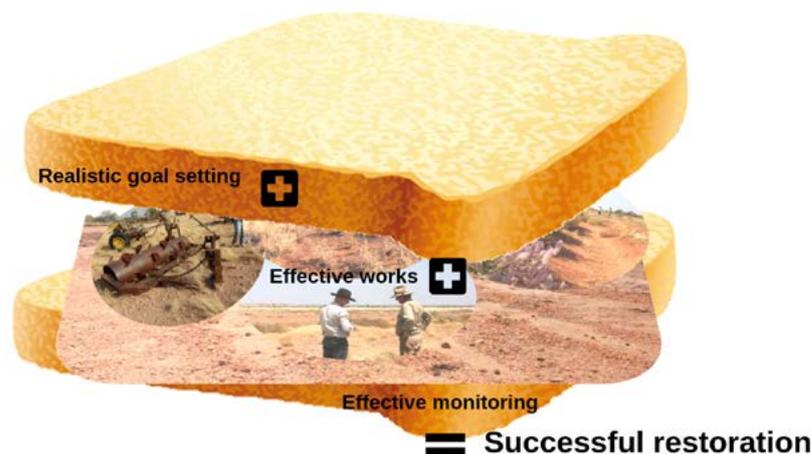
Annabelle Coppin with Husband Thomas Fox and their daughter Tanami.

Landscape restoration in the rangelands – the successful sandwich – and ecological balance sheets

Kath Ryan, Development Officer, DPIRD, Kununurra

Realistic goal-setting coupled with monitoring and assessment are essential components of the successful restoration 'sandwich' (Hobbs 2017). Key processes listed by Hobbs and Norton in 1996 remain relevant and practical for landscape restoration in the rangelands in 2019.

1. Identify processes leading to degradation/decline
2. Develop methods to reverse or ameliorate the degradation/decline
3. Determine realistic goals for re-establishing species/functional ecosystems, recognising both the ecological limitations on restoration, and the socio-economic and cultural barriers to its implementation
4. Develop easily observable measures of success (eg percentage ground cover, key indicator species)
5. Develop methods for implementing these restoration goals at a scale commensurate with problems
6. Formulate (write down) these methods for inclusion in land-use planning and management strategies
7. Monitor key system variables, assess progress of restoration relative to the agreed goals, and adjust procedures if necessary



The successful sandwich. 'Restoration is a bit like a sandwich – while the bit we all like is the stuff in the middle (getting on and doing it in the case of restoration), it cannot be a successful sandwich unless it is surrounded by realistic goal setting and effective monitoring to provide the feedback on what we have done.' David Norton (in Hobbs 2017).

Restoration efforts can improve desirable ecological functioning, even when restoration to a historic standard is not feasible with current practice. Functional restoration is becoming more prominent in scientific literature, and there is an increased emphasis on functional traits as a measurable indicator of effectiveness, as opposed to a simple inventory of vascular plant species (Jones 2017). Functional restoration emphasises restoring resilient ecosystems at large spatial scales with long-term timeframes and includes, but is more than, revegetation. Ecosystem processes are the basis for self-maintenance in an ecosystem, a common goal for functional restoration is to recover self-renewing ecosystem processes (Radford, Williams & Park 2007). Examples of ecosystem processes include carbon fixation by plants (photosynthesis), nutrient cycling by micro-organisms, nitrogen fixation by bacteria, decomposition of organic matter, water filtration, pollination of flowering plants by fauna and seed dispersal. Ecosystem processes that are of direct benefit to humans (e.g. carbon sequestration, water production, pest control, erosion control) are called ecosystem services.

The past four decades have seen a transformative process in Australian agriculture – the gradual incorporation of conservation practices such as ecological restoration, revegetation and agroforestry as a response to land degradation. Landscape-scale restoration and the integration of conservation into farming landscapes and the rangelands are recognised as a global imperative. Despite excelling in the innovation space and taking great strides over the last 40 years, land restoration progress across Australia remains partial, patchy and slow (Campbell, Alexandra & Curtis 2017).

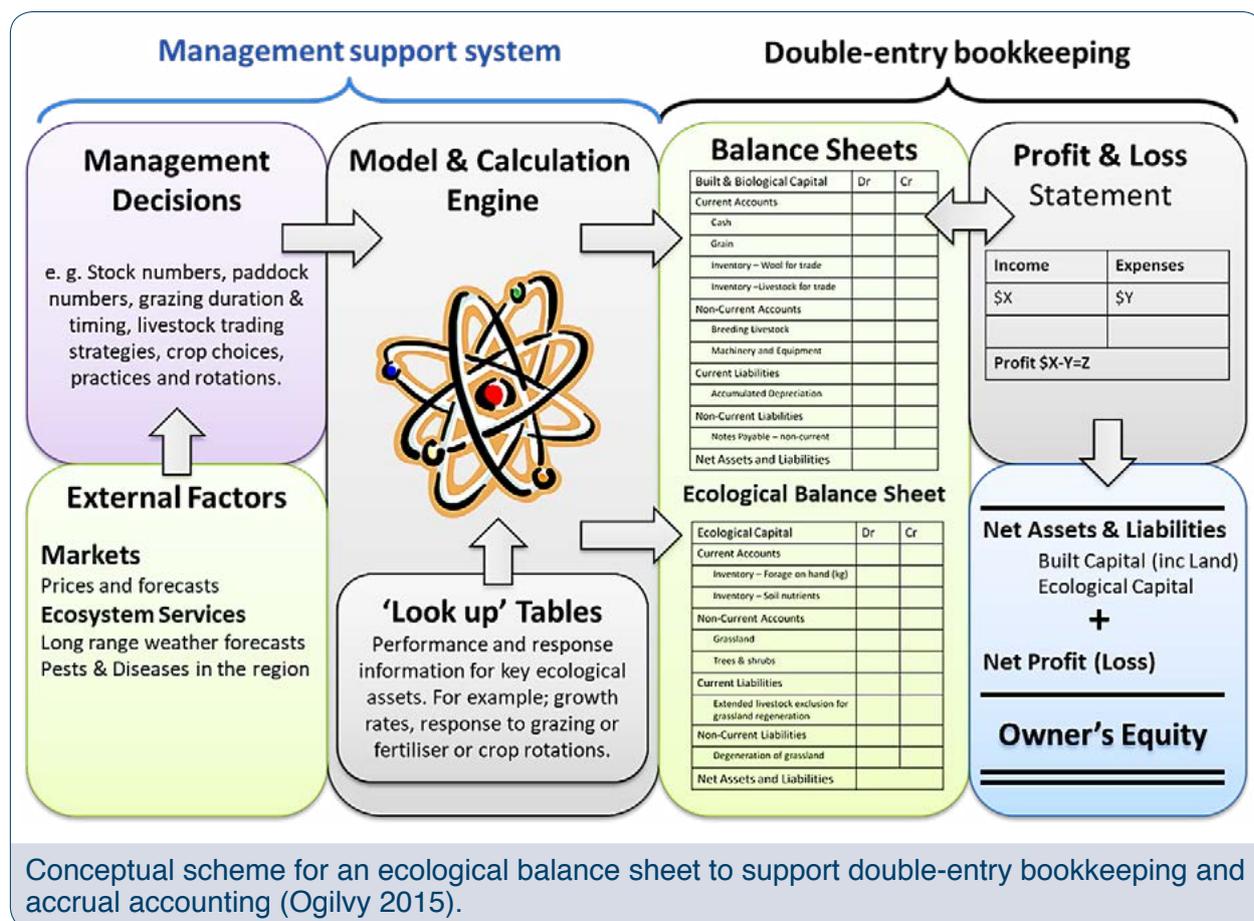
One major limiting factor to progressing restoration practice highlighted in a special issue of CSIRO's Rangeland Journal is the need to connect providers with consumers (Whalley & Smith 2018). The historical approach to rangeland restoration has not been particularly effective in conveying the potential value of restoration projects to either an interested public or funding institutions. Explicit links to specific ecological process outputs (i.e. commodity production, pollution reduction) are required to capture and convey the values achieved through rangeland restoration efforts. Reduced greenhouse gas emissions from savanna burning and sequestration in biomass under the human-induced regeneration (HIR) are methods for achieving this that are currently used (savanna burning) or being introduced (HIR) in the WA rangelands.

Brown and MacLeod (2018) reviewed the intersection of the practice of rangeland restoration ecology and ecosystem service provision as a basis for evaluating and communicating potential projects. They suggest that ecosystem services accounting be used to broaden definitions of restoration outcomes to attract attention and enhance incentives for land managers. They cite the lack of a consistent approach to aggregation as the primary limitation for developing catchment-scale delivery of ecosystem services to public and private sector markets.

The accounting standards for agriculture implicitly include ecological capital, but lack the mechanisms to support accrual accounting for this class of assets. Ogilvy (2015) proposed that a mechanism to help satisfy the requirement for explicit links outlined above would be development of an Ecological Balance Sheet (EBS) to record stocks of ecological assets and the changes to these stocks that result from actions and transactions. The nature and quantity of the flows from ecological capital is a property of their structure, composition and extent.

A balance sheet is permitted to be in a non-currency unit in double-entry bookkeeping. Mathematical and modelling methods are available to record ecological transactions and relate them to an enterprise profit and loss statement. The development of an EBS and modelling biophysical and market interactions may also provide a way for leaders in the private sector to influence trends in ecological capital (e.g. supermarkets paying a premium for product from

well-managed country). Improved quality of strategic marketing communications, business cases and operational models to realise competitive advantage will increase confidence and capability to generate ecological and capital returns from investment.



Trialling the EBS and ecological accounting in agriculture in collaboration with stakeholders could yield rapid improvements in understanding of how private enterprise can contribute to reversing rangeland condition decline. The development of benchmarks and indices of the economic value of improved ecological and human capital performance could provide a means for investors in agriculture to make useful comparisons.

Connecting providers with consumers and developing markets using practical methods in landscape restoration using environmental accounting builds on Hobbs’ practical advice (points 3-7) and has potential to improve outcomes throughout the rangelands.

For more information about the ecological balance sheet contact Sue Ogilvy at susan.ogilvy@anu.edu.au

For coordination support and information about restoration initiatives in your area, please contact Rangelands NRM through your local Regional Agriculture Landcare Facilitator (RALF):

Southern Rangelands: Sarah Jeffery +61 (0)427 626 222, sarahj@rangelandswa.com.au or Mez Clunies-Ross +61 (0)413 857 048, maryannec@rangelandswa.com.au

Northern Rangelands: Jardine Macdonald +61 (0)407 420 911, jardinem@rangelandswa.com.au

For further information and advice on design and implementation of restoration projects contact your local DPIRD office.

References

Brown J. R., MacLeod N. D. 2018, An ecosystem services filter for rangeland restoration. *The Rangeland Journal*, vol. 39, pp. 451-459.

Campbell A., Alexandra J. and Curtis D. 2017, Reflections on four decades of land restoration in Australia. *The Rangeland Journal*, vol. 39, pp. 405-416.

Hobbs R. J. 2017, Where to from here? Challenges for restoration and revegetation in a fast-changing world. *The Rangeland Journal*, vol. 39, pp. 563-566.

Jones T. A. 2017, Ecosystem restoration: recent advances in theory and practice. *The Rangeland Journal*, vol. 39, pp. 417-430.

Ogilvy, S. 2015, Developing the ecological balance sheet for agricultural sustainability. *Sustainability Accounting, Management and Policy Journal*, vol. 6, pp. 110-137.

Radford, J. & Williams, J. & Park, G. 2007, Effective Landscape Restoration for Native Biodiversity in Northern Victoria. North Central Catchment Management Authority. [Accessed online]

Whalley R. D. B., Smith R. 2018, Restore, regenerate, revegetate; restoring ecological processes, ecosystems and landscapes in a changing world. *The Rangeland Journal*, vol. 39, pp. 1-4.

Watching the grass grow back on Wooleen Station

David Pollock, Manager, Wooleen Station, Murchison

David Pollock manages Wooleen Station in the Murchison Region of Western Australia with his wife Frances. In the following article, he shares their experience with regenerating the landscape after historical overgrazing and degradation – Stephanie Coombes, Editor.

Just before my parents bought Wooleen in 1990, the WA Agriculture Department (now the Department of Primary Industries and Regional Development) found that 26 per cent of the vegetation on the property was in good condition, 36 per cent was in fair condition and 38 per cent was in poor condition. More than a quarter of the soil on the 188,000ha property was assessed as having some erosion, the great majority of which found in what were once the most productive areas - the river floodplains. Wooleen once ran 30,000 sheep, but by the time my father bought the property, it was battling to feed 10,000, despite having more waterpoints.

This situation had arisen through a misunderstanding of the rangelands' capacity to produce during a drought, as well as the time needed to recover after it. After a huge drought in the 1930s, a Royal Commission into the economic effects of the drought found that 75 per cent of the highly productive perennial saltbush shrubs had disappeared. It was not understood that unless the grazing pressure was significantly reduced, these essential production plants would not necessarily recover their numbers after rain. After many droughts, the most productive species had almost entirely disappeared from our landscape. This is the greatest failing of pastoralism in our area - we have no mechanism for dealing with drought in a land where droughts are common.

We need the plants we have lost if we are to successfully raise animals here. Low long-lived palatable shrubs hold the soil together and provide food for stock during dry times, some of which we call droughts. Even more important are the palatable perennial grasses, which were the basis of glowing reports from the early surveyors, which led to this area being opened up to pastoralism in the first place. Species such as kangaroo grass (*Themeda triandra*), native



The first population of Kangaroo grass on Wooleen for decades. We scattered the seeds in 2012 and didn't find any plants till 2017.



We fenced off an area (with the help of Rangelands NRM) and irrigated re-introduced grasses from a semi-permanent pool nearby. We now have control of a previously unmanaged waterpoint, as well as the beginnings of seedbank for these excellent production grasses.

millet (*Panicum decompositum*) that were once common, can now only be found on Wooleen where the seed has been re-introduced.

Palatable perennial grasses are the drivers of production in our pasture, as they provide a long lasting supply of energy. Ruminant animals need both energy and protein to be productive. There is plenty of protein in our pasture, but unless there has been recent rains, energy is severely limited. This is why the palatable perennial grasses were grazed out in the first place as they are the limiting factor in the pasture. Without them, we can only get high production during and shortly after rainfall events, when annual species are able to foot the energy bill. Given the demise of the palatable perennial grasses and our semi-arid rainfall, pastoral businesses in our area have struggled to stay economical for at least the last 30 years.

We destocked in 2007 with the intent to get the palatable perennial grasses back into the system. The perennial grasses are not the only plants we are lacking, but it seems reasonable to assume that if we get those back, other types of plant would also recover. We had little idea if it would work or not, and true to form some things recovered and others didn't. After years of destocking interspersed with periods of light stocking, it became apparent that some of the best species needed to be reintroduced. It didn't matter how much rain we had, there were no seeds left in the soil and so they could not germinate. I had always been told that the seed were there, they just needed a big rain. I now know that's not true. This situation highlights the importance of not pushing the country for so hard for so long. Because those species that need re-introducing will unfortunately take a very long time to become a significant part of the pasture again. The good news is that they can still happily grow here, they just need a bit of help, and time; Help to get some seeds back into the landscape, and time for them to multiply.

In 2017, with the help of a \$10,000 grant from Rangeland NRM, we built an enclosure to protect a native grass nursery next to a semi-permanent pool near the Murchison River. We bought a



In 2004 there was no grass and hence no production.

3" trash pump and a few hundred metres of 80mm poly pipe so that we can irrigate the nursery from the pool. We chose this location for a number of reasons. The pool was the watering point for many unmanaged animals and we needed to get control of it anyway if we going to be able to rehabilitate the surrounding area. As the pool is quite large and in the Murchison river floodplain where any fences are likely to be washed away on a regular basis, we thought fencing the actual pool was a poor option and so pumping it out was the next best option. The nursery is still in the floodplain, but on a higher level. It may also get washed away, but not as often. However, there is a positive side to it going underwater periodically, because that will mean that seeds are washed out into the river, hopefully to germinate. We also plan to harvest the seed from the enclosure to spread in other areas.

We sourced perennial grass seed from Nindethana seeds, who mainly get their seeds from the Pilbara. Seton Johns from Marble Bar also offers many species of grass seeds. We have so far established about 25 kangaroo Grasses (*Themeda triandra*) and 60 ribbon grasses (*Chrysopogon fallax*) in the nursery. I think these are the only ribbon grasses on Wooleen. There are some kangaroo grasses elsewhere, which we introduced in 2012 into a large creek, which is perhaps a better habitat for them than river floodplains. The nursery also contains silky browntop (*Eulalia aurea*) and those seeds came from a different part of Wooleen. As a backup plan the nursery was situated on existing populations of neverfail (*Eragrostis setifolia*) and claypan grass (*Eriachne flaccida*), which have certainly enjoyed the attention. We also tried some barley Mitchell grass (*Astrebala pectinata*), which germinated and died soon after, but this is not surprising as it's not known to have ever grown here. Apart from perennials we had great masses of button grass, which are common in any decent season, but also lots of Flinders grass, which are perhaps not so common.

We would also like to try and establish some Roebourne plains grass (*Eragrostis xerophila*), and native millet, but we will have to wait until the pool fills up again, as it has been dry since November. There is currently no Roebourne plains grass on Wooleen, but there are two populations of native millet that we know of, one reintroduced and one remnant. The total of both populations is less than 200 plants. It's going to be a slow old process to get some of these plants to the point where they are once again driving production, but if there are no seeds in the landscape, then it will never happen. Yet concentrating on trying to recover and reintroduce these plants has forced us to reassess our management of the pasture in general, and other good perennial grasses which still had a seedbank such as Cotton panic (*Digitaria brownii*), soft wanderrie (*Thyridolepis multiculmis*), native couch (*Brachyachne prostrata*), feathertop speargrass (*Austrostipa elegantissima*), Birdwood (*Cenchrus setiger*), Neverfail (*Eragrostis setifolia*), Claypan grass, Cane grass (*Austrostipa platychaeta*), Ray grass (*Sporobolus*



2009 Minimal grass, Minimal production.

actinocladus), Curly windmill grass (*Enteropogon acicularis*), and others, including palatable sedges, have gotten away well. Cotton panic is a particular standout, because I didn't even know it existed when we started destocking, and now it can be found in almost every mulga community, sometimes in large numbers. This is because it can grow in protected rocky areas that not even the goats and euros could reach, and so a seedbank remained at the top of every catchment, waiting for an opportunity to re-establish itself.

I think the most economical way of getting populations of these essential pasture plants back into the system is to create nurseries in the overflow of water points. A length of old goat yard mesh and a few starposts are all that would be needed, as well as seed of course. This isn't a new idea but I think that with the growing understanding of the role of perennial grasses in our production system, more effort needs to be made to try and rebuild the seedbank.

For more information contact David Pollock, Manager, Woolen Station, david@wooleen.com.au



2019 Profit!

Water your landscape, not your roads

Pip Grossmith, Pilbara Manager, KPCA, Port Hedland

The Kimberley Pilbara Cattlemen's Association (KPCA), as part of the State NRM funded Pilbara Collaboration Group Project, held Erosion Control field days at two Pilbara stations, Noreena Downs and Glenflorrie in late 2018.

Col Stanton is a soil conservation expert based in Alice Springs with over 40 years' experience in arid inland Australia, with much of this time spent working for the NT Government.

He is passionate about helping land managers understand how to read their country, teaching them to see where water should be flowing across their landscape and how they may have affected flow patterns through poorly constructed roads, fence lines and other station infrastructure. Col provides practical advice and demonstrations on how to fix erosion issues as well as restoration techniques using heavy machinery (graders, loaders and dozers).

Col is a real bush character and a born presenter, with his own list of swear words such as 'windrows', 'V drains', 'catch drains' and 'chute'. His passion for conserving Australia's precious soil resources is plain to see.

The first field day was held at Noreena Downs Station in the eastern Pilbara. Station Manager Joe Paull took Col and a small group of workshop participants to look at several areas that had been experiencing erosion over the past decade.

The first of these was a natural drainage line with active erosion affecting an increasing area of the country; water that once flowed across the landscape was being channelled into the growing gully, causing the surrounding country to become dehydrated.

Col provided a range of techniques designed to slow the flow of water and spread it out across the landscape rather than it being channelled directly into the gully. Joe found it valuable to get a different point of view and learn different techniques on how to tackle these issues.

The second field day was held at Glenflorrie Station in the southern Pilbara. Station Manager Aticia 'Teesh' Grey sought Col's advice on an area of erosion that had turned a fence line into an artificial drainage line, starving surrounding areas of water. Col worked with Teesh to establish where to put a new fence line to ensure the same issue didn't arise in the future.

Teesh mentioned that it is easy to get focused on one aspect of land management without considering the bigger picture. This was a comment that was expressed by several workshop participants.

At the time of writing (March 2019), there has been around 70mm of rain on the rehabilitated sites with most holding up well and spreading water back across the country. One of the large ponding banks that Col demonstrated has had a small 1m section erode where the



Participants and Col Stanton (second from left) at the Noreena Downs field day.

water crested, and with advice from Col, repairs have already been undertaken. Teesh is also undertaking further work across the station under advice from Col.

Col said that many land managers he had worked with often spend years trying to decide the best ways to repair erosion damage and go on to experience little success owing to a lack of understanding of why it was occurring in the first place. He noted that many producers spend a lot of time and money on building costly 'band-aid' solutions that don't address the root cause.

The KPCA sees the work that Col, along with Richard Marver, Darryl Hill and numerous local pastoralists are doing, as being incredibly valuable for the northern pastoral region and industry.

Large parts of the Pilbara are still recovering after historical overgrazing from sheep and whilst some areas have been able to recover naturally, others need strategic solutions.

Suitable erosion control and soil conservation techniques can retain more of the rainfall where it falls and can work to break up scalded hard pan areas by allowing water and seeds to penetrate the surface and kick-start the healing process. These works can have great environmental and conservation outcomes as well as increased production and profits - truly a win for all.



Col Stanton (left) with participants at the Glenflorrie field day and the before picture of the eroding gully.

The Erosion Control Field Days were funded by the WA State Natural Resource Management Program which is supported by Royalties for Regions.

If you would like to find out more about soil conservation or erosion issues on your station, Col can be reached at colin.stanton@gmail.com. He also has a great online training video titled "Water your landscape, not your roads!" that can be found on YouTube.



Col Stanton at Glenflorrie and the after picture, a series of check banks and other water slowing devices aiming to slow and spread the flow of water across the landscape.

The KPCA is in the process of organising another series of workshops in the Pilbara and Kimberley for the end of May 2019. To find out more about these workshops as well as new funding the KPCA has secured through the Commonwealth Smart Farms program for further work in this area, please contact Pip Grossmith via pilbaramanager@kpcanet.au or +61 (0)433 468 904 or Grey Mackay via kimberleymanager@kpcanet.au or +61 (0)429 104 043.

White grass

Matthew Fletcher, Development Officer, DPIRD, Kununurra and Andrew Craig, former Research Officer, DPIRD, Kununurra

Some of the important grasses found in the Kimberley that are often discussed include Mitchell grasses (*Astrebla spp.*), black spear grass (*Heteropogon contortus*), ribbon grass (*Chrysopogon fallax*), three-awn grasses (*Aristida spp.*) and spinifex (*Triodia spp.*). This article will look at another commonly found native grass, but one not as widely discussed — white grass (*Sehima nervosum*).

Some key characteristics of white grass (also known as rat's tail grass) are as follows:

- Perennial (lives for more than two years)
- Tussocks grow up to 1m high
- Commonly found on sandy, loam and red clay soils but not on deep sands (dunes) or cracking clays
- Leaves are a light green-bluish colour when plant is growing
- As plant matures it whitens (hence the common name)
- At end of growing season, leaves are brittle and coarse
- Old growth is very powdery when rubbed through hands
- Easily identified by the angled, concave scar left at the tip of the flowering stem when the seed head is detached
- Where fire is absent, moribund growth forms a thick mat on the ground, which seems to reduce germination and establishment of other grasses and forbs (non-grasses)
- White grass is found across Kimberley, NT and QLD (Avh.chah.org.au, 2019), however it is less common where the average annual rainfall is below 400mm.



White grass seed head.



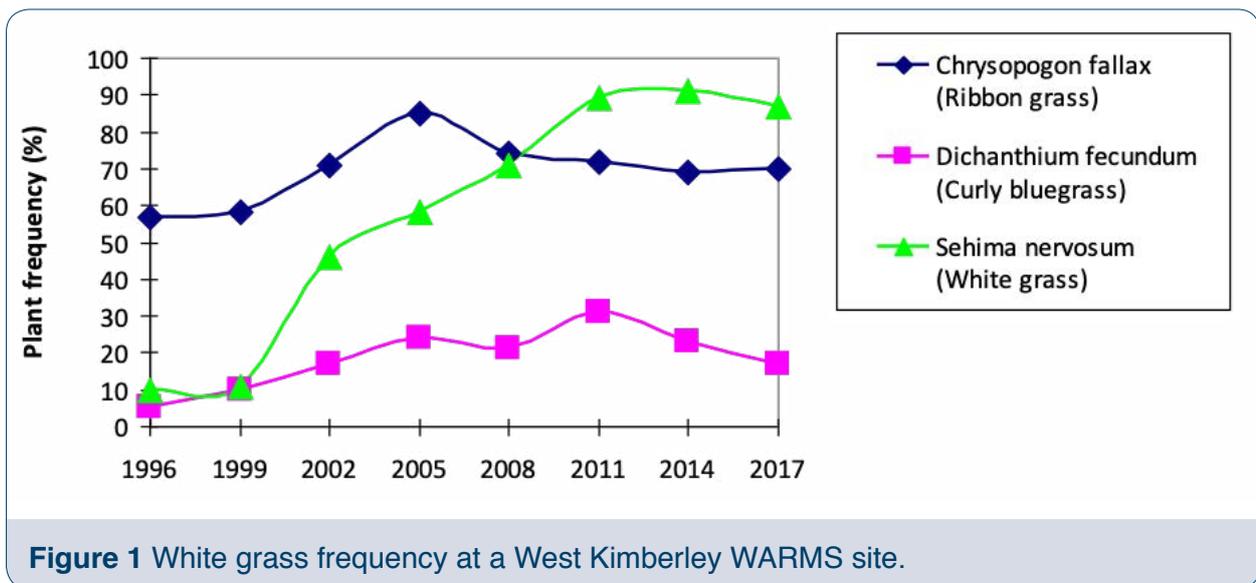
Tip of white grass stem after seed head has fully detached.

It is not uncommon to find grazed white grass plants in the rangelands, however on the whole, white grass does not seem to be preferentially grazed by stock. Wheaton (1994) described white grass as a ‘fairly coarse grass low in palatability and nutritional value, but grazed as stocking pressure increases’. Even after fire, cattle do not seem to target new growth, unlike for black spear grass where they tend to return constantly to the same burnt patch, mowing down any that becomes available.

White grass is regarded as a desirable perennial grass within a number of Kimberley pasture types including white grass/bundle-bundle, black spear and Tippera tall grass pasture types (Ryan et al., 2013). In the productive ribbon grass or bluegrass alluvial plain pasture types, white grass is considered to be of intermediate value (second choice grass for stock). White grass is not rated as an undesirable species in any of the Kimberley pasture types; the main undesirables are three-awn grasses.

Information from the Western Australian Rangeland Monitoring System (WARMS) shows that the number of Kimberley sites where white grass was recorded, increased from 54 for the 1994/96 assessment period to 83 for the 2015/17 assessment period. Not only did the number of sites with white grass increase between these assessments, but also the median frequency of white grass on those sites where it was initially present (from 8.5% to 23%). Considering changes at these sites individually, about 52% were judged to have increased in white grass frequency while only 17% decreased between the two assessments.

Figure 1 illustrates the increase in frequency of white grass at a West Kimberley site on a ribbon grass pasture type (sandy loam soil). While this site should not be taken to represent all other WARMS sites where white grass has been recorded, it does show a dramatic increase in *Sehima nervosum* frequency from the first assessment in 1996 to the most recent in 2017, by which time almost all quadrats contained some white grass. The graph also shows ribbon grass and curly bluegrass (bundle-bundle), both of which are desirable perennial grasses. There has been a noticeable decline in the frequency of curly bluegrass since 2011, making it important to monitor this site carefully. Wet seasons over the period 2011-17 were mainly average or above average, as measured by rainfall totals.



There is no obvious or simple explanation for the general increase in white grass frequency that has been observed across the Kimberley WARMS sites, with little available research on how rainfall, fire and grazing may affect this species. One possible contributing factor already well documented, is the good run of seasons experienced across the Kimberley since the mid-1990s (see article on page 6 Table 1).

Watson and Novelly (2012) assessed changes at WARMS grassland sites (306) between 1994 and 2010 and judged that there had been a transition in vegetation, from one relatively stable state to another, at 11% of the sites. Transitions at some of these sites involved increases in white grass, in conjunction with increases or decreases in other key grass species.

What does all this mean for the pastoral industry? Although white grass is considered to be of limited value for pastoral production, it is a perennial grass with good soil-stabilising properties. An increase in white grass should have no major impact on the pastoral industry unless this has a deleterious effect on other more palatable species, such as ribbon grass, bundle-bundle, curly spinifex, kangaroo grass (*Themeda triandra*) and perennial sorghum (*Sorghum plumosum*). At this stage there is no evidence to suggest that an increase in white grass is having a negative impact but it is important that we continue to monitor the situation. One important thing managers can do is to keep a close eye on the level of use of the more palatable grasses present in their pastures. If grazing of these plants is poorly controlled it is likely that over the years, they will be weakened and gradually lost from the system.

If anyone has further information to offer on white grass, we would be glad to hear your thoughts.

*Frequency is the percentage of quadrats at a site in which a given species is observed. One hundred quadrats are recorded during each WARMS site assessment.

References

Avh.chah.org.au. 2019, AVH | The Australasian Virtual Herbarium. [online] Available at: <https://avh.chah.org.au/> [Accessed 18 Mar. 2019].

Ryan, K., Tierney, E., Novelly, P. and McCartney, R. 2013, Pasture condition guide for the Kimberley. Department of Agriculture and Food, Western Australia.

Watson, I.W. and Novelly, P.E. 2012, Transitions across thresholds of vegetation states in the grazed rangelands of Western Australia. *The Rangeland Journal*, vol. 34, pp. 231-238.

Wheaton, T. 1994, *Plants of the northern Australian rangelands*. Darwin, NT: Northern Territory Government.

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Fire & flood on Mandora Station

Caitlin Mills, co-manager, Mandora Station, West Kimberley

My name is Caitlin Mills. My husband Ben and I manage Mandora Station located on the coastal plains between Port Hedland and Broome.

We have been at Mandora since the start of 2017 after the property was purchased by Haydn & Jane Sale. Mandora was previously owned by the de Pledge family who brought the property back in the 1940s. We are very fortunate to work with such a high-quality herd of cattle and have a well-developed beef production business to carry on with. The property is a true credit to the de Pledge's hard work and cattle management practices, and we endeavour to continue in their footsteps.

In our first two years at Mandora, we experienced two extremes of Mother Nature – fire and flood. To say it's been a learning curve is an understatement and 2018 certainly saw enough surface water for us to literally be able to “sink or swim”!

Mandora is only a small property, approximately 230,000 acres. The coastal plains have been well developed into paddocks which give us the ability to manage our grass well.

North of the highway is predominantly the “Anna Land System”, which is open grass plains and south of the highway is the “Nita Land System” which is sandy pindan soil covered mainly in spinifex and wattle scrub. Spinifex and wattle are both very oily and highly combustible so when a fire gets a bit of wind behind it, things can escalate quickly.

We experienced three main fire events in 2017. The first fire was started by a tourist camping on the side of the road, who thought it would be a good idea to use a spinifex bush to cook his camp oven on. The second fire was caused by a controlled burn on a neighbouring property that jumped the fire break, and the third was started by lightning. We are so grateful to have amazing neighbours who offered to bring over their own equipment and help us each time.

We are now a little more experienced and better prepared for future fire events. We have a new loader with a scrub rake and the grader has foam filled tyres which negate the risk of getting a flat. We have introduced mosaic burning at the end of the dry season too. I guess you could say it's about fighting fire with fire.



Where the pindan met the ocean.

After our first year being a literal “initiation by fire”, we could never have predicted what we would experience in 2018.

By March 2018, 770ml of rain had fallen on Mandora. The place was wet, really wet. Our centennial average is approximately 350ml, so receiving more than double that really put a damper on things.

This was a pretty stressful time for us as we hadn't experienced anything like this before and the welfare of the cattle was our biggest concern.

The majority of our breeder cows were living on the coastal plains which is about 90,000 acres. It is highly productive country and was easily supporting the cattle that were living there until the flood waters destroyed approximately 40% of it.

Our first priority was to move cattle in the flooded areas to higher ground. As the on-ground access was severely restricted, we cross-hired a helicopter for Ben to fly. It was a huge relief to be able to check on all of the cattle and assess their welfare.

Once we had peace-of-mind regarding the cattle, our concerns turned to how the coastal plains were going to recover. The water receded incredibly slowly – some areas were under water for almost six months. It was clear that we weren't going to be able to utilise the flooded country during the upcoming dry season.

There really were only three choices ahead of us; reduce our stocking rate, begin supplementary feeding, or open up the virgin country on the south side of the highway.

We knew the first two options weren't a viable choice in the long term, so we got busy!

We had existing plans to slowly develop the southern side of the highway throughout 2018 to increase our carrying capacity. "Plan A" was to finish the first round of muster and then begin the development works. However due to the flooding, we needed to move as many breeders off the coast as quickly as possible.

What's that I hear you say about Murphy and his law?

In three short months we sunk bores and installed tanks, troughs, pipe and fencing to open up 50,000 acres.



It was all hands on deck.

At the end of 2017, we had already moved a mob of cows off the coastal plains and into a paddock that has a similar land system to the country we were planning to develop. We did this so we could keep a close eye on the cattle as they adapted to the change in country. We had also planned to use them as a trainer mob when we eventually moved more cattle to the newly developed country.

As soon as the first round of 2018 was complete, we began shifting breeders off the coastal plains and into the new country. The cows settled in very well, but we had to adjust our management strategy for cattle calving out of season. While we always aim to align our time of calving with a rising plain of nutrition, out of season calvers are more manageable on the coastal plains than the pindan country due to the difference in the nutritional value of the country.

We began using a urea supplement on the pindan and removed the bulls to stop them from calving out of season in 2019. This year, we are implementing a controlled breeding program across the entire station. We appreciate that this is more achievable on a smaller station with good access, like Mandora.

Towards the end of 2018, the worst of the damaged country had slowly started to regenerate. Salt water couch was coming along in leaps and bounds and doing a great job of holding the soil together. The couch is growing with a native succulent called Samphire - apparently it's the latest bush tucker to try but I wouldn't recommend it. It's not the tastiest thing I've ever eaten, but the cattle seem to enjoy it.

As the weather started to warm up, we had high hopes of some buffel grass regeneration but this wasn't the case. We are just starting to see some buffel starting to emerge only now, in early 2019.

Being burnt out in 2017 turned out to be a blessing in disguise, as the native grasses in the pindan are at their healthiest. As of March 2019, we've had a dismal 66ml of rain. After 2017 being "Year of the Fire" and 2018 being "Year of the Flood", let's hope 2019 won't be the "Year of the Dry".

For more information contact Caitlin Mills at caitlin.mills18@outlook.com



A new water point.

Small-scale irrigation case study: Kimberley region

Kath Ryan, Development Officer, Kununurra

Interest is growing in small-scale, dispersed irrigation development (mosaic irrigation) in the rangelands to provide an augmented supply of high quality feed to certain classes of livestock. Investment is occurring and expansion is well under way, with strong growth in the West Kimberley and Pilbara in the last 10 years.

CSIRO has published the results of an economic review, including a Kimberley case study, in the Rangeland Journal in 2018 (MacLeod et al.). The research team examined the prospects for mosaic irrigation using bioeconomic simulation modelling of irrigation development scenarios conducted at the individual beef enterprise scale.

Results of the case studies showed a mixed picture.

- Apparently attractive return on irrigation investment (real internal rate of return >15%) occurred under buoyant market conditions, such as the relatively high prices of recent years.
- The projected economic advantage for the Kimberley case study was negative to only moderately positive in most instances.
- Animal productivity outcomes (e.g. the average weight of sale animals) increased for all of the irrigation simulation scenarios.
- Irrigated forage availability allowed greater scope for management opportunities influencing herd structure – such as early weaning – which appeared to be at least as valuable as changes in liveweight gain for particular classes of animals.

The Kimberley case study base scenario was a self-replacing herd of 11,000 breeding cows grazing native grass pastures on moderately productive duplex soils. The enterprise aim was to sell two year old steers at ~330–350kg for live export. The target was frequently not met, because of seasonal conditions and the selling weight was usually closer to 280kg. When CSIRO ran the bioeconomic simulation for a 17-year period, the target weight of 350kg was achieved in only 4 of the 17 years. When the target weight was adjusted to 280kg, it was met in 14 of the 17 years.

Two development scenarios were evaluated for the Kimberley case study:

1. Steers direct grazing irrigated forage (Rhodes grass, forage sorghum and lablab) to reach the live export target at 24 months. Lablab and forage sorghum were annually sown and grazed in the late dry season, while Rhodes grass was established as a perennial pasture and the steers had access to it when sufficient standing forage was present.
2. Removing growing calves from their mothers at ~100kg liveweight and feeding them a supplementary ration of irrigated forage (again: Rhodes grass, forage sorghum and lablab) for 120 days, taking their average liveweight to 160kg. First and second lactation breeding cows were given direct grazing access to the irrigated pasture, to improve their

body condition score prior to mating. Forage was also used as in scenario 1 to support the strategy of the bulk of the steers achieving the target live export weight.

The scenarios used the costs of establishing and operating a pivot irrigation system drawing water from an adjacent bore. The assumed capital costs were \$12,455 per hectare (ha). The size of the development was set to the level required to achieve the selling weight target of the relevant animals in 80% of years, and 100% of years. The feeding strategy for the selected cohorts of breeding animals influenced the scale of the second scenario. The assumed average annual operating cost of the irrigation development was \$650/ha. The baseline gross margin for 'business as usual' per AE was \$63 under the 2012-13 price regime, and \$171 under the 2015–16 price regime.

Table 1 Size of development and capital required to achieve simulated targets in 80% of years.

Scenario 1 (80% of yrs)	Lablab	Rhodes grass	Sorghum
Irrigated area (ha)	90	40	200
Capital investment	\$1.1m	\$498,200	\$2.5m
Operating (annual)	\$65,619	\$38,564	\$134,280
Gross margin/AE (2013)	\$74	\$72	\$73
Gross margin/AE (2016)	\$190	\$184	\$193
NPV 2013*	(-\$944,107)	\$444,951	(-\$3.6m)
NPV 2016*	(-\$801,045)	\$1.6m	(-\$3.5m)
Scenario 2 (80% of yrs)	Lablab	Rhodes grass	Sorghum
Irrigated area (ha)	100	130	350
Capital investment	\$1.3m	\$1.6m	\$4.4m
Operating (annual)	\$72,910	\$125,333	\$235,935
Gross margin/AE (2013)	\$76	\$100	\$86
Gross margin/AE (2016)	\$193	\$234	\$216
NPV 2013*	(-\$4.1m)	\$2.5m	(-\$6.9m)
NPV 2016*	(-\$7.2m)	\$6.8m	(-\$7.5m)
*5% discount rate			

Results suggest that mosaic irrigation developments may not generate a major economic boost to financial returns of typical northern beef enterprises, though individual cases will vary.

Projected financial returns vary considerably depending on scale, species and livestock prices. Depth to groundwater and associated pumping costs are a key component of annual operating costs; therefore, projects with access to artesian groundwater suitable for irrigation in the Kimberley or Pilbara would require further analysis of financial returns.

The extended grazing availability of perennial Rhodes grass made this the most attractive option in the Kimberley case study, so further exploration of other perennial grass options would be a desirable next step for simulation modelling research.

Other development options to consider that were listed in the article include:

3. broad-scale development of existing native pastures, using dryland sown non-native pastures (e.g. Buffel grass) or oversowing legumes (e.g. *Stylosanthes* spp.)
4. subdivision of existing large paddocks into smaller areas to support some form of rotational grazing system
5. additional investment in property infrastructure, including additional stock watering points and subdivisional fencing to increase the effective grazing area of a holding

The financial impact of applicable options for Kimberley and Pilbara enterprises will likely be competitive with mosaic irrigation options for increasing productivity. It should be noted that gaining approval for option 1 will be near impossible in WA under current policy. There are other options; those listed by CSIRO are simply examples that are commonly considered alongside mosaic irrigation development across Northern Australia.

DPIRD's advice on the reported results includes:

- Business decisions about irrigation should always be compared to other avenues of investment into the pastoral business.
- Investment into irrigation needs to consider a range of upfront prefeasibility questions (advice available from DPIRD's Broome office).
- Large allowances for time, skill and money involved in gaining approvals will need to be factored in to the enterprise costs in addition to post-approval development costs.
- Desktop modelling is bound by assumptions, the most important factor in profitability is good management – key management tips and a series of other factsheets are [available from DPIRD](#).
- Attracting and retaining staff capable of managing an irrigation enterprise in a remote location is a large part of the challenge in the WA rangelands.

Reference:

MacLeod N. D., Mayberry D. E., Revell C., Bell L. W., Prestwidge D. B. 2018, An exploratory analysis of the scope for dispersed small-scale irrigation developments to enhance the productivity of northern beef cattle enterprises. *The Rangeland Journal*, vol. 40, pp. 381-399.

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Field evidence – Risk of agricultural plants becoming environmental weeds

Geoff Moore, Research Officer, DPIRD, Perth

Northern Western Australia is a vast region widely recognised for its spectacular landscapes and unique ecosystems with high environmental, economic, social and cultural values. The WA rangelands are also a source of great mining wealth and contain large areas under pastoral production which are supported by infrastructure such as roads, rail, and ports.

The viability and sustainability of agricultural systems, including pastoral enterprises, may be improved by the introduction of non-indigenous (exotic) plant species. However, there is clear evidence that throughout Australia, some introduced non-indigenous species have established in non-target areas and some have become environmental weeds.

A series of field trials have been established in the west Kimberley and Pilbara to evaluate the persistence and/or spread of a wide range of agricultural species. These trials will inform policy on balancing agricultural potential with environmental risks.

Traditionally, agriculture in the WA rangelands has predominantly relied on the grazing of stock on native vegetation, with the development of irrigation precincts around Carnarvon and on the Ord River near Kununurra. However in recent years, there has been considerable interest in



The grass field nursery at Gogo in the Fitzroy Valley on 5 October 2016.

irrigated mosaic agriculture in the west Kimberley and Pilbara. There is also a potential role for improved dryland pastures in medium to high rainfall areas of the Kimberley.

Since most of northern WA is under pastoral lease, a diversification permit from the Pastoral Lands Board (PLB) is required to grow non-indigenous species. As part of the permit's approval process, the PLB seeks advice from the departments of Primary Industries and Regional Development (DPIRD) and Biodiversity, Conservation and Attractions (DBCA) on the 'weediness' of the proposed species.

Methodology

A focus of DPIRD's Northern Beef Development project is to inform weed risk policy settings and strengthen the weed risk assessment process. As there is not much data on many of the agricultural species in the Kimberley and Pilbara, weed risk assessments are generally based on a desk-top analysis.

The research project proposed to collect field data from a series of 'weed risk' field nurseries in four key environments (climate, soils) across the west Kimberley and Pilbara (Table 1) to support weed risk assessments.

Table 1 A summary of site details for the field nurseries

Site	Location (Station)	Soil Type	Long-term annual rainfall (mm)	Date established
1	Derby (Birdwood Downs)	Red-brown sand (Pindan)	600	April 2015
2	La Grange (Wallal Downs)	Red-brown sand (Pindan)	350	April 2015
3	Woodie Woodie (Warrawagine)	Red-brown loam	300	Sept 2015
4	Fitzroy Valley (Gogo)	Grey-black cracking clay (Vertisol)	570	April 2016

The nurseries were established under irrigation to simulate the worst case scenarios such as plants establishing and setting seed following a tropical cyclone and, an extremely high rainfall year.

There were two replicated trials at each site. The grass trials had 23 entries that included a range of warm season (C4) annual and perennial grasses such as Rhodes, panic, buffel and a selection of sorghums and millets. Each entry had plus and minus (+/-) fertilizer sub-treatments and each combination was replicated three times.

The legume trials had 23 entries and included tropical legumes such as lablab, cowpea, siratro and butterfly pea, a range of stylos and the fodder shrub leucaena, plus the temperate legume lucerne. Each entry had +/- fertilizer and +/- rhizobia sub-treatments (the seed being inoculated with the correct Rhizobia).

The sites were cleared before the treatments were sown as 3m rows and irrigated, to assist seedling establishment. The sites were kept largely 'weed' free to provide the best possible conditions for growth and seed production. Once the plants were well established (six to 12 months), the irrigation was gradually turned off and there was no further control of non-sown species, either native or naturalised.



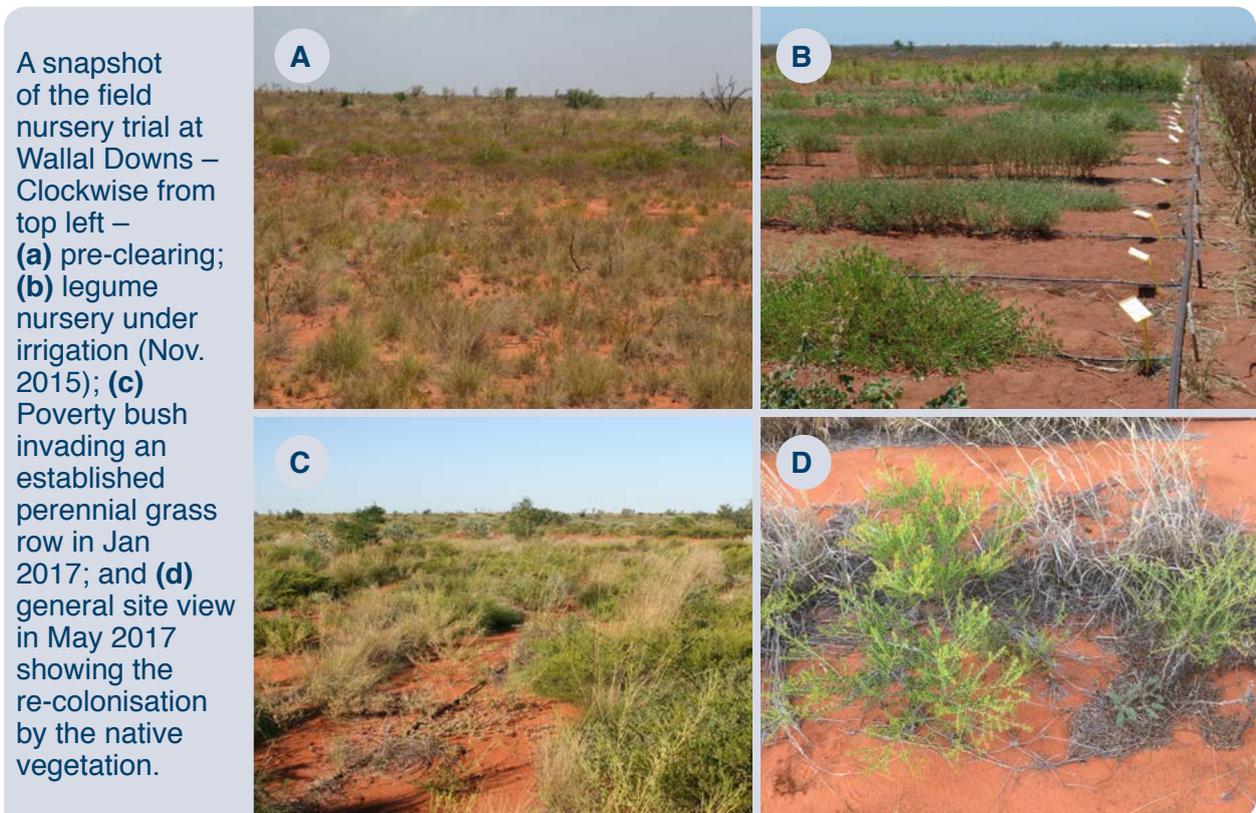
Fieldwalk at the Woodie Woodie legume field nursery on 30 August 2016.

Key results to date



There was generally good to excellent establishment across all sites. The trials are providing valuable data on the adaptation of a wide range of agricultural plants, to the soils and climate in northern WA.

- There has been a similar pattern across all the field nursery sites. After the irrigation was turned off, the original vegetation re-colonised much of the site including many rows of sown species. For example, at Wallal Downs the native vegetation, in particular poverty bush (*Acacia stellaticeps*) and spinifex (*Triodia* spp.), are rapidly re-colonising the site. See photos.



- In general, the native vegetation is much better adapted to the stressful conditions over the 'dry' season, which in some years can extend up to nine months. Under these conditions the native woody shrubs displayed fresh growth while the best adapted perennial grasses had less than 5 per cent green leaf.

Grasses

- Across all sites, the most competitive sown grasses were buffel and birdwood. While Rhodes grass can persist and spread under favourable conditions through its stoloniferous growth habit, it has persisted poorly under dry conditions. A snapshot of the results from Wallal Downs and Woodie Woodie is summarised in Table 2.
- While the annual warm season grasses such as sorghum, millet, maize were very competitive when sown, there has been little recruitment after they senesced, despite large amounts of seed being set.

Table 2 A summary of the persistence of perennial grasses to March 2018 at Wallal Downs and to November 2018 at Woodie Woodie

Legend:

'√√√' => More than 80% persistence; '√√' => 40-80% persistence;
'√' => 11-40% persistence; '-' => <10% persistence (just alive); 'X' => Nil (did not persist)

Species	Common name (variety)	Wallal Downs		Woodie Woodie	
		No fertiliser	Plus fertiliser	No fertiliser	Plus fertiliser
<i>Cenchrus ciliaris</i>	buffel grass (Biloela, Gayndah)	√√√	√√√	√√√	√√√
<i>Cenchrus setiger</i>	birdwood grass	√√√	√√√	√√√	√√√
<i>Chloris gayana</i>	Rhodes grass (Callide, Finecut, Katambora)	-	-	√-√√	√-√√
<i>Digitaria eriantha</i>	digit grass (Premier)	X	X	-	X
<i>Digitaria milaniana</i>	Finger grass (Jarra)	X	√	√	√
<i>Megathyrsus maximus</i>	panic grass (Gatton, G2, Megamax059)	X	X	X	X
<i>Panicum coloratum</i>	Bambatsi panic	√	√	√√	√√
<i>Urochloa mosambicensis</i>	sabi grass	(√)*	(X)*	(√)*	(√)*

*Results may have been affected by the low number of plants which established

Legumes

- At each site, only a small number of legumes have shown fair to good persistence, either as perennials or through seedling recruitment for annual species.
- While some of the tropical annual legumes like lablab and cowpea established and grew well across a number of sites, there have been few to nil recruits and they have failed to persist despite setting a large amount of seed.
- Lucerne has failed to persist across all sites.
- Across a range of sites, the stylos have been the best performed legumes.
 - ◊ On the cracking clay soils in the Fitzroy Valley, Caatinga stylo (*Stylosanthes seabrana*) has shown good persistence to date.
 - ◊ On the loamy soils at Woodie Woodie, the shrubby stylos (*Stylosanthes scabra*) are showing excellent persistence through numerous recruits, while the Caribbean stylo (*Stylosanthes hamata*) which behaves as a long-season annual has persisted well through recruits at a number of sites.
- Termites continue to damage the leucaena plants at Wallal Downs along with other 'woody' plants such as shrubby stylos.

Next steps

DPIRD is reviewing the weed risk assessment process in conjunction with the results of this project.

The monitoring is expected to continue for at least a further two years so that hard-seeded legumes have the opportunity to germinate and establish. This will also ensure the results will have been obtained through a sufficient monitoring period.

For more information contact Geoff Moore, Research Officer, Perth, on +61 (0)8 9368 3293 geoff.moore@dpiird.wa.gov.au

Plant book review

Kath Ryan, Development Officer, DPIRD, Kununurra

Cattle like to eat plants – but which ones? There are many different resources to help identify plants of importance to the grazing industry in Western Australia. All the available plant books and resources have strengths, weaknesses and idiosyncrasies. Below is a review of a selection of the best resources that the rangelands team regularly uses.

Books

Plants of the Kimberley Region Western Australia (Petheram & Kok 2003) is very good for the east Kimberley, particularly around Halls Creek and the upper Ord River catchment. Grazing management and palatability information are included for some species. A few of the photos are misleading and the way it is structured (in canopy layers) takes some getting used to. The sorghum lady is famous and fabulously set in 1980s. The rangeland management principles section is great, especially pages 16 to 24. There are no distribution maps. This book may be ordered from retailers online.

Important Pasture Species of the Victoria River District (Vallance et al. 1993) has fairly good line drawings, grazing value and management, plus nutritional information for the wet and dry season where available. It is important to note that the nutritional values may not be exactly the same in different locations or under different seasonal conditions as those in the book, but they give a really good guide to the relative nutritional value of pasture species. When printed out, the line drawing on the opposite page to the description is for the next plant in the list, so as the reader looks at the description of, for example *Digitaria bicornis*, the drawing next to it is for *Echinochloa colona*. There are no distribution maps.

Flora of the Kimberley Region (Wheeler et al. 1992) is the bible for plant identification in the Northern WA, Northern NT and Queensland gulf. Even though the plant names are dated and it does not cover everything, the detailed line drawings, glossary and dichotomous keys are unmatched anywhere else. These details allow the user to key a plant out to family and genus, even if the plant is not included in the book and then other guides or florabase can be used to identify it. It is a rare book and sells for around \$1,000 on ebay if any are available. Distribution information is quite detailed, but there are no maps.

Plants of the Northern Australian Rangelands (Wheaton (ed.) 1994) is simple and small with grazing values, indicator values and forage information for a good range of common plants found throughout the Northern Australian rangelands. It is out of print, but if you can find a copy, it is a great beginner's book.

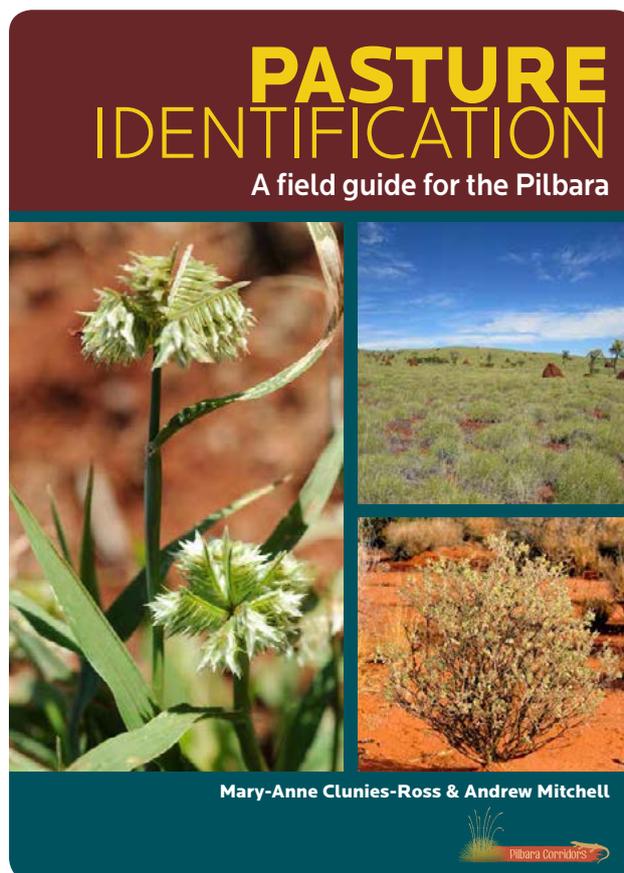
Grasses of the Northern Territory Savannas (Crowder and Siggers 2014) is similar to the above, but details just grasses in it. The photo of Birdwood grass looks more like a purple form of Buffel grass. It has a 'cow-scale' to indicate relative importance of species to pastoralism. No distribution maps. Contact Greening Australia to purchase.

Arid Shrubland Plants of Western Australia 2nd edition (Mitchell & Wilcox 1994) is a great pictorial guide for the shrublands and inland of WA with distribution maps (interpolated), forage values and indicator values for rangeland management or rehabilitation. The section on grasses is quite limited. Great arid rangeland management and land rehabilitation section pages from 5 to 24. This book can be ordered from the University of Western Australia or other online retailers.

A Guide to Plants of Inland Australia

(Moore 2005) has distribution maps (interpolated) and several sections on major and distinctive plant groups by common name (e.g. daisies, chenopods, wattles etc.) and another section titled “less familiar plants”. It includes a lot of species that may never be seen in the WA rangelands, but it is a good beginner’s guide. This book is still in print and available from bookshops.

Pasture identification – a field guide for the Pilbara (Clunies-Ross and Mitchell 2014 original edition with a revision just published in 2019) is similar format to Grasses of the Northern Territory Savannas, but includes a selection of trees and shrubs. It has a ‘cow-scale’ to indicate relative importance of species to pastoralism. Buffel and birdwood grasses and their management have been deliberately left out. There are no distribution maps. Electronic copies are available on the KPCA website. Hardcopies can be obtained by contacting Pip Grossmith via pilbaramanager@kpcanet.au or +61 (0)433 468 904.



Technical report No 147. A key to the species of bluebushes (Maireana species) of the arid southern shrublands of Western Australia (Pringle and Cranfield 1995) just covers the bluebushes, has a fairly simple key using characteristics and line drawings of the fruit at the start. Includes forage and ecological values. There are no distribution maps.

Online and Electronic

Florabase has WA distribution maps and is great for checking the current scientific name if the genus can be determined from one of the books. The maps only show records of where the plants have been collected, but it is real data rather than the interpolated areas shown in Moore or Mitchell & Wilcox. Some species have photos, but most do not. There is no information on grazing management. The plant name must be spelled correctly for this online tool to work. <https://florabase.dpaw.wa.gov.au>

The **Atlas of Living Australia (ALA)** is Australia’s national biodiversity database. Founded on the principle of data sharing, the ALA provides free, online access to millions of occurrence records to form an accessible, searchable dataset on Australia’s biodiversity. It is possible to use this tool in a similar way to FloraBase (especially useful for plants that may be new to WA) and has potential to include lots of information about each species. As with Florabase, the maps show dots of real data rather than areas and the name must be spelled correctly for this online tool to work. Some species have photos, and some grazing management information may be included in the literature tab. <https://www.ala.org.au/>

Ausgrass – grasses of Australia, **EUCLID** – eucalypts of Australia, **Wattle** – acacias of Australia and Families of **flowering plants of Australia** are interactive e-keys to plants that can be used

to assist with identification. Some of these have an online version. Characteristics of the plant can (usually) be entered to narrow the field down to a handful of possible names to investigate. There is no information on grazing management. Australia-wide distribution maps are included for species records.

References

Clunies-Ross, M-A. and Mitchell, A. 2014, Pasture Identification: A field guide for the Pilbara, Greening Australia WA (LTD).

Crowder, S. and Saggars, B. 2010, Grasses of the Northern Territory Savannas: a field guide. Greening Australia (NT) Ltd.

Mitchell, A. A. & Wilcox, D. G. & Laidlaw, E. & Western Australia. Department of Agriculture. 1994, Arid shrubland plants of Western Australia / A.A. Mitchell & D.G. Wilcox; with photographs by E. Laidlaw, University of Western Australia Press with the Western Australian Dept. of Agriculture Nedlands, W.A

Moore, Philip. 2005, A guide to plants of inland Australia / Philip Moore, Reed New Holland Frenchs Forest, N.S.W

Petheram, RJ & Kok, B 2003, Plants of the Kimberley region of Western Australia, revised edition, University of Western Australia Press, Perth.

Pringle, H. J. & Cranfield, Ray. & Western Australia. Department of Agriculture. 1995, A key to the bluebushes (Maireana species) of the arid shrublands region of Western Australia / by Hugh Pringle and Ray Cranfield, Dept. of Agriculture South Perth, W.A

Wheaton, Tim & Queensland. Dept. of Primary Industries & Conservation Commission of the Northern Territory & Northern Territory. Department of Primary Industry and Fisheries (2013-2016) & Northern Territory. Department of Lands, Housing and Local Government 1994, Plants of the Northern Australian Rangelands, Dept. of Lands, Housing and Local Government, Darwin N.T

Wheeler, J. R. (Judith Roderick) & Western Australian Herbarium & Western Australian Herbarium & Rye, B & Wheeler, J et al. 1992, Flora of the Kimberley Region, Western Australian Herbarium, Dept. of Conservation and Land Management, Como, W.A

Vallance, H. J & Northern Territory. Department of Primary Industry and Fisheries 1993, Important pasture species of the Victoria River district, 1st ed, Dept. of Primary Industry and Fisheries, [Darwin]

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Does supplementing cows with phosphorus during pregnancy change weaner performance?

Kieren McCosker, Senior Livestock Scientist, NT Department of Primary Industry and Resources, Katherine NT

Phosphorus (P) often restricts beef production in northern Australia. When an animal's P demand cannot be met either from the diet or by mobilising body reserves, dietary intake and growth are typically dramatically reduced. Therefore, it is currently recommended that heifers and cows grazing low P areas be supplemented during late pregnancy and while lactating.

A trial currently running on Victoria River Research Station (aka Kidman Springs) in the Northern Territory (NT) has reported substantial reproduction and productivity gains from P supplementation. <https://futurebeef.com.au/projects/effect-of-phosphorus-supplementation-on-brahman-females-at-kidman-springs/>. Work by Rob Dixon and colleagues shows that pre-weaning calf growth is also constrained when cows are on low P diets during late pregnancy and lactation.

To investigate post-weaning performance, a pen study was recently conducted at the Katherine Research Station, NT measuring the effect of P supplementation with cows during pregnancy and lactation on weaner weight and on weaner growth when fed high and low P content diets.

Method

Four year old Brahman cows grazing P deficient paddocks on Kidman Springs were used to supply the trial weaners. In June 2018 forty three calves were weaned off cows which received a P supplement during pregnancy and lactation (CowP+) and thirty mixed-sex calves were weaned from cows with no P supplement (CowP-).

In September (at 8-10 months of age), after co-grazing native pastures on Kidman Springs, the weaners were relocated to Katherine Research Station and randomly allocated to either a low P (WnrP-, 0.5 g P/kg DM) or high P (WnrP+, 2.8 g P/kg DM) weaner diet group. Each treatment was replicated three times, with each replicate equal to a pen of two to four animals; the treatment groups were:

Treatment groups

Steers from -P cows, fed -P pellet
Steers from -P cows, fed +P pellet
Steers from +P cows, fed -P pellet
Steers from +P cows, fed +P pellet
Heifers from -P cows, fed -P pellet
Heifers from -P cows, fed +P pellet
Heifers from +P cows, fed -P pellet
Heifers from +P cows, fed +P pellet

The weaners had unlimited access to the experimental pellet for 64 days with their changes in weight measured. Liveweight was recorded after a 15 h curfew at the start and end of the pen experiment, with interim uncurfewed weights recorded weekly.

On concluding the pen phase of the experiment (6/12/18) the weaners were relocated to the Douglas Daly Research Farm to graze leucaena-grass pastures at a stocking rate of 3 animals/ha. All animals were inoculated with the rumen bug after grazing the leucaena for about 30 days. Liveweight is recorded monthly after a 12-15 h curfew to monitor the response of weaners.

Results

At the beginning of the experiment, weaners from P+ cows were heavier than from P- cows, with heifers from P+ cows 6.4 kg (174.5 vs. 168.1) heavier and steers 23.9 kg (183.2 vs. 159.3) heavier, when compared to weaners from P- cows. These differences are thought to be explained by P+ cows likely to provide increased milk supply to calves, a response which is explained by increased cow body condition.

While being fed in the pens, the diet (P-/P+) was associated with growth ($P < 0.001$) with the total growth of weaners on the P+ diet in the pens 40.9kg greater than the weaners on the P- diet (Figure 1). This effect was independent of cow diet. Or in other words, regardless of cow diet during pregnancy and lactation the performance of weaners was similar when fed either a high and low P diet. This finding was interesting in that despite being similar in age, the calves from P- cows were lower in liveweight at weaning and therefore didn't appear to display any compensatory gain.

It should also be noted that the growth of weaners on the P- weaner diet appeared to plateau after approximately 4 weeks of receiving the low P diet.

On average, average dietary intake of weaners fed P- weaner diet was approximately 1kg per

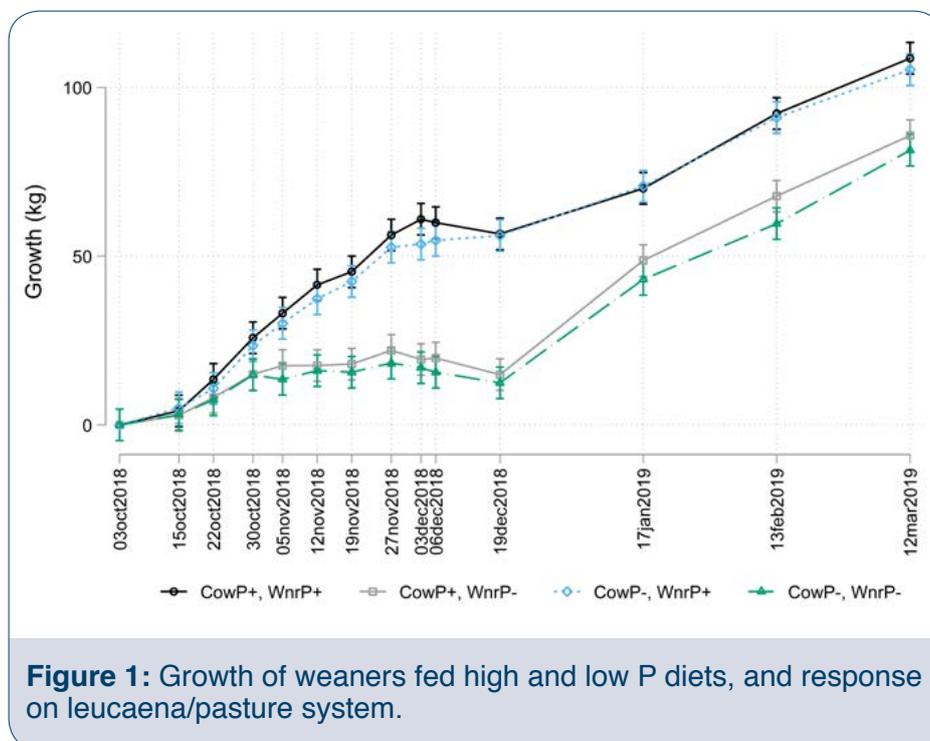


Figure 1: Growth of weaners fed high and low P diets, and response on leucaena/pasture system.

Table 1 Average dietary intake of weaners during the pen phase.

	Hay intake (kg/100kgLW)		Pellet intake (kg/100kgLW)		Diet intake (kg/100kgLW)	
	CowP+	CowP-	CowP+	CowP-	CowP+	CowP-
WnrP+	0.26	0.30	3.0	3.1	3.3	3.4
WnrP-	0.31	0.39	1.8	1.8	2.1	2.2

100kg liveweight less than weaners fed the P+ weaner diet (Table 1). The reduced intake of weaners on the P- weaner diet is likely to explain the difference in growth.



Steers from P+ cows fed P+ weaner diet.

The average daily gain of weaners fed the P- diet during the pen study was ~600g/d higher than weaners fed the P+ diet during the pen study in the first month after being relocated to the leucaena-pasture grazing system and halved the difference in total growth (ie ~20kg difference). The most likely explanation for the increased growth is the expression of compensatory gain resulting from suppressed intake and growth during the pen phase. The average daily gain for all groups was similar in the following two months.

Throughout the trial information on changes in hip height and blood samples for measurement of Plasma Inorganic Phosphorus (PiP) have also been collected and plan to be analysed during 2019.

Take home messages

The preliminary results suggest that the P content of cow diet during pregnancy and lactation influenced initial weaner weight, but had little or no effect on post-weaning performance.

Weaner diets low in P were shown to significantly affect the post-weaning performance of young cattle.

The finding from this study demonstrates the dominating effect of nutrition on weaner performance as well as the chronic impact of weight losses in calves prior to weaning.

For more information contact Kieren McCosker, Senior Livestock Scientist, Katherine NT, on + 61 (0)8 8973 9771 or Kieren.McCosker@nt.gov.au

You paid for it, now make sure it works: Principles of vaccine handling

Jodie Ward, Beef Extension Officer, Northern Territory Department of Primary Industry and Resources, and Lee Taylor, Senior Veterinary Technical Manager, Zoetis

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Vaccines have been proven to be effective at preventing the targeted disease, however once the vaccine has left the manufacturer, there are a number of ways that the contents can be rendered ineffective. Below are some tips to ensure your vaccines are effective.

At the Station

- Most vaccines need to be kept between 2-8°C at all times, therefore placing a thermometer that can record the maximum and minimum temperature in the fridge is a good idea for tracking temperature fluctuations and making sure your vaccines are kept in prime working order. While you're there, check the seals on your vaccine fridge.
- When bringing home new vaccines, bring the old stock to the front to be used first and discard any that have passed the expiry date.
- Some vaccines should be used on day of opening, some can be used the next day, and some can be used 30 days after opening. Read the label. Never put opened packs of vaccine back in the fridge with a vaccinator gun still attached. Remove the draw off tube and clean the vaccinator gun.

If you have a good quality vaccination gun that needs to be cleaned (as should be done after each session of use), DO NOT use disinfectants or antiseptics as these may interfere with the next vaccine used and damage seals in the gun.

The best practice method is to wash the gun out with dishwashing liquid and remove vaccine residue with clean tap water, reassemble the gun, lubricate it (using the manufacturer recommended oil to ensure seals and valves are kept in good order), fill the gun with water and boil vaccination gun for 10 minutes. Air dry the gun and then store the dry gun in a zip lock bag in the vaccine fridge once reassembled.

During transport

- Temperature control and exposure to direct sunlight are important factors to consider during transport. If going to town to collect vaccine, leave home prepared with enough space in an esky or car fridge to keep your vaccines cool on your travel home.

At the yards

- Invest in a vaccine cooler. Made out of wet suit material, this cheap yet effective device will keep your vaccine out of direct sunlight, and if pre-chilled before use, they will keep your vaccine cooler.

- Keep your vaccines in an esky with ice bricks when not being used, such as in between race loads of cattle or during meal breaks. Rather than allowing direct contact between the ice bricks and the vaccine container, wrap the ice bricks in newspaper, this will prevent the contents of the vaccine getting too cold and potentially freezing, rendering it ineffective.
- A car fridge on site is an excellent option for storing unopened vaccines until they are needed. Make sure to check the temperature is between 2-8°C.
- There is a new draw off tube in each pack of vaccine. Use a new one with each pack of vaccine.
- Use clean, sharp needles. Replace needles after every 30-50 head.

However, beyond all other recommendations, if you are unsure of what the right specifications are for your vaccines, it is best to read the manufacturer's instructions inside the box.

The key points are to keep vaccines cool and away from light when not in use. Treat them like milk – keep them clean and free of contamination.

For more information about vaccination schedules or correct application technique, simply type “vaccine” into the search function of <https://futurebeef.com.au/>

For more information contact your local veterinarian.



Read the manufacturer's instructions as they may vary between products.

Business improvement strategies of Pilbara and Kimberley pastoralists – from fundamentals to innovation

Mariah Maughan and Stephanie Coombes, Development Officers, DPIRD, Broome

Growing global demand for Australian beef products, driven primarily by Asian countries, presents opportunities to expand livestock production and value add in the Kimberley and Pilbara regions of Western Australia.

In 2015, the Department of Primary Industries and Regional Development's Northern Beef project implemented an incentive-based Business Improvement Grants (BIG) program. The program assists commercial cattle producers in the Kimberley and Pilbara pastoral regions enhance their competitiveness and growth prospects by connecting them with professional business advice and mentoring support.

The program reimburses approved applicants with up to \$25,000 (excluding GST), including up to \$10,000 to engage a consultant to review current performance and develop a business plan, and up to \$15,000 to implement key business improvement strategies as identified in the business plan.

Forty-eight pastoral enterprises participated in the initial round of BIG, utilising the grant in a range of business improvement areas (see Figure 1).

An additional 20 enterprises from two regions, consisting of family, corporate and Indigenous owned stations, participated in Round Two of the program last year.

Data recording

The extensive production systems in northern Western Australia can see pastoral enterprises manage anywhere from 1,000 to 80,000 head on parcels of land sized up to and more than 400,000 hectares.

Terrain, mustering method and the sheer size of northern cattle stations mean that achieving clean musters is a challenge and some animals may not pass through the yards each year, resulting in inaccurate livestock numbers. While traditional methods, such as a bangtail muster, can provide the opportunity to identify previously mustered livestock, they do not allow pastoralists to retain additional information on individual animals.

Through linking an electronic identification (EID) tag to herd recording software, pastoralists can build a history on individual animals, providing invaluable data on both cattle and business performance. Data collected may include age, weight, body condition, pregnancy status, wet/dry status, and vaccination history. Weight recording can be used to assist pastoralists drafting lines of cattle by weight class, as well as those wishing to calculate average daily gains.

Some pastoralists in the BIG program invested in crush side hardware, including scales, an EID reader and a data box. Others opted for in-paddock recording systems such as walk-over-weighers.

Water and fencing

The primary limiting factor of infrastructure development on pastoral leases in the Pilbara and Kimberley is the availability of, and access to, capital. While increases in corporate ownership are resulting in an injection of capital across the region, significant opportunities to open up previously ungrazed areas of the rangelands through the development of water points remain. Some BIG participants used grant funding to partially reimburse the cost of sinking a bore, installing solar panels and troughs and piping off existing water points.

Annabelle Coppin, of Yarrie Station, Marble Bar, installed a remote water monitoring camera at the water point located furthest from her homestead. This resulted in a significant efficiency, allowing her to reduce the 200km round trip she previously travelled every five days, to now once every three to four weeks.

The installation of new fencing by other participants allowed for the resting of rangelands and cattle segregation, as well as developing laneways to assist with mustering and yarding up.

Focus on fundamentals or venture into innovation?

The BIG program provides pastoralists the opportunity to pursue a low-risk investment to trial a new business improvement strategy such as water monitoring equipment or herd recording software or hardware. It also offers pastoralists the freedom of choice to align their chosen business improvement with their professional business plan.

Some pastoralist's trialled innovative new technologies while others invested in fundamental business improvement practices. Investment choices reflected a number of factors, including the developmental stage of the enterprise, the risk profile of the pastoralist and the guidance of their consultant. For some pastoralists, new technologies to improve efficiencies were considered to be the greatest return on investment while for others, it was opening up new country.

Participant feedback indicated that as a result of the consultation process, their reimbursement was applied toward a different strategy than the one they had originally envisioned. The value of taking the time to plan and review business operations, as opposed to purely working in it, has been a major outcome of the program. In an occupation where business owners and managers are required to possess an extensive skill set, the use of external consultants and mentors has been invaluable, planting the seed for paradigm shifts in pastoral operations.

The BIG program has proven to be a catalyst for intra-industry engagement, delivering the pre-conditions to drive transformational change and a conduit for information flow to and from industry. The high level of participation in the program is a testament to pastoralists' ability to embrace change and new ideas – ultimately enhancing their resilience, adaptability and competitiveness.

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Implementation phase of the Business Improvement Grants

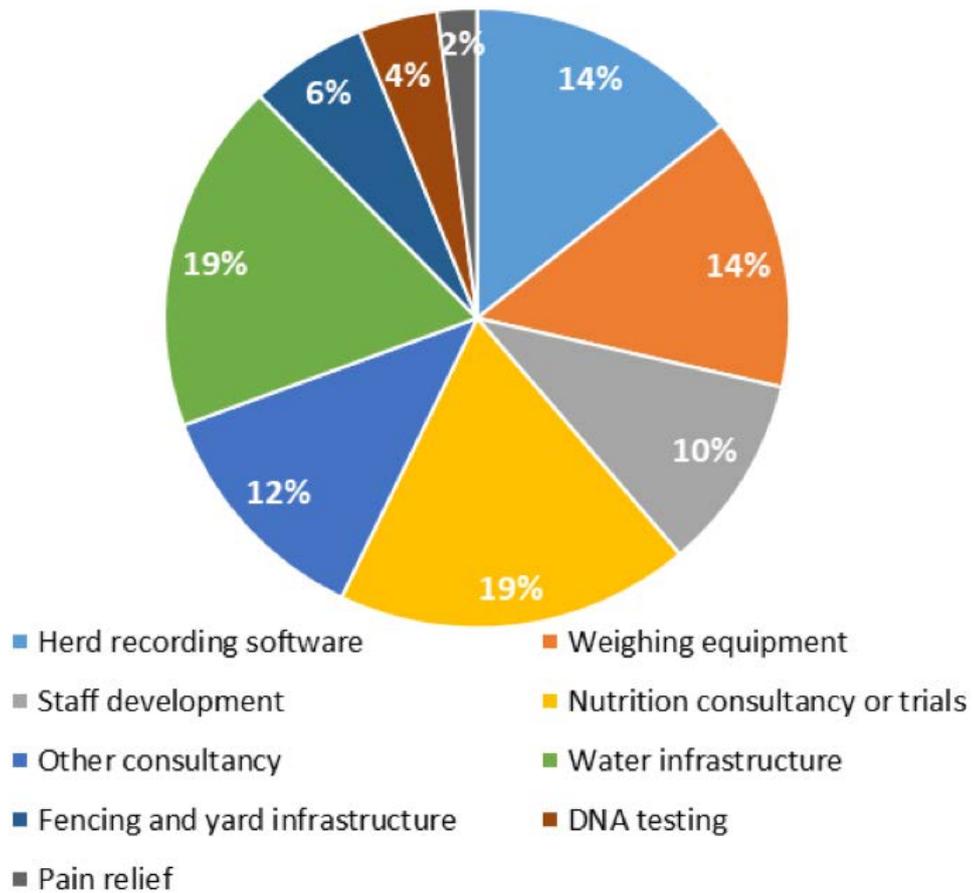


Figure 1 Focus areas of business improvement activities.



BIG participant Annabelle Coppin inspects a remote water point from her Yarrie Station homestead.

Murchison Innovation Day

Adam Murszewski, Project Manager, Mid West Development Commission, Geraldton

The Shire of Murchison, Mid West Development Commission and Wooleen Station hosted the inaugural Murchison Innovations Days on 27 and 28 March 2019. This will support the further use of innovation and new technologies within the Southern Rangelands; noting the unique position of Murchison pastoralists within the Square Kilometer Array (SKA) Radio Quiet Zone (RQZ) restrictions.

Around 45 people attended on the first day, including pastoralists from Murchison, Yalgoo and Mount Magnet.

Radio Quiet Zone requirements and compatibility – Carol Wilson, CSIRO

Carol provided a SKA project update, stating construction was scheduled to commence in 2020. She explained the importance of radio 'quietness' (not complete silence) to allow SKA observations and mentioned activities that would not cause interference with SKA observations, detailing those where prior engagement with CSIRO was recommended.

Carol explained the importance of the 900Mhz frequency band for SKA observations, prohibiting equipment within the 70km Inner RQZ that uses this frequency. She discussed activities excluded within the 70km Inner RQZ and the additional restrictions within the 10km and 30km radio quiet areas.

A key take home message was the importance of liaising with CSIRO where restrictions are unclear, particularly before making large investment decisions.

Remote weather and water monitoring and automation – Annie Brox, Origo Farm

Annie outlined a commercial scale trial undertaken on Murchison House station (127,000Ha) with support from Meat and Livestock Australia (MLA). She described the bespoke system developed to enable remote weather and water monitoring, and automation across the property, responding to specific needs of the station managers.

Savings of more than \$30,000 were realised in the first eight months, through reduced manpower, travel, maintenance and losses. Travel to some sites was slashed from three times per week to once every ten days.

A challenge going forward for pastoralists in the wider Murchison areas will be the operating frequency of the Origo system (915Mhz), which only makes it suitable outside the SKA 70km Inner



Carol explaining the important of the SKA radio quiet zone for radio astronomy.

RQZ. Nevertheless a number of Murchison pastoralists were keen to explore the opportunity.

Virtual Fencing – Mike Bowley, Mid West Development Commission

The Commission has been liaising with Agersens to better understand the eShepherd product and its potential in the Southern Rangelands environment. Most importantly, Mike explained that ministerial approval is required before cattle collars can be used in WA. He noted that approaches have already been made to the Minister.

Mike explained that each property would require its own base station/s (10m high) with a range of around 12km depending on terrain. Multiple base stations or mobile units would be required over larger areas. 3G or satellite is also required to transmit data back to Agersens' servers.

The current operating frequency of 433 MHz, makes it compliant inside the 70km Inner RQZ. However, Agersens is proposing changes to 915 MHz in the future, which would prevent its use within the 70km Inner RQZ.

Agersens are keen to work with pastoralists in the Murchison on a pilot in a Rangelands environment. The Commission has identified some interested candidates and will explore opportunities.

Wild Dogs and Fences – Barry Davies, Department of Primary Industries and Regional Development

Barry provided detailed updates on the Wild Dog Action Plan funding, the State Barrier Fence (SBF) and Rangelands Cell fencing programs. He also described the work programs that were developed developed, such as involving Aboriginal businesses to build and maintain the SBF.

Barry also described some recent trial successes using fish oil lures, cell fencing using squawker boxes, sensor lights and collars.

Water Availability and Licensing – Fleur Coaker, Department of Water and Environmental Regulation (DWER)

Fleur explained the recent Murchison Palaeochannel investigation results, providing charts showing volume, quality, depth and conductivity. These demonstrated a useful indication of water source potential, noting that it was necessary for further localised investigations.

Data from the Murchison Palaeochannel Project is available by contacting Tim Munday at CSIRO on +61 (8) 6436 8634 or tim.munday@csiro.au. The information should only be used as a guide to water availability at a broad scale. Site specific investigations are necessary to understand the quality and volumes that can be abstracted at a local property scale.

Fleur described DWER's water licensing processes, criteria and requirements. Licenses are required under the Rights



Tristan and John from CRT Great Northern Rural and Todd from TruTest (centre).

in Water and Irrigation Act 1914 to drill bores (26D) and to take water (5C). The volume of water requested and the presence of environmental, cultural or social values in the landscape, amongst other factors, are considered as part of the licence assessment.

She also outlined recent climate change projections, with 'dry climate' rainfall trends confirmed in all inland Mid West locations monitored. This highlighted a need for collaboration to explore water alternatives across the subregion.

Field day at Wooleen Station (28 March 2019) – David and Frances Pollock

Around 15 people stayed for the field day at Wooleen on the second day. This involved a bus tour to showcase progress of destocking programs to help regenerate the Wooleen landscape. This included various sites showing examples of regeneration, particularly of palatable perennial grasses, blue bush and salt bush.

David explained the importance of managing uncontrolled grazing (kangaroos and goats), which represents around 60% of total grazing pressure on the landscape.

David also showed a trial site funded by Rangelands NRM to establish a native grass nursery, with a view to rebuilding seedbanks that could be used to re-establish perennial grasses across the property. Discussions followed around the potential to scale this trial up, possibly involving two to three neighbouring stations. MWDC is exploring options.



David Pollock describing destocking efforts at Wooleen.

Summary

The key theme that emerged from the two days was the need for collaboration. Some of the challenges and opportunities in the Southern Rangelands are significant and achieving them in isolation will be very difficult.

MWDC has come away with a number of priority actions, spanning virtual fencing trials, digital connectivity investigations, water projects and various regeneration initiatives. In each instance, collaboration across stations and across local governments will be critical in ensuring maximum impact and economic benefit for those in the Southern Rangelands.

A field day is scheduled for 16 May 2019 at Murchison House Station. Those interested are encouraged to contact David Beatty at MLA on +61 (0) 409 819 045 or dbeatty@mla.wa.gov.au.

For more information contact Mike Bowley, Assistant Director, Agribusiness & Industry Economic Development, Mid West Development Commission on +61 (0)8 9956 8514 or mike.bowley@mwdc.wa.gov.au

Australian Radio-Quiet Zone WA

The Australian Radio Quiet Zone WA (ARQZWA) was established by the Australian and Western Australian Governments to protect radio astronomy receivers from harmful radio interference, while allowing for opportunities for coexistence with other activities.

This factsheet provides information about the radio-quiet zone around the Murchison Radio-astronomy Observatory site in the Mid West region of Western Australia.

The Murchison Radio-astronomy Observatory

The Murchison Radio-astronomy Observatory (MRO) is a 126 km² area located on Boolardy Station, about 315 km north east of Geraldton.

Home to world-leading telescopes such as CSIRO's Australian Square Kilometre Array Pathfinder (ASKAP), the Murchison Widefield Array (MWA), and the Experiment to Detect the Global EoR Signature (EDGES), the MRO has been created for radio astronomy research and is an exciting location for global science.

The MRO and Boolardy Station are also the future site of Australian infrastructure for the international SKA telescope project; SKA infrastructure will also be built in southern Africa.

CSIRO manages the Murchison Radio-astronomy Observatory. It is anticipated that in the near future, the MRO will be expanded to cover all of Boolardy Station to accommodate SKA construction, but this will not change the ARQZWA rules.

CSIRO acknowledges the Wajarri Yamaji people as the traditional owners of the MRO site.

The Australian Radio-Quiet Zone WA

The Australian Radio Quiet Zone WA (ARQZWA) is an area around the MRO where radio frequency emissions need to be managed to ensure the proper functioning of the MRO's existing telescopes and of the SKA.

The ARQZWA is protected by legislation and policy put in place by the Australian Communications and Media Authority (ACMA), by protected zones managed by the Department of Mines, Industry Regulation and Safety in the WA government, and by provisions in the Murchison Shire Town Planning Scheme.

The ACMA regulates the use of radio devices in the ARQZWA to enhance the national and international status of the area for radio astronomy. Under ACMA measures, radio astronomy is the primary user of spectrum in the central part of the ARQZWA (within a 70 km radius). For the lowest frequency range, the ARQZWA extends to 260 km from the MRO. The ACMA has measures in place within the ARQZWA that require applicants for a radiocommunication licence to consult with CSIRO to determine whether the equipment will adversely affect radio astronomy and to consider measures to minimize any interference.

Radio frequency interference

Radio telescopes are designed to detect faint natural radio signals from space, but this also makes them very sensitive to the interference caused by man-made radio transmissions.

This radio frequency interference can be caused by radio transmitters such as mobile phones, two-way radios and broadcasting towers, or by electrical equipment such as vehicles, appliances or electrical machinery.

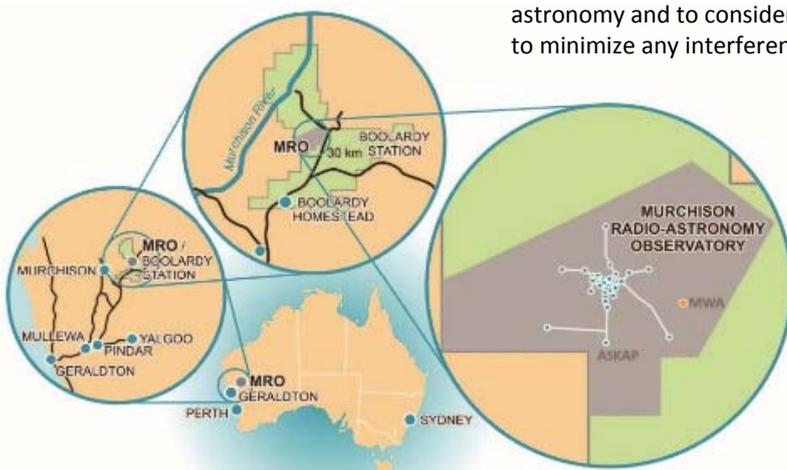
There are also limits on using class-licensed transmitters (such as WiFi or Bluetooth) within a 70 km radius.

The ARQZWA controls are only as strong as they need to be and restrictions become less stringent further from the MRO and at higher frequencies.

Based on CSIRO's understanding of current pastoral activities on properties near Boolardy Station, the ARQZWA and the requirement to protect the SKA and existing telescopes from radio frequency interference should not have any significant impact on those activities.

However, pastoralists are invited to contact CSIRO if there are questions or concerns about any particular activity.

More information on the ARQZWA is available in the *Frequently Asked Questions* section of this factsheet, or by contacting Mrs Carol Wilson (CSIRO) or the ACMA.



CSIRO's Murchison Radio Astronomy Observatory

A guide for when to contact CSIRO about the radio quiet zone

As at August 2018

CATEGORIES	EXAMPLES (Note: these lists do not include all possible devices)	COMMENTS
CATEGORY 1		
No need to take any action in regard to RQZ.	<ul style="list-style-type: none"> Any emergency use of radiocommunications CB/UHF/VHF/HF radio vehicle-to-vehicle and vehicle-to-base Satphones for normal pastoral use AM/FM radio receivers School of the Air equipment at existing homesteads General household appliances Non-electrical equipment (see comment) Cars and trucks 	Electrical equipment is anything that uses batteries, mains electricity or a generator.
CATEGORY 2		
<p>Please discuss with CSIRO before use (except in emergencies)</p> <p>In most cases (for example, mustering) this will be so that we can plan around your activities.</p> <p>In some cases it may be to advise on alternative technologies before you invest in equipment.</p>	Consumer radio communication devices <ul style="list-style-type: none"> Sat phones other than for pastoral activities or emergencies Outdoor remote controls (e.g. water pumps) Wireless, WiFi or Bluetooth devices Drones 	If within 70 km (see map overleaf) contact CSIRO, otherwise no action needed.
	Non-radiocommunication devices <ul style="list-style-type: none"> Arc welders Handheld power tools (eg electric drill) Mustering (aircraft, motorbikes, etc) 	If within 30 km (see map overleaf) contact CSIRO, otherwise no action needed.
	Electric Fences	If within 10 km (see map overleaf) contact CSIRO, otherwise no action needed.
CATEGORY 3		
<p>ACMA licence required.</p> <p>Applicants must consult with CSIRO under RALI MS 32.</p>	Apparatus requiring an ACMA licence. Some examples include: <ul style="list-style-type: none"> New CB repeaters or relocating existing repeaters Communication towers Airport radars Television or FM radio stations Satellite dishes (except satellite TV or NBN) 	Within 70 km, ACMA are unlikely to issue new licences. Between 70 and 260 km, consultation with CSIRO is required.

FOR FURTHER INFORMATION

For RQZ issues:

Carol Wilson
Spectrum Manager
t +61 2 9372 4264
e carol.wilson@csiro.au

For site issues:

Brett Hiscock
MRO Site Manager
t +61 8 9923 7750
e brett.hiscock@csiro.au

For strategic issues:

Kevin Ferguson
Head of WA Observatory Operations
t +61 8 6436 8761
e kevin.ferguson@csiro.au

www.csiro.au



Bullseye project driving beef industry developments in the central and southern rangelands

Greg Brennan, Project Officer, Bullseye

The Bullseye project, led by the Gascoyne Catchments Group, evolved as pastoralists in the Gascoyne, Murchison and Goldfields Nullarbor region identified the need to improve central and southern rangelands cattle predictably hitting supply-chain specifications.

The aim of the project is to help pastoral businesses and those further along the supply chain collaborate to better deliver the specific beef and cattle products required by current and emerging markets.

The project, due to finish in March 2020, is funded by a \$494,000 grant administered through DPIRD's Agribusiness Innovations fund. It will continue through to 2024 under the umbrella of BeefLinks, a larger WA Beef Links partnership programme.

Rachel Thomson has recently been appointed Executive Officer of the Gascoyne Catchments Group and Project Manager of the Bullseye project, taking over from Dean Revell who has been appointed General Manager of Select Carbon. Rachel grew up on family owned cattle stations in the Gascoyne and lower Pilbara. Prior to this, she was a research agronomist in the WA grain industry.

A highlight of the project has been the Value Chain tour in November 2018 when 24 pastoralists were exposed to 'cutting edge' developments in the WA beef industry. A common sentiment expressed by the tour group was, *"We've been exposed to a massive amount of valuable information that we would not have had access to without this tour."*



Group photo at the Pagoda on the final night, gearing up for a solid 'de-briefing'.

The tour commenced at Red Gum Village in Dongara with Murray Grey, explaining how the Remote Walk Over Weigher (WOW) had changed the way they grow out their heifers and manage their sale strategy at Glenflorrie station.

Shrinkage with transport from the station has always been a challenge for pastoralists but Murray stated that the Remote WOW, with its auto-draft function, avoided this shrinkage and the cost of investing into the system was repaid in about eighteen months. Combining the satellite data on the Normalized Difference Vegetation Index (NDVI) and daily body weight data provided by the WOW meant heifer replacements and sale steers could be managed to best advantage.

Craig Forsyth is a Dongara backrounder with twenty years' experience finishing pastoral cattle. He explained how a pastoralist can work to ensure that the backrounder can do the best with

his cattle after arriving on his pastures. Craig, like everyone else, is challenged by the task of increasing the backgrounding facilities in WA.

Johnnie Dichiera, at Central Agri Group's Joanna Plains background operation showed how pastoral cattle settle quickly in their 4 ha pens and adjust to a high grain ration to achieve daily weight gains of 1.6kg per day and higher, especially the lightweight aged cows.

Danny Borrello of the Borello Group provided the tour with high quality beef BBQ while he explained their beef processing business model. He emphasised how pastoral cattle ideally suit many of his customers.

Larger than life Vince Garreffa in his purple jacket did not disappoint as he entertained the group with a pre-dinner talk at the Pagoda. He claimed that Australian meat is the best in the world and that there are enormous opportunities to supply premium export markets but only when a consistent supply and quality can be guaranteed. He said that while it would not be easy, Australian producers do have a head start with Meat Standards Australia which can provide the quality assurance system for any premium brand. 'Aim for the stars' was his motto.

Meat and Livestock Australia and Murdoch University provided the perfect venue on Day Three to deliver the best package of information possible for a group of cattle producers. MLA's David Beatty gave a beef market update and Graham Gardner and his Murdoch team provided an exceptional summary of Meat Standards Australia. Pastoralists were particularly keen to hear on the latest developments in Dual Energy X-Ray Absorptiometry (DEXA) and the research to enable processors accurately assess a carcass for meat, fat and bone percentages while on the abattoir chain. A crowd puller was MSA butcher Raphael Ramirez as he displayed a range of beef cuts and demonstrated how to cut the Flat Iron Steak from the Oyster Blade cut.

Raphael then escorted the group to Scarfo's Meating Place at Myaree where Tony Scarfo gave a tour of his high-class butchery. Tony impressed the group with his commitment to customer satisfaction by spending lots of time behind the counter seeking customer feedback on his products.

From there, it was to Roger and John Dawkin's farm at North Dandalup where they breed high marbled beef, crossing the Red Wagyu or Akaushi breed with European breeds. Roger was previously a Medical Researcher with Human Genetics and he has transferred that expertise to beef breeding. Genomic research on-farm enables them to identify the gene for high melting point fat. The melting point of beef fat is an indicator of beneficial fats and associated genetic markers can be identified with simple tissue tests. During the tour of the farm, it became obvious that the Akaushi has a superior confirmation to the Black Wagyu. The Dawkins are currently keen to negotiate with pastoral breeders to trial the Akaushi crosses in the pastoral environment.

In anticipation of the value of the tour, Bullseye contracted professional filming of highlights from the tour and it will be made available soon.

For more information contact Greg Brennan, Project Officer, Bullseye, Geraldton, on +61 (0)418 222 406 or greg@grazinginnovation.com

Celebrating WA Women in Agriculture – Spotlight on Cattle Backgrounding in the Mid-west

Daisy Goodwin, Development Officer, DPIRD, Broome

The Department's Aboriginal Economic Development (AED) project would like to share the story of two inspiring women from Yallalie Downs in Dandaragan. Yallalie Downs is the first Aboriginal cattle backgrounding business in WA. The farm is managed by two young Aboriginal women, Lexine Mourambine and Madeline Anderson. Lexine is the operations manager and can be found out on the property with the cattle day in and day out. Madeline handles the books and finances, keeping the business on top of things!

Yallalie Downs, owned by Beemura Aboriginal Corporation (BAC), is a 1200ha farm in Dandaragan, 263km north of Perth. In 2014 Lexine decided to leave her comfortable public sector job to work on the property full time with grandfather, Kevin Barron. The farm was not set up to run cattle, and BAC tried their hand at a multitude of things, including sheep and horticulture, in an effort to earn an income. Over the last four years, with support from the AED program, BAC have become a profitable and sustainable cattle backgrounding business!

Producers send cattle to Yallalie to reach a required weight on Yallalie pastures. The cattle are managed on behalf of the owner and they generally pay for this service on a weight gain basis. Over the last few years, Lexine has had a crash course in all things cattle backgrounding, including animal husbandry, low stock stress handling and cell grazing.

Lexine completed a Low Stock Stress (LSS) Handling course with Bruce Maynard in early 2018. Working with the cattle and using her LSS skills is now her favourite part of working on the property. Lexine uses their nine cell paddocks and laneways to fatten up to 600 cattle at a time. Having calm cattle is integral to this process, she does her best to get new cattle acclimatised to the property and relaxed as soon as possible after their arrival. Seeing a change in the cattle compared to when they arrive on the property is the best reward Lexine could ask for.

Madeline, mother of two, returned to Yallalie earlier this year with her 11 year old daughter, whilst her 12 year old son attends boarding school in Perth. She has been assisting Lexine with the finance and book work for Yallalie for years whilst living in Perth. Now that Madeline lives on the farm, she can assist with all aspects of the business including their corporation governance. This involves compliance with the Office of the Registrar of Indigenous Corporations and the organisation of directors meetings and annual general meetings for members. She is loving life on the farm where she is able to put her creative side to use.

AED staff have accompanied the women to several Indigenous Cattlemen's workshops at various locations in Australia over the last few years. They were soon after nicknamed the 'power duo' by other participants. The workshops presented them with the opportunity to make lifelong contacts with other producers. The same can be said of the networks they will make at the RCS Indigenous Grazing for Profit Course on 20-23 May in Port Hedland.

For more information please contact Daisy Goodwin, Development Officer, Broome on +61 (0)8 9191 1488 or daisy.goodwin@dpird.wa.gov.au



Hon. Alannah MacTiernan, Minister for Agriculture and Food, with Lexine Mourambine on Yallalie Downs 2018.



Madeline (far left) and Lexine (far right) with Darrylin Gordon, National Runner Up Rural Women of the Year 2018 (second left) and AED Development Officer, Daisy Goodwin (second right) at the Indigenous Cattlemen's Workshop in South Australia, 2017.

Lessons from a child

Barbara Camp, Kalyeeda Station, West Kimberley

I'm watching my 12-week-old baby trying to lift himself up on his forearms.

It's causing him a lot of effort and hard work. He can manage for a while but then his head gets too heavy and it goes back down to the floor. His little muscles are not strong enough to hold the weight for long and he does not know how to pull his elbows underneath to prop himself up yet.

It's causing him a lot of frustration. He knows what he wants and he's trying so hard, but it's just too difficult and the longer he tries the more tired he is and the harder it gets. The grunts of effort are getting more fractious as he gets more desperate. I can see he's getting too upset and doesn't know how to cope anymore. So what do I do? I help him. Prop him up. Reassure him. Then when he's ready, he can try again because he's not giving up – he's just regrouping.

Even at 12 weeks old, the biggest battles we will ever fight are with ourselves, inside our own bodies and minds. Sometimes you need someone there to help you take a step back and reframe things because while you are fighting to control yourself you can forget you are also your greatest asset. Sometimes you need someone – be it your Mummy or a stranger on the internet to remind you that "it's okay not to be okay".

It's okay to struggle and it's okay to feel like you can't get your head off the floor but I can promise you that there is always someone who cares and someone who wants to help. There's always someone who wants to empathise; all you need to do is be brave enough to ask for help. And usually all that it requires, is making a bit of a human connection.

Mental health, social media and our rural lifestyles have been very much on my mind this year. More so than ever, I feel the three are very much intertwined.

Let me put on my nurse's hat and give you a few quick facts about mental health. Three of the biggest risk factors for mental health problems are to be young, male and isolated. Guess what demographic makes up the majority of stock camps? If you want a few more stats, I can also tell you I live in the Kimberley which has one of the highest suicide rates in the entire world and that one in four of us Australia-wide will suffer from a diagnosable and treatable mental illness every year.

I bet you didn't know that and do you know why? Because we don't talk about it nearly enough. Everyone gets the odd cold or breaks a bone on occasion. We all get sick – so why is it so hard to admit when our minds are not in peak condition?

This brings me back to our isolated young male ringers out on the stock camp. They're living and working in a culture where we applaud being tough and admire a 'she'll be right' attitude, where it's not okay to show weakness and you have to carry on regardless or be considered as being 'soft'. And now think about that young female ringer. Often she has all of that plus the added need to prove herself as one of the boys – she doesn't need to be as good as them, she needs to be better. It's a hell of a load to bear, especially when you're bearing it alone, because heaven forbid, you show weakness.

And here is where social media rears its ugly head. Nowadays at the end of a hard day's work, I will head to the social area and see everyone's head down, eyes glued to their phones as they catch up with their Instagram feed. They are tagging a Facebook friend in a meme about cats,

or perhaps, they are editing their selfies from the day and adding just the right filter so the shot looks awesome before posting it.

It's not real. It's just one of sixty nearly identical shots they took in order to get the perfect one image to portray to the world how awesome their life is. The photo of the smiling person on horseback doesn't tell the story of how the boss reamed them half an hour ago for putting the wrong horses out in the paddock. No one's life is #instaperfect but sadly that's all we see on our feeds.

And because we're all now glued to our devices, we are not chatting to the people around us. Our direct peers are unaware we are a little upset about something and there is no debriefing. We are either too busy painting our veneer of perfection or looking at someone else's and comparing.

Now don't get me wrong, social media can be a force for good and just like any tool, it can be used in many ways.

After the tragic death of Dolly Everitt, her brilliantly savvy parents are using a major contributor to her plight as a way to connect and reach out to people. #doitfordolly has touched so many lives already and started conversations that span out of the internet and into everyday conversation.

Now, here I am coming to you to ask that you take a moment to connect with people around you and embrace your own vulnerabilities, rather sitting alone behind your device.

It's been a year since I first jotted this down in a blog. My baby is a toddler now and my not-so-little man has long since learned to lift up. Then he learned how to sit, to crawl to walk and now run.

Since that day as I sat and watched him try so hard as a 12-week-old, there have been many fresh challenges. Every achievement leads to a new thing to try and struggle with, and then eventually learn. There have been tears and giggles. There have been triumphs, there have been epic fails and more than a few bumps and bruises along the way. But one thing there has always been for little Stewart is someone around to offer a helping hand when things get a bit too tough. Just remember – once upon a time you didn't know how to use a spoon either; someone had to help you.

So people of the bush especially and everyone in general, next time you feel like my little baby and that no matter how hard you struggle things are just getting harder, don't hide it away until it all becomes too much. Seek help, reach out. Make a connection and let someone know you're not feeling #instagreat. Chances are you'll find out you're not the only one feeling that way today. And do you know what? If you can hang on till tomorrow it's a whole different day.



Barbara and Stewart Camp.

No matter where you are, help is available.

- **Lifeline:** 13 11 14 lifeline.com.au
- **Beyond Blue:** 1300 224 636 beyondblue.org.au
- **Men's Shed:** mensheds.org.au
- **Suicide Call Back Service:** 1300 659 467
- **Mindspot:** 1800 61 44 34 mindspot.org.au
MindSpot is a free service for Australian adults who are experiencing difficulties with anxiety, stress, depression and low mood. They provide assessment and treatment courses, or can help you find local services that can help. The MindSpot team comprises experienced and AHPRA-registered mental health professionals, including psychologists, clinical psychologists and psychiatrists who are passionate about providing a free and effective service to people all over Australia.
- **Virtual Psychologist:** 1300 665 234 Text 0488 807 266 virtualpsychologist.com.au
Virtual Psychologist is a free service that offers qualified and experienced counselling via phone, chat, email and text. It is available 24/7 to any farmer.

Correction – J-BAS requirements to enter the NT

In the November 2018 edition of Rangelands Memo, the article BIOCHECK® and WELFARECHECK® - vets assist producers to meet LPA requirements (pg. 56) incorrectly stated a J-BAS score 7 or 8 is required to sell cattle from Western Australia into the Northern Territory.

This is incorrect – cattle entering the Northern Territory must meet the requirements for a J-BAS 6, not J-BAS 7 as published.

Further information about all the Northern Territory livestock import requirements, can be found on the Northern Territory Government's information services website available at the address below:

<https://nt.gov.au/industry/agriculture/livestock/moving-and-exporting-livestock/moving-livestock-into-the-nt>

Further information on Johne's Beef Assurance Score (J-BAS) and what it means for WA producers can be found at the follow address:

<https://www.agric.wa.gov.au/livestock-biosecurity/johne%E2%80%99s-beef-assurance-score-j-bas-and-what-it-means-wa-producers>

Events

Pasture to Pocket Workshop, Muresk Institute, Northam, WA – 26-28 June

The two-and-a-half-day Pasture to Pocket Workshop is a comprehensive introduction to regenerative grazing land management which provides producers with the knowledge and tools to improve the productivity of grazing country and livestock in an ecologically sound and financially viable manner.

Please contact The Muresk Institute directly +61 (0) 8 9690 1556

MLA Breeding Edge Workshops, Fitzroy Crossing, 17-19 July, Broome, 23-25 July

Breeding EDGE is a three-day workshop designed to assist producers improve and refine their breeder herd management and genetic improvement plans using genetic and reproductive knowledge and technologies, to achieve desired production targets.

Contact: Felicity Hamlyn-Hill, Beef Enterprise Advisory Services,
felicityhamlyn-hill@bigpond.com, +61 (0) 428 113 732

Northern Beef Research Update Conference (NBRUC), Brisbane, QLD, 19-22 August

Hosted by the North Australia Beef Research Council (NABRC), the 2019 NBRUC Conference is a fresh opportunity for people working or interested in the Australian beef industry to gather, network, learn and share technical information about important areas of beef cattle research and management.

Details: nbruc2019.com

Australian Rangeland Society Conference, Canberra ACT, 2-5 September

Established 42 years ago, the Australian Rangeland Society returns to Canberra for its 20th biennial conference in September 2019: Resilient future rangelands: integrating environment and livelihoods.

Details: austrangesoc.com.au

Regenerative Agriculture Conference, Perth, WA – September 11

While food security has been raised as an issue at other events, the 2019 Regenerative Agriculture Conference will be the first to lay the groundwork for industry-led solutions to meet the challenges of population growth and responsible environmental management. This is your chance to meet the innovative producers from RegenWA, understand the productivity constraints and challenges of 'business-as-usual' farming practices, and participate in building a strategic plan for investing in the future. The RegenWA conference is managed by Perth NRM with funding from State NRM and the Department of Primary Industries and Regional Development, supported by NRMWA and Commonland.

Please email info@regenwa.com to register your interest.

Kimberley Pilbara Cattlemen's Association Field Day, Broome, WA, November 6

See www.kpca.net.au for more details.

Kimberley Pilbara Cattlemen's Association Ladies Luncheon, Broome, WA, November 7

See www.kpca.net.au for more details.

Kimberley Pilbara Cattlemen's Association Annual Innovation Conference, Broome, WA, November 8.

See www.kpca.net.au for more details.

Research Activity Notice

Regional airborne survey

Geoscience Australia, in collaboration with Western Australia and Northern Territory Government agencies, will be carrying out a series of airborne electromagnetic (AEM) surveys across the Northern Territory and Western Australia in 2019 as part of the *Exploring for the Future* program. This program aims to gather new information about the potential ground water, mineral and energy resources concealed beneath the surface, and this information will lead to more informed resource management and to better targeted investment.

AEM survey method

Light aircraft and helicopters can be fitted with AEM instruments to map variations in the conductivity of the ground to a depth of several hundred metres.



A light aircraft (upper photograph, courtesy of CGG Australia) and helicopter (lower photograph, courtesy of SkyTEM Australia) in action during previous AEM surveys.

During the survey, a signal will be transmitted from the aircraft into the ground. Towed antennae can detect the returned signals and the nature of these signals will be analysed to map variations in the conductivity in the ground that are caused by saline water and certain types of minerals.

What you may see

A helicopter or a fixed-wing aircraft that is towing equipment below it will make a single pass approximately 150 m above the ground, along straight tracks 20 km apart. If you have any concerns with this activity such as whether stock may be disrupted, please contact Geoscience Australia (details given below).

Timeframes and work area

The airborne survey is expected to be carried out between March and November 2019, working in stages across the area outlined with a red box in the figure below. More detailed information about timing and flight lines will be released after community consultation in February/March 2019.



Important to know

All data produced by Geoscience Australia, including the data from this survey, will be made freely available after various quality assurance checks have been performed.

This survey will not involve any disturbance to the ground.

Updates related to this activity can be found at <https://www.ga.gov.au/ausaem>

Contact Details

Please contact us if you have any questions about these airborne survey works:



Free Call 1800 091 964 (Mon-Fri, 9am to 5pm AEST)



EFTF@ga.gov.au



www.ga.gov.au/efft

DPIRD out and about...



There were some bright ideas sparked at the Kununurra Grazing for Profit Course in February! Photo: Clare Atkins



Izjas Corpus installing a soil water moisture probe at the Water Corporation Pivots in Broome. Photo: Chris Ham



Some of the staff at the Broome office tracking Tropical Cyclone Veronica. Photo: Steph Coombes



Dr Graham Mackereth assembling post-mortem kits under the Northern Australian Biosecurity Surveillance (NABS) project. Photo: Steph Coombes



These signs were spotted on Yarie Station in Marble Bar. Photo: Steph Coombes



Mick Everett stands alongside Rubber Vine he spotted from the air during the Lake Argyle Rubber Vine survey in March – it was successfully destroyed. Photo: John-Paul Slaven



David Pollock (Wooleen Station) and Adam Murszewski (Mid-West Development Commission) take a break at the Murchison Innovation Days. Photo: Mid-West Development Commission



Dave Barker setting up a rangeland monitoring site in the West Kimberley. Photo: Steph Coombes



Col Paton, Eco Rich Grazing, demonstrating the art of forage budgeting at the Northern Pastoral Season Twilight Forum on Limestone Station. Photo: Steph Coombes



Mariah Maughan tries her hand at plant identification with the new "Pasture Identification: A field guide for the Pilbara" book. Photo: Steph Coombes



The DPIRD Rangeland's team at a recent workshop on Credo Station in the Goldfields. Photo: Unknown



Kevin May (second from the right) with the team from Myroodah Station, West Kimberley. Photo: Daisy Goodwin

If you would like to receive future editions of the Rangelands Memo by email, or know someone who needs to be added to the postal list, please contact stephanie.coombes@dpird.wa.gov.au