The Australian Rangeland Society

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EDITORIAL

Gary Bastin, Editor

This issue has another good complement of contributions - so just a short introduction from me. The Kalgoorlie office of the WA Department of Agriculture held a seminar 12 months ago to explore ways of surviving the downturn in the wool industry. Adrian Williams and Jenny Riches have provided a report on this meeting in which several pastoralists "bared their souls" to demonstrate practical and proven tactics to survive the current recession. Although this report is now a little dated, it offers interesting reading to all, and particularly relevant information to rangeland managers and advisers.

My focus for this issue is environmental protection and rangeland monitoring. Helen Allison discusses the role of the WA Environmental Protection Authority which, to some, may superficially appear as just another bureaucracy to frustrate development. However, a deeper reading of Helen's article will reveal that the EPA (and similar agencies) has a genuine role to play in protecting the environment for future generations.

Rodger Tynan introduces the new SA pastoral lands legislation and describes in some detail the monitoring and carrying capacity assessment components. I hope that Rodger is as good as his word and provides further information on other facets of the legislation.

Peter Jessop and David Eldridge provide technical accounts of their studies associated with rangeland monitoring, while David Freudenberger introduces us to the concept of 'productive efficiency'. His is undoubtedly a useful contribution in the light of the current interest in, and enquiry into, sustainability.

We have news from the new Council plus various reports from the recent International Rangelands Congress. Finally, the last page has a 1992 subscription renewal form. Subscriptions remain the same as for 1991 with Council continuing the discount for early payment.

May I take this opportunity to wish you a merry Christmas and all the best for 1992.

SUBSCRIPTIONS DUE FOR 1992

Ashley Sparrow, Subscription Secretary

Annual subscriptions are due on 1 January 1992. Council is continuing its incentive to encourage early payment by offering a discount on subscription renewals made before 31 March 1992.

See page 20 for details and a subscription renewal form.

RURAL DOWNTURN SEMINAR - KALGOORLIE, NOVEMBER 1990.

Adrian Williams and Jenny Riches, Dept of Agriculture, PO Box 417, Kalgoorlie, WA 6430

Last November, as the wool situation became bleaker by the minute, the Department of Agriculture in Kalgoorlie held a seminar to discuss the ramifications of this sudden turn around in the industry's fortunes. With wool-growing being the main enterprise in the rangelands of the Eastern Goldfields and Nullarbor areas, the subject matter was particularly pertinent. The seminar included talks given by an accountant, a rural economist, the Australian Wool Corporation state manager, a representative from the Rural Adjustment and Finance Corporation, animal production specialists and four pastoralists.

The seminar was very successful and those attending particularly appreciated hearing the views of their fellow pastoralists who "bared their souls" for the general benefit of all. We included their talks in a recent issue of the Kalgoorlie Pastoral Memo (No. 51, December 1990) but we felt that their high quality deserved a wider readership. Therefore, in response to Gary Bastin's call for contributions from wool growers on strategies for surviving the current crisis (RMN number 91/1 March 1991), the following are hereby presented!!!

HARD TIMES AGAIN - WITH A DIFFERENCE

John Finlayson

(John and Kathy Finlayson [see article following] and their three children live on Jeedamya station about 170 km north of Kalgoorlie. Jeedamya is 200,000 ha in size and normally shears 10-12,000 sheep. John is a second generation pastoralist in the Goldfields who has been actively involved in industry bodies and in the North Eastern Goldfields Land Conservation District Committee since its inception. John has also been involved with the Department of Agriculture's range monitoring programme since its beginning in the Goldfields region in the mid-1970s. Kathy grew up in Perth and has been very involved in managing the station, the Kalgoorlie School of the Air and ICPA (the Isolated Children Parents Association). A trained nursing sister, Kathy has maintained the nursing post at the small town of Menzies, 40 km south of Jeedamya, for some years but recently has been working only part-time due to station commitments.)

What can we gain from the experience of previous downturns? The depressed periods in the 1930's, 40's, late 60's and early 70's are mostly unrelated to our present dilemma. Historically, wages were low, interest rates were low, inflation (except for the 1970's) was low, the standard of staff skills was high, and living costs were low. Things are very different today! Yet

there are 3 important common threads through all these troubled times:

1. *The almighty $*
2. *Planning*
3. *Staff*

1. THE $

In every downturn the first thing we reach for is our pocket, and endeavour to stretch it as far as possible, and remain efficient. Historically, though, we became inefficient as fences and water points were let go. There is a fine line between spending money on maintenance without wasting funds. This leads on to the next common denominator.

2. PLANNING

Take a realistic position and plan accordingly. I believe there are a number of essential items to help do this:

a) Keep a work book to list jobs and their priority.

b) Keep a windmill book, listing all the work undertaken on each mill. Repeat costs can be budgeted, bores can be maintained before trouble starts, and you may be in a position to choose to close down bores/wells that prove to be particularly expensive to maintain.

c) Construct and use a mill run chart. Fill in details of work done, and requirements, on a daily basis. This helps to set priorities for the next mill run, cuts down on over-servicing, and allows a check to be kept on problem mills.

d) Construct and maintain a service book or chart for every piece of machinery on the station. Maintenance is generally a lot cheaper than repairs!

We have to get smarter, and make fewer mistakes. This can be achieved with good planning and record keeping.

3. STAFF

In the past, permanent staff numbers have been reduced in hard times and replaced with part-time and casual staff. Many pastoralists would have friends who work a five day week in town. Some may be willing to spend their weekends helping on the station for something different to do. We should also press the Government to offer greater incentives to pastoralists to employ Aborigines. Specific jobs that could be performed include fencing, mustering, yard work and concreting.

I have constructed a table of some of the big differences between the present and earlier market downturns to bear out points in my talk, and to suggest other ways to economise.

By getting smarter we'll beat this recession, like we beat the previous hard times.

	PAST	PRESENT AND FUTURE
FUEL		
	Rationing	*Small vehicles*
	Gas Production	*Greater use of bikes*
	Strict Monitoring	*Make the litre go further. On mill runs go for the day and fix fences and water leaks (fibreglassing) at the same time.*
LIVESTOCK		
	Goats were not a problem.	*Goats are arguably more of a nuisance than kangaroos in certain areas. Kangaroo control will go. Goat mustering will be replaced by goat trapping.*
	Sheep trap yards	*More trap yards for both sheep and goats.*
	Always used sheep dog	*Sheep dogs not used enough. More attention to sheep dog breeding and training.*
FIXED IMPROVEMENTS		
	Galvanised piping was in good order.	*Improvements are older, and require more maintenance. Big bulldozers can build big dams. Arc welders are available to make repairs.*
	Improvements were relatively new, requiring little maintenance	
	Vehicle and lighting plant were simpler and easier to fix	*Polyethylene, P.V.C. and fibreglass are available for a wide range of strong, yet lightweight uses. Vehicles and lighting plant are more expensive.*

HOW WE SURVIVED THE LAST RECESSION

Bruce Robinson

(Bruce and Ermengarde Robinson and their son Drew live on Yerilla station which is about 160 km north east of Kalgoorlie. Yerilla is 100,000 ha and normally shears 7-8000 sheep. Bruce is a third generation West Australian pastoralist and his family took up Yerilla in the 1920's. Bruce has been active in industry organisations and is a member of the North Eastern Goldfields Land Conservation District Committee. Yerilla hosted a major study into goat grazing on mulga pastures from 1985 to 1990, and the station has had range monitoring sites installed since 1980. Ermie holds an Arts degree from the University of Western Australia and became involved in the management of Yerilla during the last major rural down-turn! She is also on the state executive of ICPA.)

When Adrian asked me to speak at this seminar, he asked me to base my talk on the five most important things that I did in the last industry recession. I thought about it for a while and noted the following:

1. Nothing
2. Minimised Expenditure
3. Got Married
4. Renovated the Office
5. Bought A Fast Racehorse

1. NOTHING (DIFFERENT)

I guess we did as little as possible, which doesn't really mean nothing, but nothing different. Whether you're in a boom or in a crisis, the only difference is having less money to spend. So you still have to manage your business efficiently, and the same rules apply. You have to stretch your money a bit further. Now, I'm not going to try and tell you people what you should be spending your money on; you have to set your own priorities, but obviously you'll be postponing non-essential expenditure. In other words, cutting the suit to fit the cloth. The advantage this time I guess (if there's any advantage at all) is that we've got more notice of this crisis than most, I think. It has been pretty well talked about for a while but it hasn't really happened yet. You've still got time to do some planning and budgeting. It hasn't crept up on you like a drought or some of the other recessions that we've had where we didn't have any idea what the future held. You know you're going to be squeezed this time, so you should be drawing up your battle plans. We've had a lot of talk about planning and budgeting from other speakers, and I'm a great believer in that as well. I think it might also be interesting if you looked at yourselves as small business men and women who produce raw material for the textile industry, and not as pastoralists. This might alter your perspective on the way you run your business and your outlook on the current situation.

2. MINIMISED EXPENDITURE

Your spending should already be in damage control mode because you have notice of what is going to happen. The worst hasn't hit us yet, so you should be planning. If there are a few essential items that you're going to have to do within the next five years, you have got to do them quickly because you haven't got much time. You have to eliminate expenditure that can be deferred and remove those non-essential items that you can do without.

I'm not going to detail too many cost-cutting measures because I think most are pretty obvious: mill runs on motorbikes; an extra day between runs; watch fuel consumption, trips into town and 240 V generator usage - maybe even attend fewer crisis meetings as somebody told me; or be your own shearing contractor. Now, I'm not really advocating the last to most people at the moment, but in the last industry recession we did the shearing ourselves as a cost-cutting measure. Then, recession was combined with a drought, so that we had very low sheep numbers and were able to so. We actually came down from 9000 sheep to 1710. When it finally rained in 1973, it was a pretty tough situation financially and we had to build up from there. We didn't buy sheep - we built numbers up - and it took a long time. So we had at least a dozen years of very tough times through which we survived by being tight with expenditure.

Limiting permanent employees is another possibility. Use contractors. Question aerial mustering and other established practices that you've got into the habit of using in the good times. I think you really have to sit down and have a think about it - it's all part of planning and budgeting. Live on your wits. In the last drought, although I'm not proud of it, we learned to beg, borrow or probably acquire what we needed. We learned how to graft from mining companies, friends and tourists. We know the people that we used up because they don't now ring up and say "Can we come up to the station for a holiday?". They didn't get one because they had to work pretty hard!

Those are some of the things to minimise expenditure.

3. GOT MARRIED (EMPLOYMENT POLICY)

Well that's a big step in anybody's life. In fact, Ermie and I ran Yerilla for a good many years through the last drought, the recovery, and the fires that followed. What you can do in terms of employment policy obviously depends on the size of the operation. Early in the drought, we had an old chap who had been with us for forty years and was only getting the pension. While he was away in the summer, it was just Ermie and me. But we needed visitors and friends as I said. We also used jillaroos and jillaroo-governesses in the recovery phase and they proved to be very useful. In fact, jillaroos are very adaptable; they can work inside or out, and they do a damn good job. So with employment policy you'll have to do the best you can with whatever size operation you've got, but obviously you'll be cutting down your staff.

4. RENOVATED THE OFFICE (FINANCE AND ADMINISTRATION)

Whatever you do on the station you can't forget what happens in the office. I think it's one of the most important places for running the business effectively - and even more so now. You might think you should be out rushing around fixing mills and panicking, but you may find that more planning would do you just as much good.

I don't know if I actually did renovate the office, but I did renovate after the drought anyway, even if not before hand. It's a very important place in the whole business operation. Install good lighting so you can work early in the morning and late at night, because you're probably going to have to do that this time.

John Finlayson talked about records. We keep similar records to his and I think most station operations do - you can't do without them. Budgeting is another thing that I'm very strong on. I believe you need a budget as you can't work out where you can cut costs until it is written down in front of you. If the figures are set down, then you know where to best operate on your costs. We get our income at the beginning of the financial year, as we sell our wool either in the last June sale or the early

July sale. So, early in the financial year we receive the bulk of our income for that year and we can budget on that basis. I draw up my budget in an exercise book, but if you are high tech and you've got a computer, that's obviously the best system. Mine is basically an expenditure budget, and I list down the items and every three months I file cheques which tells me where I am through the year, so I know what I haven't spent, what I need to spend, and what I don't need to spend.

It's just as important in good times as in bad times because it avoids that rush at the end of the year to try to spend money. Don't forget the long term view - losses can be carried forward indefinitely. Look ahead as well. I think we're going to come out of this crisis eventually, one way or the other. We didn't pay tax for many years until recently as a result of these carried-forward losses. During the tough times you should get some advantages - lean as they are - at the end.

5. BOUGHT A FAST RACEHORSE (OFF-STATION INVESTMENT)

This relates to off-station investment and diversification. I did have a fast racehorse which did help me get through the last drought (not that the money was for Yerilla), but it kept me in living expenses a little bit. Now I'm not suggesting that you go out and buy a racehorse (fast ones are pretty hard to find), but the principle is that off-station investment helps greatly through all of these crises. I know that a lot of you are going to say that it's a bit too late now, because you haven't got any money, but you should bear the idea in mind for the future. There are opportunities coming up all the time and, if you can put some money aside for off-station investment, you'll be far better off for it in your business. All the investments that my family has made, have come out of Yerilla. We go back to 1925. My father was broke for the first 20 years and he came good. He started investing off-station as income allowed, so it can be done. Our station only runs 8,000 sheep so you can still do something with any kind of an operation if you plan properly.

You have to seize opportunities that come up in things like off-station investment. There have been opportunities even in recent years, and I think some of you have taken advantage of those, like pegging mineral claims or playing the stock market. Even in bad times they are there.

Diversification is obviously limited in this country. Goats are going to play a small part in income, despite the problem this may raise for those that are trying to get them eradicated. I think they are still going to be regarded as a source of income in the next few years. I hope we can keep the numbers under control at least. Other minor diversification opportunities might be found in tourism and cottage industries, maybe even yabbies in the dams around Kalgoorlie. Another avenue of income is off-station work but this will be limited to those few in the right situation.

Just in case you might conclude from these few comments that I see the outlook as all gloom and doom, let me say finally that I believe we will survive this period of low wool returns, as we and our predecessors have done before. I hope we will learn from the experience and make the right decisions about our own futures, and the future of our industry.

STREAMLINING YANDAL AND BARWIDGEE

Len Boladeras

(Len and Lynne Boladeras with their two boys live on Yandal station which is 430 km north of Kalgoorlie. In 1988 they purchased neighbouring Barwidgee station and now run a total of 15,000 sheep on the two stations with a combined area of about 400,000 ha. This sheep number may increase when Barwidgee becomes more fully developed. Len and Lynne are both third generation pastoral folk.

Len is a member of the North Eastern Goldfields Land Conservation District Committee and the Agriculture Protection Board's regional advisory committee. From 1979 to 1984 he hosted a ewe flock management demonstration on Yandal station, conducted by the Department of Agriculture. As well as teaching her own children at primary level, Lynne has been involved with the Kalgoorlie School of the Air and the ICPA. She is a keen artist and craft person.)

Everyone's station is different, and it is not possible to generalise for all situations. Yet a number of problems are common to everybody. The uncertainty in the producer and buyer markets means that we don't know what our returns are going to be. It is almost impossible to budget and we don't know what will happen to our equity and debt/equity ratios. What do I tell the bank?

I am tired of the speculation, rumours and debate on the best course of action for the industry. If Andy Stoeckel has a crystal ball to see into the next century, where was it in 1988? The lack of stability for buyers, and lack of buyer confidence, has meant that dropping the floor price from 870 to 700 cents has, in fact, resulted in less wool being sold. Our contribution to the national wool clip is quite small, so we have little influence on the national total. Unlike many farmers, we have no alternative forms of income from pastoralism. Wool production has to be our mainstay.

We cannot sell our old sheep due to the very unfavourable supply and demand situation, so we have to adjust our flock numbers in other ways. The two alternatives are to kill the old sheep to maintain even numbers, or not to lamb for one year. In the second alternative, sheep would be kept on my stations to 6 year old, but these would produce more wool than the corresponding production of weaners.

The supply and demand problem of wool has been brought about in part by chasing an exclusive fashion market. I believe marketing programs should be broadened to include other possibilities.

I foresaw that the market was falling when annual returns fell for the last three years. So I took steps to prepare myself as best I could for the hard times that seemed inevitable, using the

funds I had available. Having listed my priorities I bought a plane, poly columns, specialist vehicle repair tools, five new bikes, and pipe and fencing materials. The plane saves me time by doing one mill run a week from the air. I do my other mill runs on the bike. Replacing galvanised columns with poly means that I can now pull the bores and wells with virtually no staff. I am prepared to do all my own mechanical work. Contractors erected extra fencing for me to open up new country and extend my area of stock control, so that I can carry stock for longer if that proves to be the best alternative. We have also installed some new goat yards to make goat mustering and turn off easier.

On the labour front, I decided it was only fair to inform contractors that I would have no work for them for the foreseeable future. I have cut my paid labour force from 3 full time and 2 casual staff to one girl. There is good reason for this. She is a competent jillaroo who can help me on the station, but she can also assist Lynne. With only the three of us to run the whole station operation, it is most important that we can support and help each other.

My next action was to look very critically at my fuel use, and to cost the fuel consumption of every machine. I found that by removing the mustering sirens from the plane reduced drag considerably, decreasing fuel consumption by 2 litres/hr. Changing the propeller reduced fuel consumption by a further 5 litres/hr. Cleaning the air cleaner on my 250 cc bike after 2000 km instead of after 3000 km has meant I can travel an extra 80 km on an eleven litre tank of fuel. Riding slower has resulted in a 2 hour decrease in the time I need to spend on a mill run backtracking to refuel at one of my fuel dumps. This is a significant saving on a mill run of 800 km. I use the bike more and the vehicles less. I drive slower, and I have cut out all but the most essential grader and tractor work. We use the generator less too - 3.5 to 4 hours a day instead of 5 hours.

I have no time for any off-station work. In fact, although I have had accountancy training, Lynne now does the bookwork to allow me more time to attend to the physical running of the stations.

I intend to have the lambs shorn at cost to minimise shearing costs. The only other saving I can see after that is to restructure my loans, but it hasn't come to that yet.

To finish on a positive note, our family has become tighter knit, with the boys away in school making their own savings for us, and supporting Lynne and I in all the ways they possibly can.

BOOK RELEASE

The Conservation Atlas of Tropical Forests: Asia and the Pacific

This book, published by Macmillans, presents a "detailed and authoritative study of the issues surrounding deforestation". It includes Australian rainforests within its coverage.

Further details, including a brochure, are available from:

Macmillan Direct, Freepost 12, 107 Moray St, Sth Melbourne Vic. 3205

A DEFINITION OF EFFICIENT PASTORAL PRODUCTION IN RANGELANDS

David Freudenberger, CSIRO Division of Wildlife and Ecology, PO Box 84, Lyneham. ACT 2602

I recently took up a research position in animal production and ecology with CSIRO's National Rangelands Program. One of the aims of the program is to find ways of enhancing efficiency of animal production within the context of resource maintenance and improvement. This aim is common in many research and management centres. But what do we mean by **efficiency?**

Opening the *Macquarie Dictionary*, I found this definition of efficiency: "the ratio of work done or energy developed by a machine, engine, etc, to the energy supplied to it". To paraphrase, efficiency is the ratio of products to inputs. The key is to state the products and inputs, otherwise efficiency is meaningless. Economists think about the ratio of dollars out to dollars in. In terms of agricultural ecosystems, dollars are only an inexact and partial measure of the energy, nutrients and water flowing in and the products coming out of the system. An efficient agricultural ecosystem is one that has a high ratio of products to the energy, nutrients and water inputs. The aim of enhancing the efficiency of pastoral production is to improve this ratio of products to inputs. The inefficiencies in agricultural ecosystems are energy, nutrients and water lost to the system that otherwise had a potential to be converted into products. Historically, efficiency wasn't the issue, just enhanced production. Hopefully, the era of yield/ha regardless of costs is drawing to a close. Production has to be balanced with cost.

This concept of production efficiency is markedly different to the concept of productivity. Productivity in arid and semi-arid rangelands will always be low in the long term and variable during the short term due to inherent variations in nutrient and moisture availability. Fortunately, we can do little about the overall inputs of nutrients and water. Other agro-ecosystems are in a precarious position because they are dependent upon mining energy (fossil fuels), nutrients (fertilizer) and water (irrigation). What we can do as rangeland (resource) managers and associates is to temporarily capture and recycle through pathways of soil, plants and animals as much of the limited energy, nutrients and water that comes into the rangeland systems as possible in order to have reasonable and sustainable outputs; be it wool, meat or even aesthetics (tourism). Inefficient pastoralism is recognized by the high loss of energy, nutrients and water out of the paddock and into creeks or back into the atmosphere as heat, evaporation or dust. Woody weeds, I prefer the term unpalatable perennials, are inefficient because they cannot be easily converted into an economic product. At least unpalatable perennials temporarily capture a considerable amount of energy, nutrients and water. Many other rangelands have even greater inefficiencies due to the over-removal of unpalatable perennials for fire wood (e.g. Sahelian Africa).

Specifically, I would define efficient wool production in the same sense; a long term high ratio of wool output to the variable inputs of energy, nutrients and water. I emphasize the long term efficiency of production because it is possible to

have a high ratio of products to inputs but simultaneously degrade the resource base. Perennial grasses and palatable shrubs are a key component of efficient wool production because they capture and temporarily hold energy, nutrients and water better than annual plants, which cannot utilize much of the available elements because they are locked up as seeds for so much of the time.

Efficient pastoralism, as defined by the ratio of products to inputs, can be equivalent to economic efficiency if the fluxes of energy, nutrients and water are adequately costed. Herein lies the difficulty; it is not easy to put a dollar value on such processes as the reduction of perennial pastures or the loss of 1 mm of soil. This type of costing is the subject of much current research and will allow us to define and measure production efficiency in dollars, a fairly universal unit of measure.

Efficient pastoralism is often measured, if at all, in terms of only human inputs of energy, nutrients, water and associated management costs. This may be partially appropriate for intensive agricultural systems, where human inputs overshadow the relatively constant natural inputs. However, for the extensive and variable rangelands, the emphasis must be placed on managing the ecosystem inputs with secondary emphasis on human physical inputs. The emphasis in rangelands must be to conserve nutrients and water through soil, plants and animals and not try to provide a technological fix except in localised inputs such as ripping of rabbit warrens or water ponding in areas of high potential productivity.

Efficient pastoral production is not synonymous with profitable production. Profit is partially dependent on influences outside the efficiency ratio of products to inputs. This ratio may be high, but if the value of products are low, profitability may not be realized. A case in point are goats and/or kangaroos. Managed appropriately, both can realize a high efficiency ratio due to their remarkable ability to convert sparse and poor quality plant resources into animal tissue. However, at this moment, pastoralism based on kangaroos and/or goats is not profitable due to the low economic value of their products. Kangaroo is an essentially similar product to deer venison which currently retails for about $4/kg carcass weight. At this price for kangaroo meat, graziers would be dancing to the bank!

The next time someone rolls "efficient production" off the tip of their tongue, ask them what they mean. Are they assuming greater yield/ha, or greater profits, or do they have a more appropriate definition such as my own in which efficient animal production is a high ratio of meat and fibre to the economic and natural inputs of energy, nutrients and water. The antithesis, inefficient animal production, is a low ratio of products to inputs of energy, nutrients and water that are lost (e.g. eroded) from the landscape.

THE ENVIRONMENTAL PROTECTION AUTHORITY'S INVOLVEMENT IN THE RANGELANDS

Helen Allison, Environmental Protection Authority, Perth WA 6000

Introduction

Environmental protection in Western Australia is part of world wide action to protect and conserve the living resources of our planet. In 1980, the World Conservation Strategy was developed to find ways of reducing global environmental problems. From this beginning, National and State Conservation Strategies were prepared to find solutions at a more local level.

The State Conservation Strategy for Western Australia was prepared by people from a wide range of interest groups including representatives from the pastoral industry. The objectives of the State Conservation Strategy are to ensure sustainable development and resource conservation. In practical terms, this means protecting the soil and vegetation and the animals which are dependent on them. This will only be successful if the whole community takes responsibility for its actions and works together to make it happen. The Environmental Protection Authority (EPA) will help to identify directions and to coordinate the work, but to achieve these objectives, the thrust will have to be made by land managers.

What is the Environmental Protection Authority?

The EPA was established in 1971 and strengthened in the Environmental Protection Act of 1986. The Authority consists of a five member board and about 130 departmental officers involved in environmental investigation, environmental impact assessment, pollution control and environmental education. The EPA is based in Perth, with regional offices in Kwinana and Bunbury at centres of large scale industrial development, and at Karratha in the arid pastoral and mining area of the Pilbara.

What does the Environmental Protection Authority do?

In Western Australia, there are 50 or more Acts of Parliament which in part provide for protection and management of the environment. One example which most would be familiar with is the Soil and Land Conservation Act which is administered by the Commissioner for Soil Conservation on behalf of the Minister for Agriculture. The EPA's role is not to override functions of other Acts, because we are not a management body, but to augment, and cooperate with, relevant agencies to better protect the environment. For example, the EPA will ensure that, as far as possible, problems of land degradation in the rangelands are dealt with through the Land Conservation District Committee system with the assistance

of the Department of Agriculture, and through the pastoral provisions of the Pastoral Board.

Environmental Protection Authority officers will often be members of advisory committees such as the Soil and Land Conservation Council which advises the Minister for Agriculture on land conservation issues. Through this Council, the EPA has contributed to the preparation of the Decade of Landcare Plan. The Soil and Land Conservation Act nominates an EPA officer onto soil conservation appeal committees.

Part of this area of responsibility is achieved by the preparation and implementation of Codes of Practice and Environmental Protection Policies for those areas of the environment which need special protection - even laws to prevent long term damage from human activity. As with the State Conservation Strategy, the final documents are the result of a consultative process with people throughout the community - people such as pastoral representatives, local government and organisations who are likely to be affected.

The EPA has no power to approve or reject development proposals; it simply makes recommendations to Government. By law, any development or change in land use which will have a significant effect on the environment must be brought to the attention of the EPA for environmental impact assessment. This includes the conversion of any land to pastoral lease. Rather than assess these itself, the EPA has requested the formation of a working group of Government agencies, chaired by the Department of Land Administration and including the Pastoral Board, to advise it. In assessing exploration and mining proposals, the EPA recommends consultation with pastoral lessees and LCDCs.

With pollution control, the EPA has powers under the Environmental Protection Act to control, prevent and abate pollution. The definition of pollution is wide and may include land degradation. Some rural activities such as intensive stock holding yards and intensive animal industries are licensed by the EPA.

Environmental Protection Authority and the Rangelands

The condition of the grazed rangelands, occupying 38% of Western Australia, has always been of concern to the EPA. The Authority's concerns extend beyond pastoral land use to all land uses in the pastoral regions, e.g. nature conservation, mining, tourism, roads and railways, towns and water supplies. Even though other agencies, e.g. Department of Mines, may have primary responsibility for environmental management, the EPA can initiate the preparation of Codes of Practice and guidelines for activities to reduce possible adverse environmental effects. A number of these have been produced. There exists the potential for a Pastoral Code of Practice, which would be a negotiated agreement for action amongst pastoralists, administrators and the EPA. The objectives of such a code would be to achieve sustainable land use in the pastoral industry.

This brings us back to the State Conservation Strategy and two of the five objectives:

1. to maintain essential ecological processes and life support systems
2. to preserve genetic diversity

The first objective is familiar to all pastoralists - i.e. maintaining soil, feed and water as basic resources on which their livelihood depends. The second, on the other hand, is about nature conservation and maintaining natural environments in areas set aside for that purpose. These conservation reserves, however, may also serve other purposes such as reference sites for pastoralists and government personnel. A case in point is the area set aside on Boolardy Station in the Murchison (described in RMN 90/3).

The Decade of Landcare Plan for Western Australia has been prepared to satisfy the State's need to plan and manage for sustainable use of soil, water, vegetation, fauna and other natural resources of the environment. This need is encompassed by the first objective of the State Conservation Strategy, as given above. One focus for the plan is appropriate land use for all lands. The EPA therefore supports the concept of the Plan and through membership on the co-ordinating body, the Soil and Land Conservation Council, is working towards putting it into action.

The EPA has devoted a great deal of effort to the second of the above Strategy objectives. In 1976 the EPA recommended, and the Government endorsed, a system of conservation reserves for Western Australia. In the intervening 15 years, their implementation has been deferred because of separate mining, pastoral and Aboriginal land rights inquiries. Many vegetation types are not protected and the second objective of the State Conservation Strategy is not being achieved. It is important that examples of all vegetation types and ecosystems be protected. In the process, it is hoped that the animals dependent on those habitats will also be protected. National parks and nature reserves are one way of conserving these areas.

The Department of Conservation and Land Management (CALM) is responsible for managing these areas. The EPA only becomes involved when mining or other development is proposed in, or near, them. The EPA and CALM may need to work together on issues relating to rare flora and fauna, or protection of native vegetation. However, rangeland managers, as caretakers of the land, have a responsibility to protect all areas under their care.

Pastoral leases generally comprise several land systems with their own characteristic vegetation. Each area has a separate management requirement. The WA Department of Agriculture's range monitoring system (WARMS), which uses small representative areas throughout the land system, is one method by which pastoralists can gauge how well they manage the land. However, grazing may have changed the vegetation from its original composition. It is sometimes necessary to have larger areas set aside. These areas should ideally have a good conservation value with a full range of

plant species which will act as a benchmark or reference site. The lessees of Boolardy Station recognised the value of setting aside an area of virgin country to act as a reference site for the benefit of all pastoralists in the district. Staff from the WA Department of Agriculture and CALM have surveyed the area and together with Land Conservation District Committee members are managing the area jointly for the protection of plant and animal species and as a reference area for pastoral management.

The EPA considers vacant Crown land as having conservation value, particularly when it has not been altered by changes in fire patterns or grazing. The EPA considers it inappropriate for stock from adjacent leases to graze on, or use waters in, vacant Crown land. The Authority may seek co-operation from the Pastoral Board (or may need to take its own action in some cases) to prevent this happening. In some instances, such usage may occur through inappropriate lease boundaries such as those that do not follow easily fenced topographical features. The EPA would encourage lessees, when reviewing management plans, to also review their boundary fencing to better reflect land types and to improve its effectiveness. It would also support changes to irrelevant NS-EW boundaries.

No matter what progress is made, it is necessary to have information on the nature of the land as it was, and its present condition, so that future change can be interpreted in the light of land use. This will allow management strategies to change so as to ensure continuing improvement. Just as the rangeland manager monitors the effects of grazing (with, for example, tools such as the WA Rangeland Monitoring Scheme), the EPA has been charged with monitoring the condition of the whole environment of Western Australia.

SPEAKING AT SPOKANE

The American Society for Range Management Planning Committee invites participation in its 1992 international convention. This convention, titled "Range Management - A Public Benefit", will be held in Spokane, Washington on February 9 - 14, 1992. Program highlights include technical paper presentations, poster sessions, youth and student activities, spouse activities, and the President's reception.

Further information can be obtained by contacting:

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LAND ASSESSMENT IN SOUTH AUSTRALIAN RANGELANDS

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Introduction

The passing of the Pastoral Land Management and Conservation Act in March 1989 marked the official start of a new phase in pastoral land management in South Australia.

The objectives of the Act are:

1. to ensure that all pastoral land in the State is well managed and prudently utilised so that its renewable resources are maintained and its yield sustained;

2. to provide for-
   (a) the effective monitoring of the condition of pastoral land;
   (b) the prevention of degradation of the land and its indigenous plant and animal life;
   (c) the rehabilitation of the land where damage does occur.

Tenure, rent and 'public access' provisions are also covered by the Act and its regulations.

The land held under Pastoral Lease comprises some 333 individual leases that are amalgamated into 211 properties, covering 405,000 sq km. The Pastoral Board, through the Pastoral Management Branch of the Department of Environment and Planning, is responsible for the lease assessment and monitoring program and all leases must be assessed by March 1998. This paper concentrates on the land assessment process and the setting of long term stocking levels. Tenure, rent and 'public access' may be the subject of subsequent articles.

Assessment of land condition

The Act specifies that the assessment of the condition of the land must:

- be thorough;
- include an assessment of the capacity of the land to carry stock;
- be conducted in accordance with recognised scientific principles;
- be carried out by persons who are qualified and experienced in land assessment techniques.

Additional suitably qualified staff were recruited in 1990 and have been further trained to ensure they are experienced in land assessment techniques. The ten field staff work in teams of two on allocated leases, generally spending two weeks on each lease assessing land condition and setting up a baseline monitoring system.

Lessee involvement in the assessment and monitoring program is strongly encouraged, and most lessees have been supportive of the establishment of baseline photopoints. Indeed, many have suggested that it should have been done 20-30 years ago as it would reveal that the condition of the land has improved during this period.

The lease assessments will be completed as blocks within the eight newly formed Soil Conservation Board Districts, established under the Soil Conservation and Land Care Act, 1989. The first district, due to be completed by October 1991, is in the North West, covering the Kingoonya Soil Conservation Board District.

The process of lease assessment involves a preliminary reconnaissance survey by senior scientific officers to determine pasture types and condition criteria. This is followed by a training period for field staff to become fully competent in using these criteria in assessing the various land condition states, before commencing the individual lease assessment program.

This strategy has the objective of ensuring that all staff will assess the condition of land uniformly and without bias, by using clear criteria and a series of randomly selected sites.

Reconnaissance Survey

The purpose of this survey is to identify the various pasture types (eg saltbush, bluebush, mulga grasslands) that occur within the district and to determine the criteria that will be used to identify three condition states (1 = degraded, 2 = reduced and 3 = near intact) within each type. To allow for the influence of seasonal changes and drought, the criteria are based primarily on perennial vegetation components, with erosion levels included where applicable. The criteria and photo-standards are compiled into a manual which are to be used by the assessment teams.

All field staff are then trained on-site to recognise the pasture types and to use the agreed criteria objectively and uniformly.

Lease Condition Index

The field teams are then allocated a batch of leases to assess. A transect through the lease is planned that will cover most of the accessible parts of the lease and a minimum of 80 random sample points are generated along this path. The number of random points may exceed 80, depending on the size of the lease.

When the team arrives at precisely this point in the field (determined by an electronic trip meter), the assessment criteria are used to score the condition of the land in the camera field of view. Firstly, the pasture type is identified and then the appropriate condition state (1, 2 or 3) is determined. A slide photograph is then taken.

A 'weighted average condition index' for each lease is determined by multiplying the percentage of sample points for each condition rating by the rating, giving a value range from 100 to 300. This index employs standardised criteria and sampling routines and provides an objective assessment of the land condition between properties within the district. The data are reviewed by the full assessment group, including senior staff and the pastoral inspectors, to assign land condition categories. Thus, properties in the district are sorted into three groups; degraded, reduced or near intact.

Capacity of the Land to Carry Stock

The Pastoral Board is required to specify a stocking level for the lease, and the lessee is not permitted to exceed this figure without the prior permission of the Board.

Maximum stocking levels under the previous Act were last determined in 1975. These figures were calculated from an index based on the 1964-75 10 year average. This rated figure provided an estimate of lease carrying capacity (its potential) in an average year when fully developed. Rents were charged on this figure without regard for land condition or actual numbers carried. The maximum stocking figure was the rated figure plus a 25% allowance for seasonal conditions. This maximum figure was often incorrectly interpreted as the actual carrying capacity of the lease. In some cases, it was incorrectly calculated and recorded as being from 10% to 105% above the rated figure, instead of the normal 25%.

The strong land care emphasis of the new Act is clearly specified and the Board must ensure that degradation does not, or is not likely, to occur. The balance between setting a long term stocking maximum that will not be abused, and a legal requirement that specifies that the land must not be degraded poses a dilemma for the Board. It is recognized that setting maximum stocking levels for leases is far from ideal as a control method because these figures are inflexible in correctly managing individual paddocks under a range of seasonal conditions.

The evidence for carrying capacities must come primarily from what the land has carried in the past, what management practices have been implemented for various pasture types, and how this is related to present land condition. In setting new long term stocking levels, the 10 year (1980-89) stock average for leases assessed as being in good condition, will be adopted as a benchmark for determining the capacity of the land to carry stock. Those leases that are assessed as being nearly intact (i.e. good condition) set the land management standards for the various pasture types in the district, as they are deemed to meet the requirements of the Act in maintaining the renewable resources and thus represent the 'capacity of the land to carry stock'. Other factors such as the number of stock per water point, size of paddocks, grazing management, seasonal use, number and location of waters, water quality and land management problems are also considered in determining the final long term stock level.

Leases assessed as being in degraded or reduced condition states would have their stocking rates and management practices compared with those of the benchmark leases. It is likely that their stocking levels would be reduced. The Board would determine an appropriate stocking level based on the land condition and the above factors.

In determining the new long term stocking level, a margin above the maximum will be allowed for temporary seasonal increases, depending on the condition of the lease. Category 3 leases (good condition and management) will be allowed up to 25%, but only 10% for Category 2 (fair condition) and no increase in Category 1 (poor condition) without Board approval.

The Board may also elect to use Section 43 of the Act where a notice to destock or take other action may be required to prevent the likelihood of degradation of the land in the short term.

Lease Assessment Reports

Lease assessment reports are submitted to the Pastoral Board in a district batch and contain an assessment of the condition of the land, any identified land management problems along with suggested strategies to combat these, and calculated carrying capacities.

The Board reviews these reports and they are then forwarded to individual lessees, who have 60 days to consider and comment on their report. The local Soil Conservation Board is also invited to comment. The Pastoral Board reconsiders the reports and invited comment, and then sets the land management conditions of the lease and the long term stocking level.

Monitoring

The assessment teams also establish a monitoring baseline in each paddock, which consists of a photopoint and a fixed belt transect to collect ecological data. The details are compiled into a manual and the lessee is given a copy and encouraged to photographically monitor the sites when a visible change becomes apparent. These sites are located on water runs to enable the lessee to use the sites on a regular basis. The sites will be re-monitored by Pastoral Management staff after 5-7 years, and the combination of the short term details collected by the lessee and the long term monitoring by Pastoral Management Branch, coupled with stock figures at the paddock level, will provide a valuable interpretative base for evaluating changes that have occurred within each paddock over a district.

Remotely sensed imagery is being used as a mapping and monitoring tool, while computer based geographic information systems are being evaluated as cost effective options to assist in monitoring.

The lease and land system boundaries are digitised, together with water points, tracks, internal fences and photopoint locations and this will provide a graphical and textual database. Hand held global positioning (GPS) units will also be used in the near future to accurately locate features and sampling points.

This inventory data will be of use to the local Soil Conservation Boards in formulating their district plans under the Soil Conservation and Land Care Act, 1989.

Management

Land management guidelines for each district will also be compiled, and these will provide information for lessees and Soil Boards on management strategies for the area. The information will be extracted from research findings, the assessment process and the experience of the lessees in that area. These guidelines would be developed in association with the district Soil Board and would form part of the District Plan. The guidelines would be used by the Soil Board and Pastoral Board as the standards for the management of the various pasture types in that district. All lessees would then have information on what constitutes good land management practices within the district.

Regular inspection of leases by Pastoral Inspectors will continue, as this provides an essential link between lessees and administrators and, to some degree, provides for the early detection of land management problems.

Conclusions

The new legislation arose out of public concern over land degradation and provides the legislative framework to ensure that the emphasis in managing the pastoral lands is on land care rather than administrative and tenure provisions.

The challenge for the future is to ensure that the land resources are appropriately managed for future generations to use and enjoy. This must combine the practical knowledge of land users with the results of scientific studies and research to achieve a balanced land use. Our record over the previous 150 years provides evidence of past land abuse. In some cases, inappropriate government policy and action have contributed, resulting in the present need for expensive rehabilitation programs. The assessment and monitoring program described here will perhaps provide evidence that the condition of South Australia's pastoral lands is steadily improving and will reinforce the joint efforts of governments and the pastoral industry towards sustainable land management of the pastoral zone.

FURTHER STUDY?

The University of New England - Orange Agricultural College has a number of courses available by study at home. These courses provide expanded career possibilities and are of potential relevance to Society members.

Of particular relevance are the Associate Diploma in Land Management and the Graduate Diploma and Graduate Certificate courses in Sustainable Agriculture. These courses are pitched at people in agriculture, agricultural extension and service industries.

Further information and application forms can be obtained from the Orange Agricultural College, Leeds Parade, Orange, NSW 2800 (Ph 063 635555).

RESPONSE OF ARID RANGELAND VEGETATION TO CATTLE GRAZING

Peter Jessop, Dept of Environmental Science and Rangeland Management, The University of Adelaide - Roseworthy Campus, Roseworthy SA

The research I am currently undertaking as my Masters degree responds to the new South Australian Pastoral Land Management and Conservation Act (1989) which requires that pastoral leases be scientifically assessed for range condition, their problems specified and their carrying capacities prescribed, all by the 7 March 1998. The necessary information required to achieve this for South Australia's northern rangelands does not exist. This project will initiate the collection of usable data on this area specifically for range condition assessment.

The South Australian Department of Environment and Planning has developed a range assessment methodology under the requirements of the Act, which employs the Weighted Average Condition (WAC) index. However, this index requires a knowledge of the range condition indicators for each landscape type, i.e. which species increase under grazing and which species disappear. I propose to identify the indicator species for the northern (SA) cattle rangelands based on Welbourn Hill, Todmorden and Allandale pastoral leases.

The expected outcomes will be:
- a robust and credible WAC index for assessing leases in northern cattle rangelands
- identification of indicator species for use by pastoralists themselves
- new knowledge about the ecology and management of these rangelands.

Methodology

I intend to undertake botanical field surveys, based on a detailed account of pastoral lease geography and management history (development of fences and watering points), land forms and vegetation, and local pastoralists' knowledge. Piospheres, or distance-from-water effects, will be examined around waters with a known grazing history to determine the response of perennial species to cattle grazing. Documented history, local knowledge and 'natural experiments' will be used to distinguish between grazing effects and other environmental factors such as fire. Natural experiments are the present outcomes of past management practices, e.g. the correlation between piosphere (water point) gradients and perennial species abundance. Other comparisons can, and will, be made across fences. Information will be sought on the location and installation dates of fences and waters, paddock stocking histories and map-based land resource information.

Photopoints and exclosures will be used to document recovery of grazed areas after rain. The degree of recovery is an indicator of range condition. Vegetation information will be interpreted in conjunction with station records of stock numbers and turn-off. Information obtained from these exclosures over the next two years will assist me in my Masters degree. After that, they should serve as valuable reference areas and will be maintained and monitored by the South Australian Department of Environment and Planning.

Currently

Three sets of 50 m square exclosures were recently erected on Todmorden station to allow future comparisons of cattle and rabbit impact on the vegetation. These exclosures comprise a cattle and rabbit proof plot, a plot which excludes rabbits only and a control area. It is hoped that these exclosures will last for up to 15 years thereby allowing the continuous monitoring of animal impact in the region. Further exclosures will be erected to take account of all the major vegetation types.

This work is directed towards developing easily recognized plant indicators of range condition that pastoralists can use for the sustainable management of their leases under the Pastoral Land Management Act.

COMPARING MEASURES OF BASAL COVER OF GRASSES USING A POINT QUADRAT AND DIRECT MEASUREMENT

David Eldridge, Graduate School of the Environment, Macquarie University, Sydney NSW 2109

Basal cover is a useful measure of cover and a proxy for biomass in semi-arid plant communities dominated by perennial grasses. Basal area of grasses can be defined as the total area of the soil surface occupied by the butts. As a measure, basal cover is less sensitive than foliage cover to short-term fluctuations imposed by, for example, crash grazing, insect defoliation and wildfire. It is therefore a good indicator of long-term range condition. Basal cover is also strongly correlated with runoff and water erosion (Pressland and Lehane 1982). A direct measurement of basal cover can provide useful insights into the population structure of perennial grasses as this indicates the size distribution and possible age structure of the population and therefore its capacity to produce new individuals.

Measurement Techniques

Techniques for determining herbaceous cover (both basal and foliage) have included various point-based methods such as wheel-pointing (Mentis 1981), step-pointing (Cunningham 1975) and numerous point-quadrat techniques (e.g. Cook and Stubbendieck 1986). Apart from the many problems associated with point sampling by wheel- or step-pointing (Friedel and Shaw 1987), measuring basal cover by step-pointing is

complicated by the fact that projected foliage cover often obscures the grass butts as the vegetation is trampled to the ground by the recorder.

In range monitoring, techniques for measuring vegetation cover over large areas of rangeland must be reasonably rapid as well as accurate (Friedel and Shaw 1987). Because the traditionally used techniques of step-pointing and wheel-pointing suffer from high variability between observers, quadrat techniques such as dry weight rank have been recommended (Friedel and Shaw 1987). Where cover data are required on a finer scale however, more detailed techniques may be required such as the use of point quadrats using a large number of points or, in the case of grass butts, direct measurement.

At Yathong Nature Reserve south west of Cobar NSW, I have been studying the influence of soil and vegetation attributes on infiltration, runoff and sediment movement. To characterize cover, I measured the ground cover of perennial grasses in small plots in a pasture dominated by *Stipa* spp. Twenty nine plots, each measuring 0.80 m by 0.80 m were intensively sampled to measure, among other things, the basal cover of grasses.

The Measurements

I used a point quadrat (Semple and Leys 1987) to obtain one measure of basal cover. This records the vegetation when pins are dropped vertically from a frame supported over the plots. One hundred and sixty points were used to measure the cover on each plot. The quadrat has 10 rows of 16 pins, with 50 mm spacings between the pins and 90 mm spacings between the rows. Using this device, the basal area of the grasses was determined by the total number of pins touching grass butts. A second measure of basal cover was obtained by directly measuring the diameters of individual grass butts in the same plot using a tape measure. All grass butts within the plots were measured.

Results

There were gross discrepancies in basal cover as measured by the two techniques. Cover measured by the point quadrat was three to four times greater than that measured by the diameter technique (Fig. 1). Diameters of individual butts ranged from less than 5 mm to more than 60 mm. Eighty six per cent of the grasses had diameters of less than 30 mm (Fig. 2).

Figure 1. Scatter plot of basal cover measured with the point quadrat and by direct measurement of diameter.

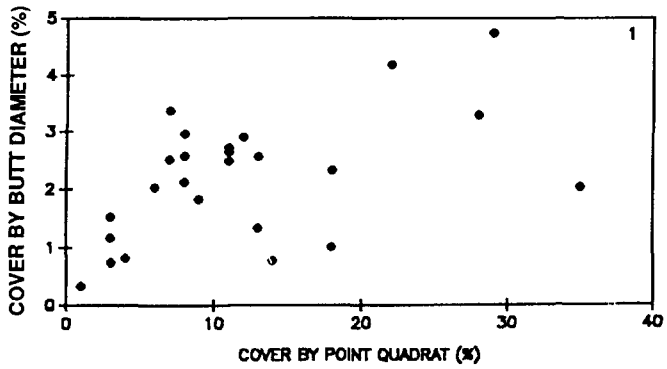
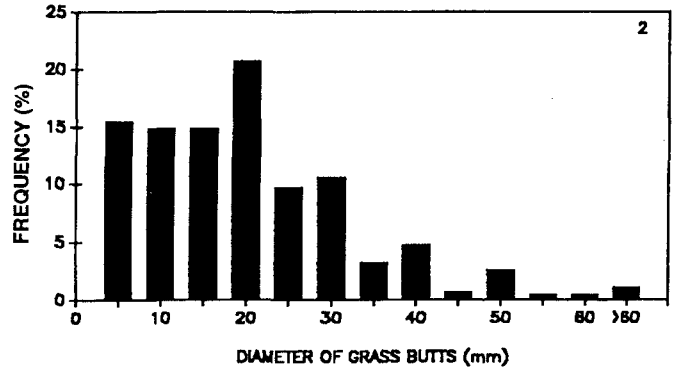


Figure 2. Frequency distribution of grass butt diameters (mm) used in the comparisons.



Discussion

In accordance with other studies where basal area has been measured (e.g. Orr 1979), it is unlikely that basal area of grasses exceeds 5-6%. It is probable therefore that the point quadrat technique was overestimating basal area. Thus a point quadrat using 160 points per 0.64 sq m (i.e. 250 points per sq m) does not provide a realistic measure of the true cover of grass butts in this environment.

Differences in basal cover could have arisen from differences in interpretation of what does, and does not, constitute a 'hit'. For example, a basal hit could have been incorrectly recorded when the pin hit a piece of vegetation attached to the base of the plant. Using the diameter technique, there would be fewer problems associated with definition and only butts would be measured no matter how small. If the butts were too small however, there could be too much error associated with their measurement. Moreover with the point quadrat method, only entire quadrats are regarded as independent, not the individual points (Goodall 1952). Thus the quadrat method is statistically less efficient.

In the present trial, I used a point quadrat technique because I wished to measure cover components other than basal cover. In other situations at different scales, the minimum number of points required to adequately sample basal cover using a point-based method might restrict the use of this method due to the low frequency of strikes (Mentis et al. 1980). Techniques other than direct measurement of individual grass butts, even at a high intensity of sampling, may overestimate the true basal cover and result in erroneous conclusions.

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APPLICATION ABSTRACTS
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PAPERS

Effects of Providing Supplements During the Wet Season on Beef Production in the Darwin District of the Northern Territory
T.H. McCosker, P.K. O'Rourke and A.R. Eggington

Brahman cross cattle were supplemented over a four year period at Adelaide River in the monsoonal tallgrass region of the Northern Territory. Eight herds totalling 870 head (cows, bulls, steers, heifers) were allocated to four different wet season supplementation regimes. These were nil (Control), a complete mineral mix (Mineral), the same minerals plus nitrogen and protein (+Protein), and the consecutive use of salt, mineral and NPN/protein supplements over the early, mid, and late wet seasons, respectively (Strategic). The cattle in all treatments were supplemented with NPN plus minerals during each dry season.

Production data (reproduction, lactation, mortality, liveweight) were recorded biannually during the dry season. The +Protein treatment had higher lactating cow pregnancy rates, branding rates, calf weight per breeder and had lower mortalities in each animal class than the Control. The response to the Mineral and Strategic treatments was intermediate to the Control and +Protein, but was not significantly greater than Control for reproductive variables. All supplemented groups had significantly lower mortality than the Control.

Classes of stock differed in their response to supplements, with lactating cows being more responsive in pregnancy rate to supplements, than non-lactating cows. Herd production was also heavily influenced by class of country and seasonal conditions.

Wet season supplementation with NPN/protein and minerals has the potential to substantially increase herd productivity in the monsoonal tallgrass region.

Grazing Management Strategies for Reseeded Rangelands in the East Kimberley Region of Western Australia
R.B. Hacker and S.B. Tunbridge

Reseeded rangelands within the Ord River Regeneration Reserve are characterized by a patchwork of vegetation communities in various stages of regeneration. Some areas are dominated by annual and semi-perennial species, particularly limestone grass, while seeded species, particularly Birdwood grass, are dominant in other areas.

Cattle grazing these rangelands tend to favour the short grass patches which are the major contributors to liveweight gain under reasonable seasonal conditions. Perennial grasses contribute more to animal production when seasonal conditions are less favourable.

Given this pattern of area-selective grazing, continuous grazing is not an appropriate management strategy for these rangelands. Continued regeneration will be achieved either under total exclosure or under a tactical management system which ensures that a minimum level of cover is maintained on the short grass phase and that the end of dry season utilization level for the major perennial species is maintained at a yearly average of about 30 per cent. It appears that the level of utilization may be considerably higher in individual years so long as subsequent compensation maintains the average at about this level.

Effects of Sheep Grazing *Astrebla* Grasslands in Central Western Queensland - Dynamics of *Astrebla* Spp. Under Grazing and Exclosure Between 1975 and 1986
D.M. Orr and C.J. Evenson

Between 1975 and 1986 rainfall was more important than light grazing (30% utilization) in determining changes in basal area and yield of Mitchell grass (*Astrebla* spp.). However, summer drought increased the level of utilization which, in turn, may compound the effect of drought by affecting recovery. Grazing increased the rate of turnover (both death and recruitment) of plants and it was concluded that grazing, in the long term, is beneficial to these grasslands.

ARTICLE

The Cost of Aerial Baiting for Wild Dog Management in North-Eastern New South Wales
J.A. Thompson and P.J.S. Fleming

Aerial baiting, using meat baits poisoned with compound 1080, is widely used for the management of wild dogs in north-eastern New South Wales. Following the aerial baiting in 1988, a survey of participants was undertaken to determine the costs involved in annual baiting programs. The total cost of the 1988 aerial baiting was $106,152 with the major components being labour and helicopter charter. Predictions of the cost of future aerial baiting campaigns can be made using the linear relationship between the quantity of bait used and the total cost of aerial baiting. The cost-efficiency and cost-benefits arising from aerial baiting are discussed.

SHORT COMMUNICATIONS

Effect of a Single Clipping on the Seed Production Response of *Astrebla* Spp.
D.M. Orr and C.J. Evenson

A previous study of the effects of grazing on curly Mitchell grass (*Astrebla lappacea*) indicated that grazing promoted the production of seed by increasing the density of seed heads. This short communication reports a field study undertaken to examine this effect in further detail.

Plants were clipped at the end of the dry season to imitate a wide range of grazing pressures and seed production was measured following good summer rainfall. The results indicate

that increasing levels of clipping promote the production of an increasing number of secondary tillers (stems) which, in turn, produce seed heads.

An Evaluation of Cover Type as a Predictor of Soil Surface Roughness in a Semi-arid Grassland
D.J. Eldridge

Erosional processes operate at a range of scales from a whole catchment right down to the microscale associated with individual plants. Processes occurring at the microscale are important because they ultimately affect what happens at a management or paddock scale. At the microscale, grasses play an important role trapping sediment, seed and nutrients around their butts during rainflows, and are thought to alter their micro-environment by increasing soil roughness or microtopography.

This paper reports a test of the hypothesis that grass sites are rougher than ephemeral sites and investigates whether routine measurements of cover can be used adequately to predict soil surface roughness.

Sites dominated by grasses were rougher than sites dominated by ephemerals but the type of surface cover, i.e. litter, cryptogram, bare soil, grass or ephemeral, did not consistently relate to the degree of surface roughness. The implications are that the rougher grass sites should store more water on the surface and have greater infiltration than ephemeral sites.

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FINAL REPORT ON THE IVTH INTERNATIONAL RANGELAND CONGRESS

H.N. Le Houerou, President, IVth IRC, Montpellier France

(Ed. This is an edited version of the President's report. The full report is available, on request, from Margaret Friedel, CSIRO, PO Box 2111, Alice Springs NT 0871.)

The IVth International Rangeland Congress was held as planned from April 22-26 1991 in Montpellier, France. It brought together 620 participants from 67 countries. This was the first Congress where French speaking participants outnumbered English speaking delegates. Participants by country included:

Country	Number	%
France	189	30
USA	42	7
Australia	38	6
Spain	36	6
Algeria	30	5
China	25	4
South Africa	25	4
Italy	17	3
Germany	17	3
Morocco	14	2
Tunisia	11	2
Kenya	11	2
Senegal	10	2
Great Britain	9	1
India	9	1
Holland	8	1
Uruguay	7	1
Mexico	6	1
New Zealand	6	1
Belgium	5	1
Switzerland	5	1
Chile	5	1
Argentina	5	1

This Congress presented a certain number of innovations over past meetings:

- There were no readings of individual papers. Instead, syntheses of the papers were presented in the reports of the 16 different symposia, thus leaving a large place in the schedule for discussion.

- There were almost 300 papers, 320 posters, 13 videos, 41 slide shows and 11 software presentations. The use of videos, slide shows and computer presentations constituted a series of innovations that seem to have been well received by most participants.

- For the first time, Eastern Europeans participated in an International Rangeland Congress: Soviets, Poles, Hungarians, Yugoslavs, Romanians.

- Three mid-Congress excursions, included in the basic registration fee, were an additional innovation. Each of these day trips emphasized very different problems and finished with a banquet featuring local products.

- The high participation of 'francophones' (French speaking) and individuals from developing countries, notably Africans, also represented a change from previous meetings.

- The simultaneous translation of all Congress activities was particularly well received and it has been decided that future Congresses will be at least bilingual.

However, a few inadequacies must also be acknowledged. These include the low participation by sociologists and socio-anthropologists and the low number of registrations for the pre- and post-Congress technical excursions. The presence of the Gulf War before and during the registration period for the excursions undoubtedly contributed to this lack of interest, though the relatively expensive price of the trips also may have been responsible.

In general, the participants expressed their satisfaction with the Congress, according to the letters received and public (or private) rumour. The innovations were well received as a whole, though of course there is still room for improvement.

However, if the innovation of presenting synthesized themes instead of individual papers was particularly appreciated, it was also a considerable task for the program organizers. These included active members of the Scientific Committee, the chairmen, rapporteurs and secretaries of the symposia, and especially members of the scientific secretariat who worked extremely hard in coordinating this part of the Congress.

A breakdown of the registration figures shows that the Congress attracts, in decreasing proportions, plant biology specialists (ecologists, range scientists, agronomists, foresters), zoologists and animal production scientists, geographers, a few rare sociologists and socio-anthropologists, and a few equally rare teachers. The presence of more than 60 students was a positive factor.

Copies of the volume of abstracts of contributions to the Congress are still available in English. The volume is 270 pages long and includes 490 summaries averaging approximately 300 words. This is the only published document indicating the content of non-written contributions to the Congress (posters, videos, slide shows, computer presentations); the volume of course also includes summaries of written communications. It is available for 100 FF from the Congress's Scientific Secretariat: address Secretariat Scientifique du IVeme CITP, Institut Agronomique Mediterraneen, 3191 Route de Mende, B.P. 5056, F-34033, Montpellier Cedex 01, France.

The Proceedings will be published in three volumes of approximately 500 pages each. In addition to the papers presented, they will include the plenary addresses, the syntheses of the written papers by the rapporteurs and the accounts of the debates of each of the 16 symposia and the different opening and closing addresses. Subject to finances, these may be available in late 1991 or early 1992. Proceedings will be available from the Secretariat of the AFP (Association Francaise de Pastoralisme - same address as the Scientific Secretariat listed above). They will of course be distributed at no charge to regularly registered Congress participants.

IRC IMPRESSIONS

Noel Preece, Ecoz - Ecology Australia, PO Box 3839, Alice Springs NT 0871

I received an ARS Overseas Conference Scholarship to attend the fourth International Rangelands Congress. In recognition of that award, I offer the following brief observations on the Montpellier Congress. These comments are made with particular reference to the two papers I presented on behalf of colleagues and co-authors. Some personal observations on the status of rangelands and their conservation are also included.

My observations are of necessity, generalisations and there is considerable variation in the practices of managers, researchers and others associated with rangelands.

Those interested in the papers we presented will have to await the publication of the Proceedings.

Fire Management

Expertise in fire management and associated skills are highly variable from one country to the next. Australia has a high level of skills and ecological understanding in the use and control of fire. Researchers and managers in the United States are developing similar skills, although I found from those with whom I spoke that they are limited in their perception of the role of fire in rangelands. This possibly results from entrenched thinking generated in North America and also borrowed from Europe.

Ecological understanding of the role of fire, and its use, is lower in Europe, and almost non-existent in Africa, Asia and South America. To a large degree, technology could be considered irrelevant in most third world countries. This can be attributed to a number of factors.

Perceptions of fire in rangelands

Fire is seen as anathema to the management of rangelands in many countries (Australia included), even in the Mediterranean landscapes of France and adjacent countries. Although many scientists are now seeing the benefits of applying fire to manage rangelands, they are often very cautious about its use; they are, perhaps, at the stage Australian rangeland scientists and some managers reached several years ago. They appear to lack the skills and confidence that come with the practice we, for instance, have gained over the years. Inexperience with predictability through methodical monitoring and modelling of fire behaviour may be a factor in this lack of confidence.

Even where fire is recognised as important, many scientists and managers face the problem we have often confronted in Australia - the fear of fire by the bulk of the population. This is despite the recent historical use of fire in Mediterranean and other rangeland types. These observations apply mostly to Europe and North America, with the situation being different in Africa and Asia.

African rangeland managers apparently use fire in more traditional ways. In many areas that are not eaten out by grazing animals, fire is still used as a tool to refresh pasture and clear land. In Asia too, fire appears to be more commonly used where there is adequate vegetation.

Our paper (Preece, Allan and Baker), which evaluated the success and problems of transferring technology to managers, was cited by the session rapporteurs as a valuable contribution in that this sort of evaluation is rare, yet essential if management and science is to improve. It was also considered important as it made recommendations to improve the future of fire management in rangelands.

Rare Species Conservation in Rangelands

The other paper I presented (Preece and Stafford Smith) discussed the need to consider conservation of species, including rare species, on a scale much larger than conservation reserves.

While this may seem obvious to us, it is often not as clear to many policy makers, scientists, managers and the rest of the world's population. If the subject is considered at all, and it rarely is, then the perception is often that national parks and other types of reserves are adequate to preserve current biodiversity.

The plight of native species throughout the world is serious. Many species are on the verge of extinction, as perusal of any conservation journal will reveal. Conservation work is limited by lack of funds, policy, commitment, staff and resources. Even the most publicised endangered species such as elephants in Africa and tigers in India suffer from these problems.

The main problem however is the pressure of human over-population which creates exceptionally high demand for food, water and fuel, at the expense of all other species.

Our paper suggested that conservation of native species can only be achieved with an ecosystem approach (i.e. beyond national parks) and must involve farmers and graziers. There must be appropriate financial and other incentives for the conservation of habitat and species. This has been stated many times at many forums and it is possible in Australia despite the current singular lack of success. It is far from possible in underdeveloped and over-populated countries.

Even in the U.S. (as an example of a wealthy country), perceptions of conservation can be at variance with reality. A senior U.S. Forest Service officer stated in one of the IRC forums that the Service considered there were no problems for native species caused by mining, grazing, burning, introduction of artificial waters, clearing and overseeding in multiple-use publicly-owned and managed rangelands. This is in marked contrast to a plethora of literature reporting problems associated with each of these activities and the plight of many rare species native to North American rangelands (see for instance recent issues of *National Wildlife*, *International Wildlife*, *Conservation Biology*, etc.). The status of species smaller than medium carnivore or large ungulate size are rarely considered in the management of the rangelands, according to the speaker.

In the south of France, too, the plight of rare species is affected by homocentric perceptions. In one area we visited, the Garrigues, some rare deer survive only because they are attractive to hunters, not because there is any conscious action to save them for their own sake.

In Kenya, changing lifestyles and the effects of social, economic and political constraints on wildlife manipulation policies can have long term benefits for wildlife. But the increasing human population has forced their migration into sparsely populated rangelands with the consequent application of marginal farming practices. This has reduced wildlife habitat and increased the conflict between stockmen, farmers and wildlife. Wildlife is of no direct economic value to stockmen, and is therefore not included in land use planning considerations.

Increasing the value of wildlife is difficult. Their value doesn't rise with more extinctions because human nature dismisses extinct species as being no longer relevant. Traditional arguments such as potential for human use, intrinsic value, duty and obligation, inextricable evolutionary links, pleasure, diminution of world/self and economic value are not sufficient of themselves when food, water, fuel and shelter are paramount. If we in Australia can't get it right with the conservation of biodiversity, then what chance is there when basic human needs cannot be satisfied?

Analysis and Conclusions

Rangeland scientists must become involved in social aspects of rangeland management and science.

Conservation biologists must become more involved in rangeland science and the social aspects of their science.

Ecologists must consider their science as a social, as well as a natural, science.

Native species and ecosystems are under serious threat throughout the world's rangelands. The wealthy countries have an obligation to reduce the debt burden on third world nations and to dramatically reduce their own consumption.

There is a fundamental ignorance, and sometimes a denial, of the plight of species in most countries. This is partly as a result of the need to provide for the human population and partly as a result of the lack of suitable education on matters of conservation. Conservationists may be compromised because each time a species, habitat or ecosystem is eliminated, the "balance" is shifted and the recently demised species etc. is no longer included as a factor in the equation.

Rangeland scientists and managers have an increasingly important role in managing for long term ecological sustainability, both for productive capacity and native species conservation. A better knowledge of how people interact with the rangelands, and a basic understanding of local through to global priorities, should better equip us to find some solutions to the many pressing problems facing the rangelands.

References

Preece N.D. and Stafford Smith M. (1991). Evaluation of species and habitat conservation in central Australia. Proc. IV IRC, Montpellier, France.

Preece N.D., Allan G.E. and Baker L.M. (1991). Two approaches to fire management in central Australia: implications for rangeland management. Proc IV IRC, Montpellier, France.

PRESIDENT'S REPORT

Bill Low, PO Box 596, Alice Springs NT 0871

This is my first report as current President of the Society. The new executive has settled in very quickly and I would like to thank Greg Campbell (Secretary), Bruce Strong (Treasurer) and Ashley Sparrow (Subscription Secretary) for doing their jobs efficiently and effectively. One temporary problem of updating the financial resources so as to prepare a budget for the year was finally overcome by Bruce's diligence. There are still a few things to tidy up, but we should have everything in hand by the end of this calendar year. While David Liddle, Vice-President, resides in Darwin, we have frequent communication with him and David will be handling projects that require urgent attention. We have been unable to confirm a Vice-President from Western Australia, but look forward to this within the month.

The feared decline in membership due to the economic downturn has occurred and we are sorry to lose 104 members who have not renewed their subscriptions. Ashley has briefly summarized the interests of non-renewers and found that 50% were pastoralists with 12% being government employees. Some private addresses were difficult to categorize and these percentages could be higher. Economic depression tends to make people introspective at the very time when they should be outward-looking. Ideas for ways around problems come more readily from communicating with others. This is a very strong reason for continuing membership in a Society with other professionals including pastoralists, economists, technicians, etc.

One of our aims this year is to increase communication between the variety of users of the rangelands: pastoralists, miners, Aboriginals, tourists, conservationists and recreationists. You as Society members can contribute to this effort by promoting the Society to a broad range of people in your community and urging them to communicate on matters of appropriate land use and land management. The Newsletter provides a good forum for getting ideas to members. Please make an effort and contribute!

While I'm on about communication, the new look Journal certainly has appeal and is easier to handle. Congratulations to the publication team, particularly Malcolm Howes, Allan Wilson and Marg. Friedel, for their efforts. Allan is having difficulty getting papers for the Journal and we earnestly solicit your contributions. The Society is continually striving to raise the status of the Journal and having high quality papers to choose from is one of the cornerstones of that effort. Most papers proceed through the refereeing stage quickly, so if you have a paper nearing readiness for publication, please consider contributing it to TRJ (The Rangeland Journal). Allan's panel of editorial assistants will give papers quick and honest attention.

Council has obtained sufficient information to decide on the issue of honoraria for the hard working Society Editors. Both the Journal and Newsletter take large amounts of the Editors' personal time and the results before us now are very professional. The Editors are to be commended and as a token of our esteem, and in recognition of their efforts, the Council felt that an honorarium of $1000 per year for each of them was appropriate. Communication is what our Society is about and, rightly, the publications are a major cost of the Society. Having editors with professional and selfless attitudes makes it easier to work toward our goals. The membership will be pleased to know that we can achieve these honoraria within budget and without increasing fees. It also pleases me that Council saw fit to recognize the efforts of the two previous editors, Ron Hacker and George Gardiner, who considerably raised the standards of both Journal and Newsletter largely through personal effort. We feel that an honorarium of $1000 was small payment for their efforts over many years.

Other Council activities have included organizing to resubmit the offer to host the 1999 IRC in either Queensland or Western Australia. FASTS is still an uncertain interest (Ed. more in the next issue) with those close to government centres seeing it as a platform from which to help educate upcoming generations and bureaucrats. A suggestion that we might merge our Journal with that of Tropical Grasslands and possibly the South African rangelands journal is being looked at by the Publications committee and Marg. Friedel will tell us more about that in the near future.

Council looks forward to a useful two years in office and anticipates further interaction with members to promote appropriate use and sustainable management of our rangelands.

Best wishes, Bill Low

REPORT OF THE PUBLICATIONS COMMITTEE TO THE ANNUAL GENERAL MEETING OF THE AUSTRALIAN RANGELAND SOCIETY 30TH MAY 1991

Margaret Friedel, CSIRO, PO Box 2111, Alice Springs NT 0871

In January 1990, the Committee met to review the roles of the Australian Rangeland Journal and the Range Management Newsletter, and to consider the responsibilities of the Editors of both publications. At the request of the Council, when it had been based in Queensland, the Committee made a number of recommendations to the present Council including draft policies for its own operation and for both publications. We also drafted definitions of the roles of the Editors and Production Manager. These recommendations were particularly relevant in the case of RMN as neither the Newsletter nor its Editor are recognised in the Articles of Association. These recommendations were considered by Council in May 1990 and were put before a general meeting at the Biennial Conference in Carnarvon in September for discussion.

Changes to the Articles of Association can only be made at Annual General Meetings and so the alterations are to be put to this meeting, 30th May 1991. The Council will then be required to endorse or modify our recommendations on the other issues in order that they can become policy. Since these matters have been pending since January 1990, the Committee will welcome their final resolution.

During the last year, both publications have seen a change of Editor. Ron Hacker retired from the Journal after giving us much valuable service, and we gratefully acknowledge all his work. Under his guiding hand the Journal became increasingly professional, and we are pleased to have retained him on the Committee. Allan Wilson took over the helm towards the end of 1990 and will be responsible for 1991 issues onwards. We welcome his appointment.

George Gardiner also set a high standard as Newsletter Editor, and his efforts are much appreciated. Gary Bastin replaced George as Editor in May 1990, and he has produced three very good issues since then. It is important to realise that the Editors are presently operating in a voluntary capacity and that they have given a great deal of private time to the Society. The Committee is presently pursuing the possibility of honoraria for them with the Council.

The Production Manager, Malcolm Howes, has maintained a high standard for the production of the Journal. Due to his efforts, costs of production have remained modest, and publication has been on time. Unfortunately, not all his efforts have been well rewarded. Malcolm submitted a case on behalf of the Society to 'Current Contents' for listing the Journal but was not successful. We believe that the Journal would benefit from such international coverage and will continue to work towards it.

Several options are under consideration. Theme issues may be developed which include invited papers and which address topics that have not received extensive coverage in the past. A smaller format Journal in keeping with present trends has been proposed. As well, new sources of contributions are being sought, with a view to attracting a wider audience. In the short term, additional issues will mean greater cost to the Society, and the Council has yet to determine whether it can support the outlay until an increased number of subscribers is attained.

The Committee met together once during the year to 30th May 1991, at the Biennial Conference in Carnarvon during September. So that all participants in the processes of publication could be informed of our activities, the Associate Editors also attended the meeting, along with Council Chairperson Martin Andrew. During the remainder of the year, business has been transacted by letter, fax and phone.

We continue to aim for the highest possible standards for both the Journal and the Newsletter because they are the Society's flagships, and the reputation of the Society to a considerable extent rests on them. Council has described our responses from time to time as 'vigorous' and 'strong'; the Committee hopes to maintain that energy in the future.

Membership of the Committee is as follows:

Gary Bastin (NT), Newsletter Editor
David Eldridge, NSW representative
Margaret Friedel (NT), Chairperson
Ron Hacker (NSW), previous Journal Editor
Malcolm Howes (WA), Production Manager
Leigh Hunt, SA representative
Tony Pressland, Qld representative
Allan Wilson (Vic), Journal Editor

NEWS FROM THE SOUTH AUSTRALIAN BRANCH

Robyn Duffy, Dept. of Agriculture, PO Box 357, Port Augusta SA 5700

The South Australian Branch of the Australian Rangeland Society has once again managed to keep busy over the last year. A very successful Plant Identification Course was held in October 1990 at Middleback Station near Whyalla. The course, which was run by Ashley Sparrow, went for three days during which time participants spent long but enjoyable hours gathering, dissecting and identifying some of the plant species from the local area.

In November, a committee meeting was held in Port Augusta and then, in May 1991, the A.G.M. of the SA Branch was held in Adelaide. The A.G.M. was well attended by thirty members and friends.