



The Australian Rangeland Society

RANGE MANAGEMENT NEWSLETTER

An official publication of The Australian Rangeland Society

ISSN 0812-4930

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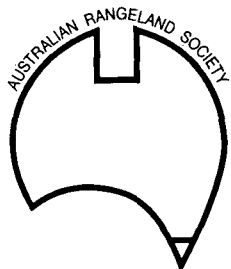
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Bastin, G. and Allan, G. (2012). After the smoke has cleared: 2011 fire in Central Australia. In: Range Management Newsletter (Ed. N Duckett). 12/2:3-6. (Australian Rangeland Society: Australia).

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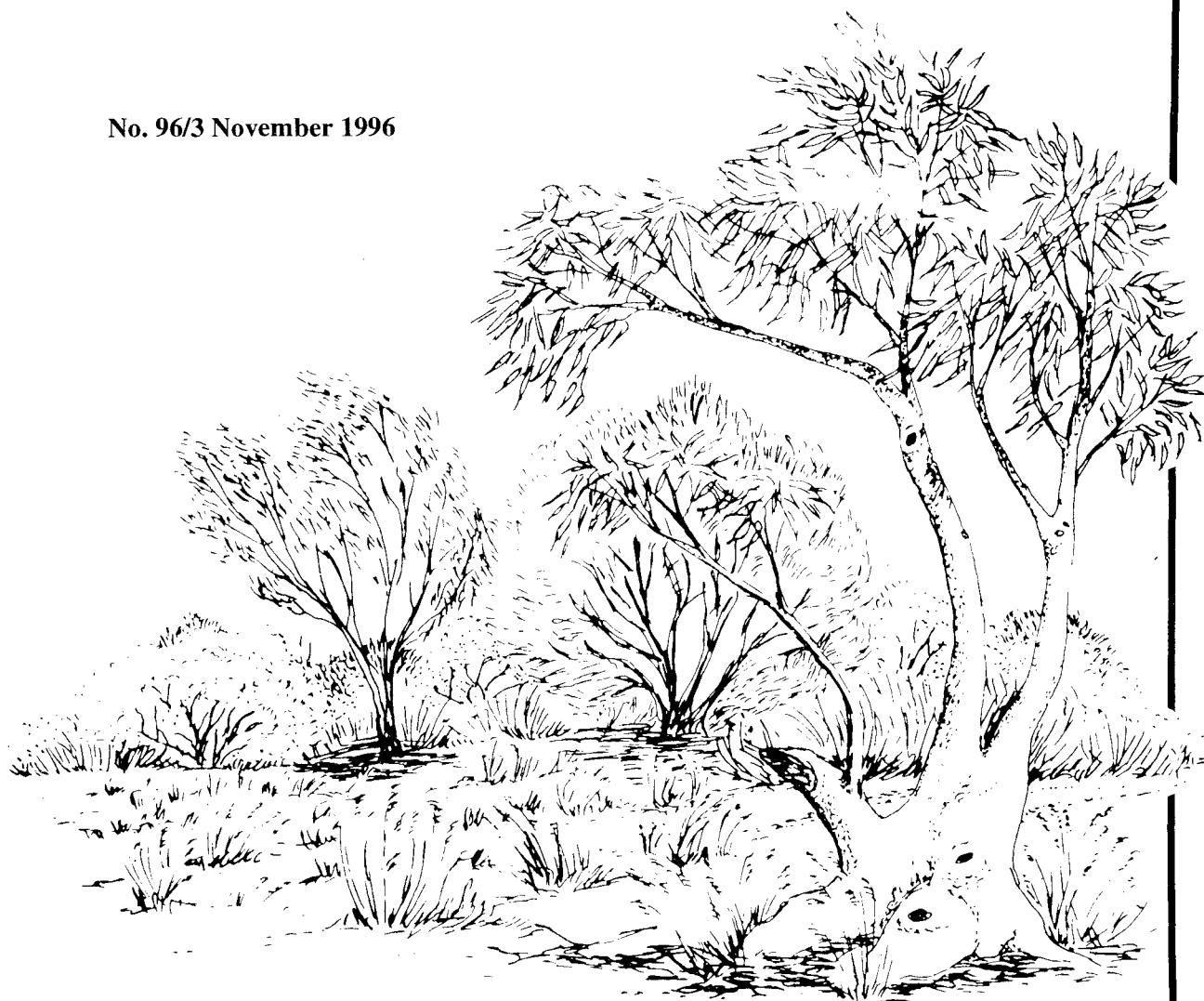


ISSN 0812-4930

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Range management Newsletter

No. 96/3 November 1996



Registered by: Australia Post - Print Post No. 545270/00001

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FROM THE EDITOR

Gary Bastin, CSIRO, PO Box 2111, Alice Springs NT 0871

Another year has almost run its course and the highlight for the Society this year has certainly been the recent, very successful conference in Port Augusta. The organisers set themselves a bold challenge with their format of searching the future through possible, and in parts plausible, scenarios. While at times feeling quite lost and uncomfortable as a participant in the "Extra Green" scenario, the whole process turned out to be a rewarding experience for me at the end. This was in no small part due to the efforts of the "super facilitators" (Tony Gleeson, Don Burnside, Megan Lewis and Steve Morton) who had the unenviable job of synthesising the many scattered threads (and some gems) of information spread amongst numerous sheets of butcher's paper. These people were able to bring seemingly rational conclusions to the end of our week's work.

The outcomes of the foresighting exercise are steadily being compiled and reported in different forums. The first of these was a paper presented at the recent Fenner Conference. (We have a brief report on that conference from Nick Abel at the end of this newsletter.) Under the apt title of "We Dared to be Different", Jenny Bourne provides a summary in this newsletter of the key points developed within each scenario. She has also included the essence of each stakeholders' "take home" message. For the next newsletter, Leigh Hunt has promised me an article containing the richness of the material extracted from the butcher's paper.

As my final word on the conference, I congratulate the Organising Committee for a well-run, informative and stimulating event. WELL DONE!

Turning now to the lead articles in this newsletter - which in this edition have the common thread of modelling. I must admit to, at times, being a little cynical of modelling because the results often seem academic, theoretical and irrelevant. However, in both articles, the authors demonstrate that their results are credible and have considerable practical application. In the first article, Roger Pech and Greg Hood explore the potential conservation benefits to be gained from the rabbit calicivirus disease (RCD). Although the authors have had to make numerous assumptions in developing their models they clearly demonstrate that, provided the virus can persist and function to produce reasonably frequent epidemics, it should be able to substantially reduce rabbit populations, assist the survival of native animals (taken as alternative prey) and benefit pasture growth for the grazing industries. The reliability of the models can hopefully be improved as more data become available now that RCD has officially been released for rabbit control. Even at this early stage though, the models indicate that the virus will not totally control rabbits - future eruptions must be anticipated in seasons favourable for rabbits. This highlights the need for concerted efforts directed at integrated control of rabbits - e.g. through warren ripping to destroy their harbour.

In the second article having links with modelling, Rosemary Buxton reports on how the economic performance of various

drought management strategies can be evaluated. This form of economic analysis has a clear practical benefit in helping producers decide how to best manage their enterprise in the years leading into, and out of, the next inevitable drought.

Earlier this year, Allan Wilson reported rather pessimistically on the contentious issue of kangaroo management in the Australian rangelands (*RMN* 96/1). Allan has continued to develop his ideas and in this issue provides a possible solution to the problem of excess kangaroo numbers - and in turn, control over total grazing pressure.

As well as the Port Augusta conference, we have reports on other recent workshops and conferences. One of the more significant, and successful, workshops in terms of achieving the organisers' desired outcome was the Cooper's Creek workshop held in Windorah. I was delighted to keep in touch with one of the local organisers, Bob Morrish, as events unfolded in recent weeks leading to the eventual rejection of this irrigation proposal by the Queensland Government.

So please read the different articles in this newsletter - you should find much of interest. Also, please keep your contributions coming. My deadline for the next issue is the end of February 1997.

Most importantly, remember to remove the invoice from the front cover of this newsletter and promptly **RENEW YOUR 1997 SUBSCRIPTION.**

CONFERENCE PROCEEDINGS AVAILABLE

Leigh Hunt, Primary Industries SA, PO Box 357, Port Augusta SA 5700

Copies of the Conference Proceedings from the Port Augusta conference are available. Each copy costs \$45.00 plus \$5.00 for postage. The proceedings include the invited papers, the open forum papers and the 88 poster papers. Send your cheque to:

Rob Richards
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**The Editor wishes all
ARS members
a Merry Christmas and a
successful year in 1997**



POTENTIAL CONSERVATION BENEFITS FROM RCD

Roger Pech and Greg Hood, CSIRO Division of Wildlife and Ecology, PO Box 84, Lyneham ACT 2602

Introduction

Since escaping from Wardang Island in September and October 1995 Rabbit Calicivirus Disease (RCD) has spread through much of south-eastern Australia, causing dramatic reductions in the abundance of rabbits. Well before RCD spread to the mainland, public concerns had been expressed about some of the potential side-effects. Will weedy plant species increase? What will happen to native predators, for example birds of prey, which have come to rely on rabbits as an important source of food? Will predators, particularly feral cats, foxes and dingoes, turn to other prey items, and will this increased predation cause problems for some already-vulnerable native animals? In response to these questions, the Australian Nature Conservation Agency (ANCA) contracted Chris Dickman, Peter Banks (from the University of Sydney), Alan Newsome, Bob Smyth and Roger Pech (CSIRO) to produce a report on "The Potential Impacts on Australian Native Fauna of Rabbit Calicivirus Disease". The report was delivered to ANCA in May 1996 and will be published later this year.

One of the findings of the report to ANCA was that *"myxomatosis and drought have significantly affected populations of rabbits in ways equivalent to those expected of RCD. The precise effects on Australian native fauna arising from those historic population declines in rabbits were not documented. Information is mostly anecdotal if available at all."* To some extent this is symptomatic of all the questions listed above. However two species, rabbits and foxes, have been relatively well studied in Australia. This article outlines some of the predictions contained in the ANCA report which deal with the indirect effects of RCD on native pastures and predation by foxes on native species.

Models for Making Predictions

The first step in predicting the consequences of RCD is to gauge the likely impact on the abundance of rabbits. Overseas experience, for example from Spain, indicates that mortality due to RCD ranges from about 65% to very high levels of 95%. Epidemics seem to have settled into a two-yearly pattern, which is about the time required for rabbit numbers to recover to a density where the disease will "carry" in a population. However the limited experience we have had with RCD in Australia has already provided some unexpected outcomes. The escape of the virus from Wardang Island was not anticipated, nor was the rapid spread through north-east South Australia late last year. These differences between Australia and overseas suggest we cannot be certain about the likely pattern of occurrence of RCD in the future in the wide variety of climatic zones in Australia. At this stage, the simplest approach is to include a wide range of possibilities in our considerations.

In contrast to the uncertainty about the effectiveness of RCD, we do know how rabbit populations respond to climatic variability and to the impact of predators such as foxes. For example, the off-take of pasture biomass was measured by Jeff Short during a study of kangaroos, rabbits and sheep in chenopod shrublands at Kinchega National Park in the early 1980s. An experiment conducted by Alan Newsome, Peter Catling and Ian Parer at Yathong Nature Reserve, NSW, between 1979 and 1983 has provided much of the information on the importance of predation. Their experiment compared changes in the abundance of rabbits in areas with foxes and feral cats to areas where the predators were intensively suppressed. The results, and subsequent analysis using predator-prey models, show that under most conditions foxes are able to hold rabbits at low densities, less than about 2.5 rabbits/ha. However under exceptionally good conditions, rabbit populations can erupt because their productivity far exceeds the predation rate. The same effect can occur even under average conditions if predators are suppressed: the experiment showed that an eruption of rabbits could also occur when foxes were consistently removed.

In addition to rabbits, native species in the critical weight range of 35 g to 5.5 kg are particularly susceptible to fox predation. Measurements of predation on native species are lacking, except for a few special cases such as rock wallabies and quokkas in Western Australia. In order to make predictions with a degree of generality, a "generic" native species was modelled. This generic species is assumed to be a herbivore which competes with rabbits for forage and has a pattern of predation characteristic of "by-catch". A species is termed by-catch when it is not the primary food source for a predator but is caught incidentally. Under these conditions, by-catch species can be driven to extinction by predation because the number of predators is dependent on the availability of primary prey, not by-catch. For example, at Yathong rabbits are primary prey and malleefowl are by-catch for foxes.

A model of the total system (predator - herbivores - pasture - rainfall) can be constructed from the information outlined above. It includes ten basic components. These are pasture growth and senescence as determined by rainfall, the rate at which pasture is eaten by rabbits and native herbivores, and the changes in the abundance of rabbits and native herbivores depending on their food supply. The abundance of both types of prey species, rabbits and native herbivores, determines the density of foxes. Foxes, in turn, reduce the number of rabbits and native herbivores. The final element is the frequency and intensity of RCD epidemics. With these ten components, or even a subset of six if native herbivores are excluded, the model is sufficiently complicated to require computer simulations for predicting the likely outcomes of RCD. Once the model is in place, the rainfall characteristics of a particular location such as Yathong can be simulated and the behaviour of the whole system (pasture, rabbits, native herbivores and foxes), or parts of it, studied with and without RCD.

Changes in the Abundance of Foxes and Their Prey

An example of the model's output with no RCD is shown in Figure 1. Rainfall is simulated at quarterly intervals for 50 years. The abundance of the herbivores, both rabbits and native species, is expressed as numbers of animals per hectare, and the abundance of foxes is shown per square kilometre. Figure 1 demonstrates three main features of this predator-prey system. Firstly, there are long periods, for example in the interval from year 22 to year 36, when rabbits are consistently at low densities (less than about 2.5/ha), despite some years with good rainfall. This is because there is sufficient predation by foxes to keep the rabbits in check. However, occasionally there are relatively few foxes leading into a run of good years, with the result that rabbit populations erupt. For example, the density of 20 rabbits/ha in year 44 is similar to a rabbit plague observed at Yathong in 1979. The occurrence of rabbit plagues is erratic but in the long term they occur about once every ten years on average.

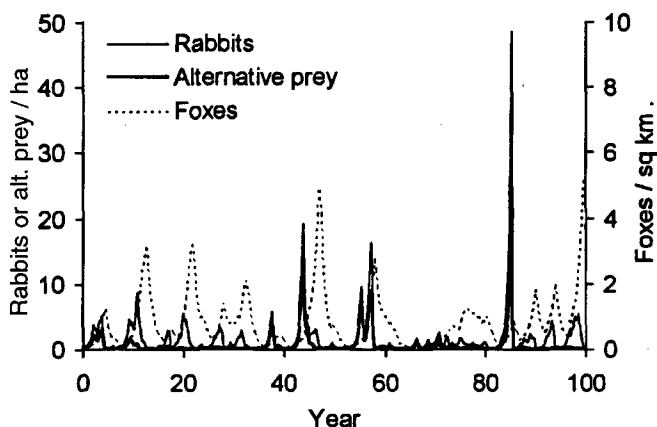


Figure 1. Typical 50-year computer simulation of the density of foxes, rabbits and a "generic" alternative prey species.

The second feature apparent in Figure 1 is the delayed response of foxes to the availability of both prey species. The build up of fox numbers is slowed by their annual breeding cycle and declines in abundance are buffered by their generalist diet. In the model, the long-term average density of foxes is about 1/sq km, which is typical of semi-arid Australia.

The "generic" native herbivore species responds to good rainfall and pasture growth in the same way as rabbits. In contrast to rabbits, they are culled by predators much sooner during an increase phase and to much lower levels subsequently. The result is long periods, for example years 12 to 36 in Figure 1, when they disappear, and they only re-emerge in the model because new immigrants are assumed to arrive. Extended periods of mortality inflicted by highly efficient predators, coupled with competition with rabbits, signal the demise of these native species and can frustrate attempts at reintroduction.

Before considering the likely effects of RCD, the model can be used to illustrate the role of predation by foxes in the dynamics of rabbits populations. For Figure 2, the model has been simplified so that it includes only rabbits as herbivores in the

system. (Alternative food for foxes is implicit in the model when rabbits decline to very low levels.) For a typical sequence of rainfall, we can compare how the abundance of rabbits would change with and without foxes. Without foxes, the frequency and intensity of rabbit plagues increases significantly. With foxes, predation is sufficient to regulate rabbits to relatively low density for many, but not all, years when there is abundant pasture. Clearly fox control, without simultaneous rabbit control, is not recommended.

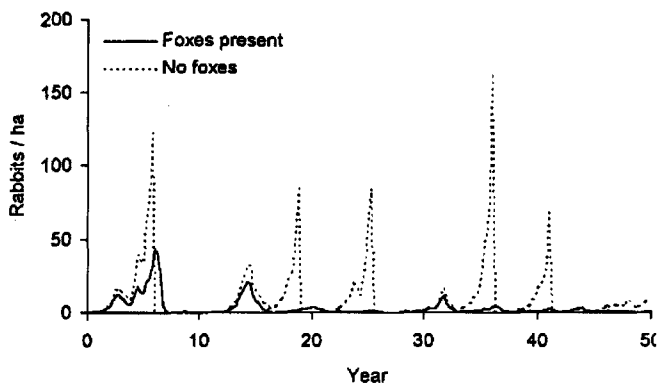


Figure 2. Typical 50-year computer simulation showing the frequency of rabbit plagues with and without foxes.

Predicted Consequences of RCD

For the reasons outlined above, a detailed mechanistic model has not yet been developed for RCD under Australian conditions. In the interim, the consequences of introducing RCD can be evaluated by simply assuming the virus is a highly effective "biocide" with a range of possible frequencies of application. Figure 3 illustrates the modelled outcome of RCD epidemics occurring at two-yearly intervals on average, with each epidemic achieving a rapid 85% reduction in the abundance of rabbits. For this regime, RCD prevents most eruptions of rabbits and, aided by fox predation, the long-term average abundance of rabbits is reduced by 75%. The subsequent effect on pasture (Figure 4) is a modest increase of about 5% in average biomass. Biomass with RCD is generally higher than without RCD. Although not apparent for the time period shown in Figure 4, there are occasional periods when the converse is true. In the model this can happen through a sequence of events where rabbits exhaust their food supply so their population crashes, which in turn allows recovery of the pasture if rainfall is adequate. RCD tends to smooth out extreme fluctuations in rabbit density so that there is a substantial reduction in the time when biomass is sufficiently low (less than about 250 kg per ha) to force intense competition between herbivore species. This outcome from RCD may be particularly important for the maintenance and recruitment of perennial plant species. The results are also encouraging for native species threatened by fox predation. Average abundance of the "generic" native herbivore increases by 150%, and the frequency of occasions where densities reach relatively high levels is greatly increased. However there can still be long periods, for example between years 25 and 36 in Figure 3, when fox predation is important. The model suggests that RCD alone will not solve the problems of species threatened by predation, and additional fox control is likely to be required.

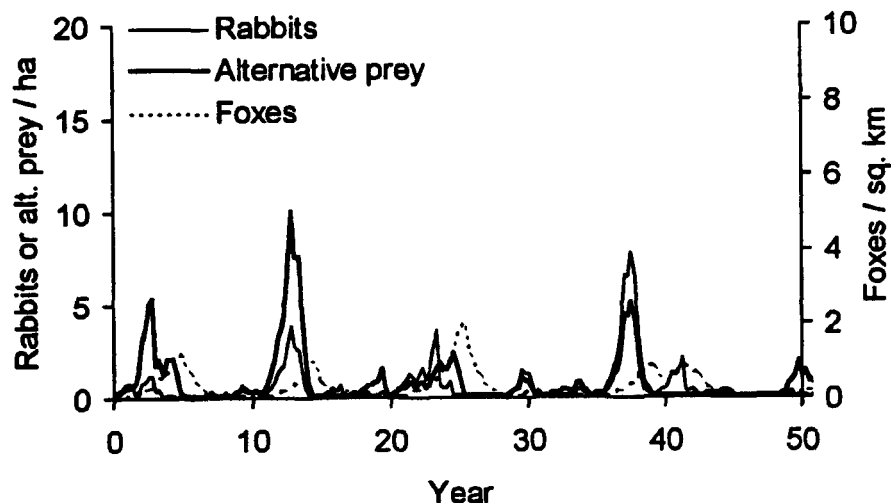
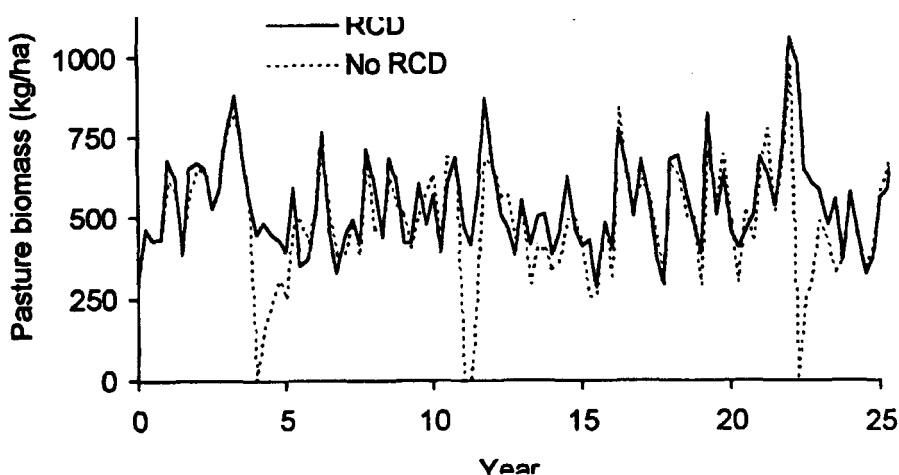


Figure 3. Typical computer simulation of the density of foxes, rabbits and a "generic" alternative prey species over 50 years. RCD causes an 85% reduction in rabbit density in spring every two years on average.

Figure 4. Typical computer simulations of pasture biomass over 25 years with no RCD (---) and with an 85% reduction in rabbits by RCD in spring every two years on average (—).



Figures 3 and 4 show typical computer simulations for a particular two-yearly pattern of occurrence of RCD. Other patterns can be simulated with the computer model to give the following general results.

1. There will be little benefit if epidemics of RCD turn out to be very infrequent, for example occurring less than once every five years. The benefit increases as the epidemics increase in frequency.
2. High mortality rates increase the effect of RCD but even if there is evolution to less virulent strains or more resistant rabbits, the benefits are still likely to be significant. This is because the combination of fox predation and disease can effectively suppress rabbits, even when mortality rates drop as low as 65%, for example.
3. The benefits accrue through a lower average density of rabbits and fewer eruptions to high density, through less competition for pasture, and through enhanced opportunities for native species threatened by predation to persist and re-colonise new areas.

4. There should be some reduction in the density of foxes (for example, a reduction of about 40% with two-yearly epidemics of RCD causing 85% rabbit mortality) but this may not be sufficient on its own to protect native prey species.

Conclusion

With the limited available information, the computer simulations can make only fairly general predictions of what might happen after RCD sweeps across Australia. Currently, a national RCD research program is planning a network of ten key sites distributed across Tasmania and mainland Australia to monitor the outcomes for agricultural production and conservation. These projects will last two to three years initially, and should provide a basis for quantifying and understanding the full consequences of RCD.

DROUGHTPLAN

Rosemary Buxton, CSIRO, PO Box 2111, Alice Springs NT 0871

After floods, droughts, dust storms, sandhills, bulldust, flat tyres too numerous to count, two years, two Landcruisers and 90,000 km (and that's only one part of the project), DroughtPlan is all but over - in a formal sense at least.

"DroughtPlan" (or the more formal title "*Grazier-based profitable and sustainable strategies for managing for climatic variability*") has been a collaborative project between producers across the country, CSIRO and state government agencies. DroughtPlan helped producers develop economically-viable drought management strategies which increase animal production efficiency whilst sustaining the land resource. The project comprised five linked and overlapping 'streams'.

Stream One involved talking with producers in Queensland to determine information needs and to develop benchmark performance indicators;

Stream Two has obtained detailed information about the range of management options used in various rangeland and agricultural regions of the country. This has helped producers identify management practices which will result in more stable production despite climatic variability, and hence will result in more consistent cash flows;

Stream Three has used data from producers and researchers to analyse the relationships between animal condition and reproduction and mortality rates in sheep and cattle;

Stream Four has developed products to help deliver the information requirements determined in Streams One and Two; and

Stream Five is testing the Stream Four products with producers to ensure they are both appropriate and useable.

Results and Products

Stream One has assisted producers in central Queensland to develop best-practice statements of how they cope with climatic variability and other management issues, and established benchmarks for on-going monitoring of performance.

On a broader geographical scale, *Stream Two* has interacted with over 50 pastoralists in providing financial analyses of various management strategies, and has produced eight regional summaries of management practices. Regional reports are available for western Queensland, south-west Queensland, western NSW, the Kimberley, South Australia, the Gascoyne-Murchison region of WA, central Australia and the Southern Tablelands of NSW. These regional summaries include 25 economic case studies developed from analyses conducted on individual properties. Topics which pastoralists considered to be the most important and the general conclusions from these were:

- Stocking rate strategies. A reduction in current stocking levels can often improve cash flow.
- Selling tactics during drought. Small adjustments in livestock selling tactics during drought can have relatively large financial ramifications.

- Increasing stock numbers after drought. It is financially advantageous to build stock numbers up quickly after a drought, even though this may conflict with longer-term environmental values.
- Diversification. While diversification can provide financial rewards, these often can be matched by small improvements in the productivity of the livestock.
- Alternatives to diversification. Fine-tuning of the existing pastoral enterprise can provide a less risky means of improving cash flow and reducing its variability than does diversification.

An example of a typical study conducted for a pastoralist can be seen in the shaded box.

A national overview of this work is currently being prepared, and several papers will be published in the *Rangeland Journal*. The project has also taught "yours truly" a few things about diesel mechanics, surviving sand storms at midnight, and how climate variability can rapidly change road conditions! Other products from Stream Two are three new CSIRO divisions: the "Division of Motel Standards and Design", the "Division of Landcruiser Testing and Design" and, through popular demand from pastoralists, the "Division of Religion" (to control the weather)!!

Stream Three has provided new scientific information on the relationships between climate variability and the biological rates of sheep and cattle.

Stream Four has developed nine products which are now being evaluated through Stream Five and commercialised by the Queensland Department of Primary Industry to ensure effective distribution. These products are:

BB-SAFe (Buy/Breed-Sell/Agist/Feed evaluator) - which allows users to compare the costs and returns of different stock reduction and build-up options on their property during and after drought.

GrazeOn - helps producers in the Mitchell grasslands to think about forage budgeting and to establish potential stock numbers over periods of three months to three years.

Pasture Supply and Demand Calculator - implements information in the *Feeding Standards of Australia* relevant to northern Australia in the context of specific concerns of producers about feed deficits during the dry season.

Assessing Your Options - a workshop module that addresses strategic stock management.

Carrying Capacity Calculator - has been developed in south-west Queensland to help producers determine safe stocking levels.

Grasp Pasture Production Calculator - a database that collates production parameters for all major pasture communities in Queensland and which is being extended to other regions of the country.

Decision Trees - a workshop module designed to help people compare alternative management options that may be available in dry years. The participant works through a decision tree of options and considers their financial implications.

HerdGrasp - a research tool linking separate models of forage production and herd / flock dynamics (Grasp and Herd-Econ). These combined models allow enterprise viability to be examined under varying seasonal conditions.

RiskHerd - is a "proof-of-concept" tool used to analyse the whole-farm production system - from rainfall all the way through to taxation. It is being used to examine the implications of various policy changes.

Further enquires regarding DroughtPlan can be directed to Rosemary Buxton or Mark Stafford Smith at the CSIRO Division of Wildlife and Ecology, PO Box 2111, Alice Springs, NT. Phone (08) 89 500111 or fax (08) 89 529587. Email Rosemary.Buxton@dwe.csiro.au.

How Much Can I Afford To Invest To Improve Lambing Percentages ?

Take the case of two actual properties in the Longreach district: the first has "average" lambings and the second property (within 50km) has much higher lambing percentages (see adjacent table). I will call the properties **Average Lambing** and **Better Lambing**.

There are certainly differences in the type of country, amount of shade, flock genetics, etc., between the two properties, but imagine that **Average Lambing** can improve the reproductive performance of the flock to the same level as that of **Better Lambing**.

How much can **Average Lambing** afford to invest to achieve this?

Lambing percentages for the two properties		
	Maidens	Others
Average Lambing		
Year Type Good	50	75
Okay	25	65
Poor	16	58
Bad	10	20
Better Lambing		
Year Type Good	83	95
Okay	85	95
Poor	75	80
Bad	68	72

Management on **Average Lambing** maintains a self-replacing flock by double-joining ewes, purchasing ewes and wethers, and reducing the culling rate of ewe hoggets from time to time.

Now assume that lambing percentages on **Average Lambing** have been increased to those being achieved on **Better Lambing**. No longer does **Average Lambing** need to double-join ewes or purchase sheep to maintain the numbers, and the culling rate of ewe hoggets can be maintained at a more desirable level. Also, it is possible to sell cast-for-age ewes a year younger.

The table below compares the effects on cash flow without and with the improved lambing percentages. From this analysis **Average Lambing** could afford to spend an average of \$11,592 each year to increase lambing percentages to those levels being achieved by **Better Lambing** without being worse off financially.

	Average Lambing	Better Lambing	Improvement
Average annual cash surplus	\$ 38,140	\$ 49,732	\$ 11,592
Range in cash surplus/deficit	-\$ 56,486 to +\$ 88,651	-\$ 43,386 to +\$ 90,570	Range decreased by \$ 11,181
No of years with a cash deficit	13	6	No. of years with cash deficit reduced by 7.
Standard deviation (variability)	\$ 44,416	\$ 41,479	Standard deviation reduced by \$ 2,937

So how might you invest \$11,592 each year to achieve this aim? Some suggestions are:

- Feral animal control to reduce lamb losses.
- Control of native animals to reduce total grazing pressure. Resulting improved forage availability would improve wool cuts, lambing rates and flock survival.
- Supplementary feeding of ewes prior to joining to improve conception rates.
- Purchase of superior quality rams.

In fact there are other benefits to be gained from improving the lambing percentage which have not been included in this analysis; e.g. the sale price of cull and surplus sheep may increase due to having larger lines to sell, wool cuts may increase as a result of the greater selection pressure, and so on. In practice it would take some years to make the improvement. Using this type of analysis, it is possible to examine likely financial performance at intermediate stages.

KANGAROO MANAGEMENT

A New System of Management by Conservation Agreements

Allan Wilson, "Cal Col", Deniliquin NSW 2710

The present system of managing kangaroos is a mess. It was developed in the 1970s under the assumption that kangaroos were under a conservation threat, yet the introduction to the draft National Strategy for Rangeland Management says that rangeland biodiversity is under threat from (amongst other things) "sustained, excessively high numbers of native kangaroos and wallabies which remove plants, alter plant composition and contribute to soil erosion".

State government departments spend considerable amounts of their conservation resources in monitoring and controlling species that have no conservation risk. Landholders lose considerable sums of money depasturing animals that belong to someone else and cannot be legally harvested by them without permission.

The rangelands on which they occur are being grazed too hard. The landholder gets the blame for this, but half the problem is attributable to governments who own the kangaroos. The public at large talks generally about conservation of the land and the fauna, but the two objectives are presently in conflict. It is a modern form of the tragedy of the commons.

The law has been changed to allow the sale of kangaroo meat for human consumption, but other restrictions remain in place, which reduces industry development. Gordon Grigg keeps talking idealistically about the merits of replacing the sheep industry with a kangaroo industry, but since the landholder still gets nothing from the roos, there is no progress towards that ideal. The present kangaroo industry resists change: it is content with the current restrictions that limit competition. The various governments do nothing, perhaps because they receive conflicting advice from their departments of agriculture and conservation: the former advising only on the sheep and the land, the latter advising only on the kangaroos.

Meanwhile the landholders go broke. Some academics talk about paying landholders to conserve the land, but they miss the obvious inequity of the government not paying agistment for the excess kangaroos they own. Advisers talk generally about diversification, but one of the main opportunities to do so is closed off by regulation which does not allow landholders control of the harvesting program.

Developing Common Rights and Responsibilities

All these problems could be solved if we could devise a system where there was a congruence of property rights and a single point of decision making. This should have two elements: a unity on who makes the decisions and harmony on the boundaries of the land over which those decisions are made.

Mike Young (Young *et al.* 1984) has written in the past about the rights and responsibilities of individuals and governments concerning land use and conservation. He writes:

"It is the role of the government to create a framework within which individual land users can make decisions which are in both their own interests and those of society. Governments should develop a socio-economic framework which encourages self regulation and within which pastoralists can work to achieve these objectives in their own self-interest."

All advice on range management is that we have to consider the system as a whole: the soil, the pasture, the livestock, the fauna, and the finances and business interests of the landholder. The only person who can do that is the landholder, who manages the individual property. The government retains an interest in the needs of the people at large, both present and future generations. Hence various covenants may be placed on land use. However, the government should not interfere in the day-to-day management of the agreed land use, provided those covenants are being met. An appropriate example is the agreements reached over mining developments.

Are Conservation Agreements the Answer?

This framework could be used to develop a more rational system of kangaroo management.

The government and the landholder could enter into conservation agreements, in which landholders receive the right to control or harvest the kangaroos on their properties, in return for agreeing to maintain numbers above an agreed minimum conservation level. In essence the kangaroo population is looked on as having split ownership: the government retaining rights to the minimum number required for conservation of the species, and the landholder receiving rights to numbers in excess of this level. The excess numbers could be harvested or controlled by the landholder as market opportunities arise or are developed.

This program could be managed in either of two ways. The first would be to allow the landholder the right to shoot kangaroos for meat only. The second would be to appoint each participating landholder as an "Officer of the Crown", with responsibility for managing the kangaroo population to meet land conservation, sustained utilisation and kangaroo conservation objectives.

This does not mean that kangaroo numbers will fall. Some landholders might choose to concentrate on sheep and keep only low numbers of kangaroos. Others might choose the opposite, particularly where niche markets can be developed and tourism ventures fostered. The Zimbabwean experience is that numbers of native animals increase when they are commercialised.

Such conservation agreements might be developed in a broader context than kangaroos. They could include agreement by the landholder to control total grazing pressure (sheep, cattle, goats and kangaroos) according to an agreed formula, or to

conserve native vegetation or other fauna. In return, the government might agree to provide other services, such as satellite monitoring information on forage levels, climate forecasts and drought alerts, and estimates of changes in kangaroo populations and age classes based on known seasonal conditions, expected growth rates and numbers harvested.

The concept of conservation agreements is as yet undeveloped. There will be problems to solve, both known and unforeseen. However, if these are faced and worked through, we might yet have a solution to the current mess of conflicts on kangaroo management.

The National Strategy: Going Forwards or Sideways?

The draft National Strategy for Rangeland Management seems to recognise the need for some change within the following objectives (although the context is of course wider than kangaroos):

1.2 "Property rights legislation to enable appropriate diverse and multiple use of the rangeland, and to provide a clear definition of the rights, duty of care and stewardship responsibilities that come with those property rights."

2.2 "Programs to expand the range of ecologically sustainable uses of rangeland resources."

However, under this objective the actions listed include the following:

2.2.1 "Investigate alternative ecologically sustainable uses of rangeland resources including the commercial use of native and introduced plants and feral animals, and integrate with the management of pest animal damage."

2.2.3 "Remove legal, administrative and other obstacles to appropriate multiple resource use in the rangelands."

On close reading, action 2.2.1 excludes the commercial use of native animals. Whether this is intentional or accidental one cannot tell. If it is accidental, it needs changing. If it is intentional, then not even those writing the draft recognise the problem or the internal antagonism within the Strategy.

Reference

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WE DARED TO BE DIFFERENT

9th Australian Rangelands Conference

Port Augusta SA

Jenny Bourne, Primary Industries SA, PO Box 357, Port Augusta SA 5700

The 9th Australian Rangelands Conference was different. The format was structured around foresighting, which is a process through which delegates developed and analysed a range of possible futures for the rangelands. Delegates found new understanding of the values held by various rangeland stakeholders as a result of interactions within the framework of the foresighting process.

Background papers published in the *Range Management Newsletter* 96/2 (July 1996) aimed to prepare delegates for the conference by providing a framework for thinking about where the rangelands would be in 2010 (Maconochie, 1996).

A **vision** for the conference was established by speakers under four themes. I have extracted quotations from these presentations which I believe capture the essence of these themes. (The complete papers are published in the Conference Proceedings.)

Community Concerns - the vision leading to the National Strategy for Rangeland Management (Graeme Robertson).

"The rangeland strategy development process clearly indicated that there was not a shared vision for the rangelands of Australia; indeed the view and understanding of the community as to the current use and condition was at best patchy.....The Working Group's proposed vision is: 'That all Australians will recognise the value and significance of the rangelands for the diverse economic, cultural and social values which they contain, and will be committed to the ecologically sustainable management of the rangelands through implementation of this strategy'."

Sustaining Cultural Values - a vision for the future (Lois O'Donoghue).

"...it's an undeniable fact that, as with any community, culture and heritage provide the framework for social structures and identity. From culture and heritage come self esteem and a sense of place.

"...I'm hoping to provide the framework for understanding the stakes for Aboriginal and Torres Strait Islanders in the use of land. Our cultures, beliefs and identities are rooted in our relationship with land, and deprivation of land has had impacts in ways that are not well understood.

"The Aboriginal and Torres Strait Islander Social Justice Commissioner, Mick Dodson, has said 'Land is the source of our physical and spiritual sustenance. Removed from our land, we are literally removed from ourselves.'

“And so we come back to the Native Title Act, which is one of the primary mechanisms for sustaining indigenous culture in the rangeland regions of Australia. The native title process can be used as an important process for protecting traditional culture and ensuring its survival.... The Act can provide benefits to other indigenous and non-indigenous interests by providing a framework for negotiation on land use without compromising the rights of interested parties....”

“One of the questions modern Australia must face, if social justice and reconciliation are to be achieved, is whether it really is necessary to extinguish all indigenous interests to enable pastoral and agricultural development to proceed. It should be possible to find a new balance that enables traditional rights to be reasserted and exercised simultaneously with the rights of land holders.

‘Aboriginal people are here to stay’ - that’s the unmistakable message from the rangelands.”

Enhancing Conservation Values - a vision for the future (Andrew Campbell *et al.*).

“The need to improve the conservation status of Australian agricultural and pastoral land is one of the most compelling challenges for Australia in the 1990s.

“It is time to start managing this country as if we intend to stay, rather than as if we are just passing through, or as if it is business in liquidation. The solutions of the past are not the solutions of the future.....Conservation is an investment in natural capital. It is not an alternative land use nor an opportunity cost, it is the fundamental protection of the natural resources which underwrite our material wealth. This vision should inform our management of the rangelands, today and in the future.

“....this vision is broader than an isolated policy for nature conservation. It sees an ecological basis for natural resources’ management and for using Australia’s extraordinary natural cornucopia to develop new markets, in Australia and abroad, and to ensure the commercial viability of Australian rangelands. To achieve these integrated and mutually supportive goals, Australia’s rangeland managers, users and policy makers will have to significantly improve the conservation performance of rangeland management throughout the remainder of the 1990s and beyond.”

Recognising Production Value - a vision for the future (Pearce Bowman).

“The value of our mineral and metal production is not limited to economic growth. The Australian minerals industry is very aware that our role has extended beyond mining and metal production in the quest for cost-efficient and ethical performances. We have accrued, developed and applied a mass of knowledge about the environment, about the conservation of water, about the respect for traditional and

commercial landowners, and about the needs of our communities and other related businesses.

“All these industries and groups depend on the interior for their survival. We need to share our knowledge and experiences to truly reap the benefits of this country’s riches. That means developing our sustainable relationships with all alliances so that we can perform at our best and respect the magnificence of this great country at the same time.”

Recognising Production Value - a scenario for a cattle station in the Australian rangelands 50 years down the (Birdsville) track (David Brook).

“The property will have a secure lease or ownership and its owners will have implemented a long-term property management plan. The career path of those involved with the property will be known well in advance and they will have undergone the appropriate educational and practical training to best suit their job. Living conditions will match those in cities and improved infrastructure and communications will have reduced the isolation from society of people living on the property and improved their access to services.

“The property will carry internationally recognised accreditation as a clean food producer using natural systems. Beef produced on this property will be marketed under a brand name and will carry individual property identification....They will host a steady stream of visitors to the property keen to see the fantastic environment in which such high quality product is produced.....and to see demonstrations of traditional skills such as bronco branding and camp drafting.”

Key issues identified as important to the future of the rangelands were also discussed:

Sustainable Use (Nick Abel).

“I have argued against leaving the fate of Australian rangelands to free markets, and have suggested a variety of important roles for economists in influencing coming changes. They include: the use of non-market as well as market values in estimates of net benefit; proxy representation of future generations on key policy and decision-making bodies; design of policies which buffer forces over time and space; estimation of trade-offs in conflicts over regional land allocation; design of ways to link otherwise ‘footloose’ resource-use projects into local economies; and the design of instruments for promoting sustainable resource use on Australia’s rangelands.”

Sustainable Management - a pastoralist’s view (Andrew Nicolson).

“...I wish to introduce another factor, and that is social sustainability. I strongly believe that for effective sustainable management we must have all three factors, that is, ecological, economic and social sustainability.”

Living in the Rangelands - servicing peoples' needs (Robyn Tredwell).

"Within the rangelands the resources for human development are limited. Many of the plans and initiatives are at an operational level rather than strategic, and are therefore limited in their vision and effectiveness. Literacy, good health and access are fundamental to development of our society. Our vision for the future must take into consideration the actualities of the situation in the rangelands and address needs rather than wants."

Towards a Communications-led Rural Renaissance (Bood Hickson).

"We live in one of the last great habitable wildernesses on Earth. As custodians of the Outback we have a great responsibility to protect and nurture it for future generations. This requires us to reconcile our past mistakes by developing shared regional visions for the future. These visions need to be articulated into regional strategies and then integrated into a composite Rangeland Strategy so that we can convince the rest of Australia that it is not only worthy of support but emulation. Reconciliation would help us to build greater social cohesion, achieve sustainable land management, develop new information industries and gain much greater credibility throughout the world.

The choice is clear. We can continue to deny that we have serious problems, or begin to reconcile past mistakes by collaboratively developing a Rangeland Strategy using a Rangeland Network."

Regional Development - translating resource values into regional benefits (John Holmes).

"Pastoral dominance is being displaced by diversity in values, uses and ownership..... Rangeland strategies need to consider social, cultural, and environmental as well as economic outcomes. Regional coalitions of diverse, previously antagonistic, interests are essential if regional benefits are to be maximised."

Maintaining Biodiversity in Australian Rangelands (Craig James *et al.*).

"We conclude that high densities of water points are disadvantaging large numbers of species through the maintenance of widespread, moderate to heavy grazing pressure. We conclude that while many species can persist under grazing, many cannot, and that conservation of biodiversity will not be satisfactorily achieved without explicitly planning to have areas that are not grazed within the matrix of grazed rangeland."

The views expressed above are from papers presented between workshop sessions.

The workshops were a structured process for working through scenarios of the future. There were four scenarios:

- Economic Growth - "utilise nature and value dollar wealth",
- Best Practice - "manage nature and value enough dollars",

Extra Green - "sustainability before profit", and
Partial Retreat - "ignore nature and value economic survival".

Participants were allocated to groups so as to maximise the diversity of rangeland stakeholders in each group. Each group considered one scenario only, independently from other groups, and each scenario was considered by five groups. Groups met five times over three days:

- to progressively develop their scenario,
- to anticipate and summarise the key opportunities and downsides which might evolve under the scenario, and
- to outline actions which would be needed to capture the benefits and avoid any negative outcomes of the particular scenario.

Scenarios were considered for the Australian rangelands as a whole, and then separately for various regions (mulga lands, Mitchell grass, chenopod shrublands, spinifex and northern tropics) - see Blesing *et al.* (1996).

Workshop outcomes are summarised in the tables on the following page.

Take-Home Messages

These were presented by four delegates representing stakeholder groups. Here are some snippets from those take-home messages:

From a Pastoralist's Perspective - Simon Campbell, "Norwood", Blackhall QLD 4472

There appeared to be a recognition amongst conference delegates that if we are to solve problems and recognise opportunities in production or conservation, then we need to craft processes that are relevant to both the individual and to the community in which that person works and acts.

It is now seen as being okay. to use the rangelands' products. This covers the range of multiple and diversification issues and products; whether they be roo meat or flowers, cultural tourism or wool and meat products.

This shift from an ecocentric view entrenched in some environmental philosophies to a balanced view of utilisation has the scope to reduce conflict about resource use in the rangeland and to promote the careful and intelligent use of rangeland resources.

In looking forward in this foresighting exercise, we have failed to recognise the grim social realities that are actual and contemporary. There are major and widespread social and economic problems in the rangelands now - in rates of suicide double the national average for some sex and age groups, in Aboriginal infant mortality and lifespan issues, in the immeasurable despair in the hearts of many living in the rangelands. The only point that this human pain has is to stimulate change for the better. If we do not recognise and address these problems, then the opportunity for a change to the better will be lost.

A further failure of the discussion groups was to recognise reality: failure to recognise the hard reality of product development and marketing. Most of those present recognise

Possible opportunities and downsides

	Economic Growth	Best Practice	Extra Green	Partial Retreat
Opportunity	Improved action capability (the Kerry Packer syndrome) from more \$\$, better management and secure title. New enterprises, new markets, vertical integration and horizontal diversification. More philanthropy gives better biodiversity and involvement of Aboriginal people. Fast track development of kangaroo industry.	Uniqueness, unique products, biodiversity and bio-prospecting. Regionalising wealth creation, decentralisation, multiple use and local value-adding. New land uses into which are woven Aboriginal and non-Aboriginal spiritual values.	New economic systems designed to enhance regional economies and retain economic benefits within regions New financial and other institutional arrangements to support innovation. Lifestyle settlements in unique locations. Skilful regulation of multi-national corporations.	Hunting and other unique products for the rich. Cheap land and labour attract international investment. A "Carbon Research and Development Corporation" to maximise returns from carbon sinks in rangelands.
Downside	Polarisation, corruption and lowered ethics. No national oversight and increased problems from feral animals, weeds, animal disease and degradation. Marginalisation and depopulation of rangelands with rural poor and loss of Aboriginal and European culture.	Losing individuality, boring, depends on government regulation, and social dislocation. Negative effects of large investors becoming dominant, then shonky operations and eventual resource degradation. Highly technology-dependent. Controlled by "fringe" (urban) dwellers.	Saturation of bush tucker market Multinational stranglehold. High impact of tourism. Complacency in population leading to system run-down.	Water controlled by powerful minorities. Locals unable to keep locally generated benefits. Overseas disease scares (e.g. BSE) lead to loss in demand for beef and sheep meats. Nuclear accident in Java poisons our rangelands.

Actions NOW to capture opportunities and avoid downsides

	Economic Growth	Best Practice	Extra Green	Partial Retreat
Social	Freehold ownership of ALL resources to landowners now. Legislation to "do what you like" since ownership encourages care. Remove protection of native species and develop high-value "ecological and cultural" tourism.	Develop "state collaboration" rather than "federal control". Full regional approach to people-planning-organisation-information and communication. Service providers (government ++) to live in the rangelands.	Promote rangelands' image and awareness through education, media, networks, exchange programs and links to towns and cities. Strong local and regional governments with fairer regional and political representation. Laws on bio-prospecting and intellectual property to retain benefits in the regions.	Empower local communities to control their own futures. Re-build local social networks through education, cultural awareness and self sufficiency. Analyse local problems and local roles, and promote self-regulation.
Economic	Bed tax, 4WD tax and access tax for ALL visitors. Remove government props to poor performers. Invest in road, communication and transport infrastructure to stimulate market potential.	Incentive mechanisms to encourage clean-green production and also to be central to any restructuring process. Mining royalties returned to regions and remove tax incentives of "fly-in fly-out" schemes. Identify and cost all non-market values and assess risk of market failure.	Implement full natural-resource accounting. Incentives (stewardship fees and covenants) and penalties to maintain natural capital. Retention of mining and tourism benefits within the region.	Same as for Extra Green scenario.
Resource	Maintain all infrastructure as a jumping-off place for further development. Implement rich information systems at a (John Holmes) regional level.	Production systems to be matched to bio-regions by state governments working together.	Regional accountability of water cycle and full user-pays. Stringent quarantine systems.	Initiate international carbon-sink agreements for mulga lands and northern savannas so funds flow back to regions.
Technology	Maintain national quarantine and product-quality auditing systems with private support. Market feasibility studies for new products. New exploration and processing technology for mining industry.	Niche marketing and accreditation schemes. Overseas market scan to design new options for clean green products.	Decentralised information and property-scale monitoring. National land evaluation. Range management games. Bush tucker cultivation.	Establish "appropriate technology" industries in country towns.

the multiple and diverse use of rangeland products. However, developing a new market and providing a consistent supply (whether it be mulga-ant honey, native timbers for musical instruments, or clean green wool with guaranteed processing characteristics) requires an immense amount of time, considerable money, an aggressive marketing attitude and a big heart. If these new products are a part of the future of the rangelands, then their development and marketing requires addressing.

From a Conservation Perspective - Georgia Stewart, Arid Lands Environment Centre, PO Box 2796, Alice Springs NT 0871

When I was asked for a take home message, I couldn't help but come back to the small group I had travelled through this conference with as we pursued the ramifications of the future "free market" scenario. Fortunately, the extreme and unfriendly ramifications of this scenario gave our group the license we needed to lay our shared ideas and values on the table. It also helped our discussions to have a scenario which was stripped of the urgency and stress of an immediate crisis - a situation we often find ourselves in. This lack of urgency removed, to some extent, the immediate responsibility for those involved.

I think our group, despite our different orientations, shared a common purpose in trying to identify those things we all value, and are frightened of losing, in the rangelands. When I say most of us I am referring to the regrettable absence of an Aboriginal voice during most of the conference. Nonetheless it was partly the values articulated in our group which helped me to find a potent take home message.

The first part of my message is that we value our existence in the rangelands. This includes the rights of ordinary people to continue to live in, and collaborate over, ideal and possible futures for the rangelands. This option is made less likely in a free-market scenario where the rangelands are the playground of an elite and powerful few.

Secondly, after exploring the full ramifications of a free-market, non-interventionist approach we decided we valued (and were afraid of losing) a framework of community values and expectations to guide our use of the rangelands.

Finally, in most aspects of our discussion it was clear that those community values encompassed the protection of the rangeland as a natural resource. It struck me, as I know it has others, that this might not have been the case if a similar exercise had been conducted at a rangelands conference not too many years ago.

On Behalf of an Aboriginal Perspective - Jocelyn Davies, Dept. Environmental Science & Management, University of Adelaide, Roseworthy SA 5371

.... Coming back to 1996, the biggest issues facing the future of the rangelands relate to the stark divisions between Aboriginal and non-Aboriginal populations. I ask you to take home a commitment to building a sustainable future for the

rangelands that includes their majority populations, Aboriginal people, in partnership.

Inside the rangelands now, community is starkly constructed along black and white lines. Aboriginal people in various groupings are planning for their future, and resisting having their future controlled by others. Non-Aboriginal people of the rangelands are doing the same thing. And the two processes are quite separate. There is nothing particularly surprising about this divide. The culture and heritage of Aboriginal and non-Aboriginal peoples are so different that great contrasts in social structure and identity exist. Nevertheless it is very important that we try to address the future together because by ourselves we are all just people, but when we work together we are a powerful force for change.

The basis for sustainable communities in the rangelands are the strong common interests that Aboriginal people and pastoralists share...

Communities outside the rangelands, in national and international forums, have set the standards for sustainable rangeland futures: social justice and equity based on human rights, conservation of biodiversity and ecologically sustainable development. Our challenge is to start a dialogue on reconciliation inside the rangelands through which we inform ourselves about, and apply these standards to, our planning. Building community in the rangelands requires identifying opportunities that will promote justice and reconciliation and which build synergistic partnerships between Aboriginal and non-Aboriginal people. There will be no sustainable future for people in the rangelands without this.

From the Perspective of the Australian Rangeland Society - Denzil Mills, Ennisclare, Gore QLD 4352

Value the diversity.

We (the society and its members) constantly need to be asking ourselves are we talking to ourselves? The futuring sessions were very much part of an inclusive, team approach and to be encouraged. But still some views of rangeland users were not well represented. The society needs to keep striving to have inclusive action and programs. We need to ask ourselves how comfortable some of our members are in this forum?

People in the rangelands need a better deal - how will the ARS respond?

David Brook in his paper "A Scenario for a Cattle Station 50 Years Down The (Birdsville) Track" vigorously argued that people in the rangelands need a better deal. The challenge to the ARS is to consider how it can help to achieve this. One role could be that of an "honest broker". An example is the recent workshop held at Windorah to explore the environmental implications of cotton development in the Cooper Creek system. This was convened by one of the stakeholders and as such, has been down-graded by the politicians. There is scope for the ARS to convene such workshops in the future.

Community self determination - what is the role of the ARS?

I consider that there are three areas where the ARS can contribute:

Education. The art and science of rangelands management need to be a part of the national education curriculum. We could consider forming a Rangeland Education Network.

Communication. Our Society could play an important role as the honest broker.

Bridge building. The ARS has a role in improving information flows and in identifying barriers to change."

As my final take-home message, remember that *we are all part of a Rangeland network - don't let your connection fail!*

Two output scenarios

Two scenarios, "Looking Out" and "Looking In", present a distillation of all the workshop material. These scenarios have been compiled by the workshop convenors (Barney Foran, Don Blesing, Nick Abel, Martin Andrew and Jenny Bourne).

Looking Out anticipates that the financial rewards generated by a full application of free market monetarist policies will result in production and management efficiencies which benefit all Australians. Under this direction, good financial returns from all industries in the rangelands allows appropriate investment in human, cultural and ecological resources currently considered as being under threat.

The second possible direction entitled **Looking In** anticipates that rangeland Australia and its human, financial and ecological resources will be best served by the development and maintenance of strong communities in each rangeland region. Under this direction, empowerment of local communities and reconciliation between Aboriginal and non-Aboriginal peoples give a base from which a range of new land uses and enterprises will evolve.

We suggest that these two scenarios be used as the basis for further regional consultation with rangeland communities, and that the output of these participatory consultations form the basis of a regionalised and practical Rangelands Strategy (Blesing *et al.*, 1996).

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THE CONFERENCE IN RETROSPECT

Carolyn Ireland, Chair of the Organising Committee, 9th Biennial Australian Rangeland Society Conference, 13 Woodland Close, Aldgate SA 5154

I was extraordinarily pleased and heartened to hear comments from most participants about how much they liked the format of the conference. The mix of people (although a bit shy on Aboriginal people and miners) was good. After the initial shock wore off that they would be expected to work and, horror, express their opinions in public, everyone seemed to plunge right in, enjoy the discussions and even feel ownership of their respective scenarios. This was born out by the number of delegates who wanted the richness of those discussions preserved.

In retrospect, I am personally very glad that we, as a committee, did not waver from our goals. The whole committee is to be congratulated, not only for all the pure hard yakka that they put in, but also for the courage to continue with what might have, at times, seemed an idealistic and rather far-fetched idea. We went forward however, and WON!

I had a GREAT time, met more people than at any other conference I have been to, exchanged a myriad of ideas and learned heaps.

The most positive outcome for me was to see people from all stakeholder groups sitting down and talking rationally and with mutual caring about the future of that beautiful and vast land out there. And this from some who would have never dreamed of talking to each other before! Let's hope that this new understanding of the other's point of view continues for the future.

REPORT ON A 1996 ARS TRAVEL GRANT

Sandra Van Vreeswyk, Agriculture WA, Barron-Hay Court, South Perth WA 6151

I received a Travel Grant from the Australian Rangeland Society which enabled me to attend the Society's biennial conference at Port Augusta in September.

I was immediately attracted by the conference theme 'Focus on the Future'. Many of the changes which impact on the future of the rangelands listed in the conference brochure are happening now in the Pilbara region of Western Australia where I work. These include questioning of the pastoral industry, the emergence of eco-tourism, an increasing amount of land coming under Aboriginal control, the expanding

presence of mining and increased area under conservation reservation.

I am currently employed as a member of Agriculture Western Australia's rangeland survey team. I am involved in describing and mapping the biophysical resources of Western Australia's rangelands, and extending this information to rangeland managers and administrators. At Port Augusta, I was able to discuss technical aspects of my work with others from around Australia who do similar work.

Through the poster sessions I was able to learn about many other aspects of the rangelands, in particular I was very interested in posters dealing with grasslands and cattle. I am very familiar with sheep grazing lands but have only just started working with, and learning about, cattle grazing.

One of the most important benefits of attending the conference was to renew and increase my contacts with others who live or work in the rangelands. It is always exciting to meet people whose names you are familiar with through published papers, and of course to put a face to the person at the other end of the phone.

I was a bit wary of the workshop parts of the conference but I seem to have survived all right. Being a traditionalist I do like to just sit back and have other people tell you about what they've been up to, but I am pleased that I had the opportunity to try the foresighting process and I also congratulate the Organising Committee for being brave and trying something different.

All participants were invited to attend the opening of the Australian Arid Lands Botanic Garden. It was moving to see how proud the people involved with the project were.

I really enjoyed the field trip to the Flinders Ranges. I was amazed to see 'our' pearl bluebush growing all over the hills around Port Augusta - amazing enough to see it so far from home, but to see it in a completely different position in the landscape was nearly too much.

The social functions were a lot of fun. I especially enjoyed the barbecue at Spear Creek where we had the opportunity to try kangaroo, camel and quail, not to mention desserts like quandong tart (highly recommended) and chocolate and wattleseed mousse.

I thank the Society for providing me with the opportunity to attend this conference.

VITH IRC ON THE NET

For those with access to the Internet, remember that information about the 1999 International Rangelands Congress can be found at:

<http://irc.web.unsw.edu.au/>

MONITORING RANGELANDS WITH SATELLITE DATA

*Gary Bastin, CSIRO, PO Box 2111, Alice Springs NT 0871
Bob Karfs and Paul Frazier, Department of Lands, Planning and Environment, PO Box 1680, Darwin NT 0801*

Introduction

Proponents of remote sensing have, for many years, advocated its use for monitoring vegetation - and more generally, the environment. However in the rangelands it is only in the recent past that practical methods for analysing satellite data have become available. It is even more recent that the usefulness of these technologies has been evaluated by state and territory agencies. Why is this? Why is it that ground-based methods and those that use satellite data are still not entirely complementary? How can we progress the two approaches to ensure that monitoring of the rangelands is accurate, efficient and credible?

A series of meetings has been held in recent years to explore some of these issues. This article summarises the major outcomes from those meetings and proposes that we examine the role of satellite data for rangeland monitoring within the wider rangeland community - possibly at the next Rangelands Conference.

1993 Workshop

In October 1993 some of the scientists involved in rangeland monitoring throughout Australia met in Alice Springs. Those present ranged from researchers who were using satellite data to assess small parts of the rangelands through to representatives of state agencies engaged in monitoring at the regional and state level using ground-based methods. The purpose of the meeting was to explore the usefulness of satellite data for practical rangeland monitoring and to discuss ways in which the research methods might be better implemented. In a report compiled after the meeting, Frazier *et al.* (1994) concluded that:

- Satellite data were essential for effectively monitoring the rangelands because of their ability to provide a regular and complete view of the rangelands.
- Satellite data could usefully assist in locating sites for ground-based monitoring.
- Effective rangeland monitoring required linkages between satellite data and ground-based methods. It had to be recognised that satellite data provided a different level and type of information to that from ground methods. Remote sensing was an additional tool for monitoring, not a replacement technology.
- Technologies for analysing satellite data (i.e. hardware, software and methodologies) were available but they were not being used operationally. The major reason for this was poor technology transfer.

The outcomes of the workshop were reported to the National Rangeland Monitoring Program (NRMP). Specific recommendations included:

- The NRMP could play an active role in promoting the use of satellite data for rangeland monitoring.
- A national coordinator was required to facilitate cooperation and interaction between the various agencies involved in monitoring.
- There was a need for improved methods of technology transfer between researchers and land managers and between researchers and state agencies.
- The running of specialised application workshops would help users to bridge the gap between using methods in a research context and operationally.

How Far Have We Come Since 1993?

Scientists met again to exchange information and review progress in the use of remote sensing technologies as part of the 8th Australasian Remote Sensing Conference held in Canberra last March. A representative from each state and the NT provided a brief overview of monitoring being conducted in that state. Speakers then went on to describe, in greater detail, monitoring techniques and applications that specifically use remotely-sensed data. The following is a brief summary (further detail is contained in the Workshop Proceedings produced by Karfs and Frazier, 1996).

Jeremy Wallace, CSIRO Division of Mathematics and Statistics in Perth

A joint project underway between CSIRO and Agriculture WA is investigating temporal change in Landsat Multispectral Scanner (MSS) data using statistical methods. A particular outcome is testing the extent to which the results can be summarised to provide useful maps of change in condition through time where condition is based on the response of annual species compared with perennials. The technique is now at a semi-operational stage and prototype products are being developed to summarise regional changes over a ten-year period.

Bob Karfs, NT Department of Lands, Planning and Environment

The technique developed by the CSIRO Division of Mathematics and Statistics is being tested in the Victoria River District of the NT. Multitemporal MSS band two data are calibrated and then summarised to produce maps. The mean value of each area over time is displayed as a channel of information on one colour gun. Areas having a positive trend (i.e. effectively an increase in vegetation cover through time) are displayed on another colour gun and those areas with negative trend (i.e. declining cover over time) on a third gun. The results from the pilot study indicate that carefully processed historical MSS imagery can identify areas where the cover has been changing or is stable over time.

Gary Bastin, CSIRO Division of Wildlife and Ecology in Alice Springs

A "technology transfer" project is about to commence with the NT Department of Lands, Planning and Environment. This project will test the effectiveness with which CSIRO's grazing gradient methods can assess grazing impact on the Barkly Tablelands. The grazing gradient method uses satellite data to determine average cover levels at increasing distance from watering points. Where cover levels are fully restored in the vicinity of water following major rains, no long-term damage to the vegetation has occurred. A variant of this technique, the resilience method, produces a scaled map showing how vegetation at each location in a paddock responds to rainfall. This method potentially has application for paddock planning and could be a useful tool for monitoring trend.

Rodger Tynan, SA Department of Environment and Natural Resources

Rodger is determining how useful the CSIRO Division of Wildlife and Ecology's grazing gradient techniques are for assessing the condition of pastoral leases in northern SA. Information collected at photopoints is being used to supplement the grazing gradient method in the SA Government's lease assessment program.

Graeme Dudgeon, formerly with NSW Agriculture

NSW Agriculture are working with the Department of Land and Water Conservation in that state to develop links between satellite-derived measures of vegetation cover and ground data collected at monitoring sites. The most consistent and useful information about vegetation cover appears to be expressed by albedo, or total image brightness. Field checking has shown that areas with a high mean albedo show chronically low vegetation cover. Areas with high albedo variability were dominated by annual species which show a typical "boom and bust" cycle of vegetation cover. Conversely, areas with low mean albedo and low albedo variability were dominated by perennial species.

The remotely-sensed data and information collected at monitoring sites appear to be incompatible. Problems have occurred in relating the information collected at monitoring sites to the results arising from image processing. Reasons for this include different data types (e.g. density-based ground measures compared with the cover information extracted from satellite data), variable tree cover (which partially masks change in the pasture layer) and cryptogamic cover (whose colour and reflectance change throughout the year with the level of photosynthetic activity).

Shane Cridland, formerly with Agriculture WA

Moving to a much larger spatial scale, Shane described how the normalised difference vegetation index (NDVI) computed as images of vegetation greenness are being used to assess seasonal conditions for the whole of the WA rangelands. These images are produced from data acquired by the NOAA satellite at 1km pixel resolution. The information is being

examined to see if it can help pastoralists to better rank seasonal conditions through time. The information is also useful for assessing the severity and extent of drought. "Time traces" of NDVI values should help in interpreting the ground data collected at rangeland monitoring sites.

John Carter, Queensland Department of Primary Industry

Queensland DPI has a major program underway to develop process models that describe the biology of the rangelands. These models require data with extensive spatial coverage and relevant temporal context for their parameterisation and validation. Coarse-resolution NOAA data are being used for this purpose. Model inputs for determining pasture growth include climate data (rainfall, temperature, vapour pressure, evaporation and radiation), tree density (obtained from mean and coefficient of variation statistics of multitemporal NDVI), stock distribution (using tree-adjusted long-term mean NDVI) and fire occurrence. Model estimates of pasture green-cover have been correlated with NDVI data for many locations throughout Queensland.

The brief summaries provided above indicate that there is considerable diversity amongst agencies in the approaches they have taken in using satellite data for rangeland monitoring. As a seemingly good example of collaboration, NSW workers in one department are attempting to validate their analyses of remotely-sensed data with ground-based information collected by another agency. In terms of a modelling approach, QDPI are developing process models of plant growth which are parameterised, calibrated and validated with satellite data. Both CSIRO-based methods seek to determine the effects of grazing management from the satellite data alone; one with a predominantly statistical approach and the other using distance from watering points as a measure (or surrogate) of grazing pressure. Both methods are in various stages of technology transfer to client agencies and the results of their analyses are being interpreted and supported with some ground-based information.

Where To From Here?

At the conclusion of the Canberra workshop there was general agreement that the meeting had been worthwhile - but that any future meeting would be more appropriately held in conjunction with the ARS's biennial rangelands conference. It was suggested that future workshops might include time devoted to addressing specific issues, problems and/or themes related to remote sensing rather than just exchanging information.

Time constraints and the full program already arranged by the organisers did not allow for a formal workshop to be convened at the Port Augusta conference - although an informal meeting was organised by Rodger Tynan. Despite the lack of a formal agenda, it is worth noting that a number of posters presented at the conference described work involving the use and analysis of satellite data. This fact alone emphasises that remote sensing is an important tool for studying the rangelands.

The consensus of the brief Port Augusta meeting was that we should seek to elevate the status of remote sensing in the eyes of the rangeland community. One approach could be to ask the organisers to consider including the topic of remote sensing as a structured workshop within the program for the next rangelands conference. A possible theme for the workshop could be a critical evaluation by agency staff of the extent to which current satellite-based technologies meet their monitoring requirements.

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AN ECOLOGICAL PERSPECTIVE ON COOPER'S CREEK Windorah Workshop, 3-5 September 1996

Bob Morrish, Cooper's Creek Protection Group, Springfield Station, via Windorah QLD 4481

Proposals to develop a large irrigated cotton enterprise on Cooper's Creek near Windorah in south-west Queensland have alarmed community residents, pastoralists, conservationists, scientists and the Australian public. Recently about 80 people including arid-zone ecologists and environmental scientists, pastoral, resource and conservation managers, conservationists and local community representatives met in Windorah to provide an authoritative ecological scientific perspective on the irrigation proposals to governments. This meeting may well have been the first scientific conference ever held in a small, outback township - and it is certainly the first for Cooper's Creek.

The workshop was attended by many of Australia's foremost arid-zone ecologists and environmental scientists with extensive and ongoing research interests in the Cooper and related arid-zone areas.

Paper presentations addressed:
the value and dynamics of native pastures in the Cooper region (Brian Roberts);
vegetation biodiversity of far south-west Queensland (Mike Olsen);

the fluvial geomorphology of Cooper's Creek (Jerry Maroulis);
 a general overview of the Cooper system (Bob Morrish);
 wind erosion implications of agricultural development in the Channel Country (Grant McTainsh);
 the effects of water deprivation on invertebrates of the wetlands of the Paroo (Brian Timms);
 arid zone river-riparian linkages (Stuart Bunn and Peter Davies);
 the influence of flow conditions on aquatic fauna of arid-zone streams of the Pilbara (Peter Davies);
 the responses of arid-zone fauna to flooding of Cooper's Creek (Martin Denny);
 waterbird dynamics of Coongie Lakes (Julian Reid);
 the effects of irrigation on wetlands and waterbirds (Richard Kingsford);
 the role of hydrology in the fish ecology of the lower Cooper (Jim Puckridge and Keith Walker);
 an ecological assessment of plans to irrigate cotton on Cooper Creek (Keith Walker and Jim Puckridge);
 an holistic approach to environmental flow assessment (Angela Arthington);
 the flooding requirements of riparian vegetation in the semi-arid River Murray (Stuart Blanch and Keith Walker);
 the cultural interpretation of landscape and relation of ecosystems to social systems (Mandy Martin and Guy Fitzhardinge);
 the need for recognition of Aboriginal perspectives (Scott Johnston);
 an artistic interpretation of the arid Lake Eyre Basin landscape (Erika Calder);
 the legal and constitutional context of the Cooper irrigation issue (David Eldridge);
 the Department of Natural Resources (DNR) hydrological model and flow management decision framework (Graeme Milligan, Kev Baxter and Steve Schreiber).

Major conclusions emerging from the workshop included:

The aquatic and terrestrial ecology of the Cooper is intimately dependent on its variable and unpredictable flow regime.

- The Cooper flows are fully consumed in providing for the growth of native vegetation and the support of ecological processes along its length and through its wetlands downstream to Lake Eyre. There is consequently no surplus water for extraction or diversion for irrigation.
- The Channel Country is an area of naturally very high wind erosion activity, which would be greatly accelerated by the cultivation of soils and removal of natural vegetation associated with intensive agricultural activity.
- Irrigated cropping has an exceptionally poor record of disturbance to aquatic systems because of huge demands for water and the introduction of toxic agricultural chemicals and fertilisers.
- The ecology of the Cooper system would be seriously threatened by the proposed irrigation development and the potential damage of this development is unacceptable in view of the system's national and international conservation

significance, and in view of its importance to local communities and the pastoral industry.

- The hydrological model underpinning the DNR flow management decision framework is based on an inadequate data set and is therefore of doubtful predictive value.
- The entire DNR flow management and decision process is inadequate in failing to address ecological impacts.

The scientists communicated these concerns in an open letter to the Queensland Minister for Natural Resources, recommending that the proposed irrigation project and all future irrigation proposals for the Lake Eyre Basin rivers be rejected. They further recommended legislation to improve Queensland's process of dealing with water allocation and resource management issues, and urged the Queensland Government to take a leading role in the development of an interstate Lake Eyre Basin catchment management structure, with appropriate resources and powers to ensure the long-term protection of the ecological integrity of the Basin.

These views and recommendations received the full support of participants of the workshop. Only two observers representing the cotton irrigation proposal dissented. Thirty-six wetland scientists at a recent Australian Society for Limnology conference have endorsed the recommendations of our workshop. A subsequent large international conference of wetland scientists and managers in Perth unanimously (430-0) passed a resolution calling on relevant State Governments and the Federal Government to implement a moratorium on irrigation proposals in the Lake Eyre Basin (with specific reference to the Cooper's Creek cotton irrigation proposal) and to set up a framework for the sustainable management of the Lake Eyre Basin. The Institute of Wildlife Research of the University of Sydney strongly supported the recommendations of the Windorah workshop in letters to the Queensland Premier and to the Minister for Natural Resources.

On the 29th October 1996 Howard Hobbs, Minister for Natural Resources, told the Queensland Parliament that the Currareva cotton irrigation proposal would not proceed. He also announced that a new Bill would be enacted to provide for better management of water resources in sensitive areas of the State, and that water management plans would be backed by legislative force. Mr Hobbs indicated that the ecological evidence presented at the Windorah workshop, and the comprehensive rejection of the proposal by Channel Country residents and the wider community were significant factors in the Government's decision.

The Windorah workshop was successful as a scientific forum, in influencing government policy and by promoting informed dialogue, cooperation and friendship amongst representatives of the pastoral, scientific, artistic, conservation, local and wider communities. Participants are resolved to continue such events focussing on ecological science in the outback on a regular (annual or biennial) basis.

Ed. In a postscript to this article, Bob advises that proceedings of the Windorah workshop are available in summary form from the Australian Conservation Foundation, Adelaide Branch, 120 Wakefield St, Adelaide SA 5000.

MEASURING AND MONITORING VEGETATION IN NORTHERN AUSTRALIA

Report on a Workshop Sponsored by the Meat Research Corporation

Judy Lambert, Community Solutions / consultant to Meat Research Corp., 179 Sydney Road, Fairlight NSW 2094

From 15 to 17 October, a group of some 50 people with interests in measuring and monitoring vegetation on pasture lands in northern Australia for sustainable use came together at Gatton College. Within a workshop environment, the group discussed why monitoring should occur, what should be monitored and how monitoring should be done in order to ensure that its application assists sustainable use of northern Australian pastures.

Organised as part of Phase Three of the Meat Research Corporation's North Australia Program (NAP3), participants comprised equal numbers of beef producers, rangelands research scientists and government officials with an interest in rangelands management.

The workshop was planned and run by a steering committee led by Meat Research Corporation NAP Technical Coordinator, Dr Barry Walker, and former CSIRO scientist, Dr John Tothill. Each session (focussing on the why, what and how of monitoring) commenced with a plenary paper designed to begin discussion and was followed by small-group workshops to develop effective ways of monitoring. The final workshop session brought together the outcomes of two days of intense activity, through a focus on the links between monitoring and resource management. Director of the CRC for Soil and Land Management, Dr Ann Hamblin, then faced the difficult task of drawing together the outcomes of the workshop in a final plenary session.

Outcomes of the workshop will be published by the Meat Research Corporation in a form useful to those who want to adopt monitoring strategies to assist in the move to sustainable management of properties. Key features of the workshop were the extent to which producers, scientists and government officials each came to a better understanding of the needs of the others, and the extent to which some producers are keen to establish a process in which the landholders take the lead and are guided and supported by both scientists and government agencies. Within that process, monitoring would be followed by knowledge gain, from which interpretation will lead to informed management decisions. Such decisions can, and must, bring about both ecological sustainability and economic viability.

OUTBACK ALTERNATIVE ENTERPRISE EXPO

Fiona Lander, Secretary, Bourke Enterprise Development Agency, PO Box 531, Bourke NSW 2840

The inaugural Outback Alternative Enterprise Expo was successfully held on the 26th September 1996 at Bourke.

The Expo was an initiative of the Bourke Chamber of Commerce, NSW Agriculture and the Bourke Enterprise Development Agency. Along with interested members of the community these organisations formed a committee with the view to holding an expo on alternative enterprises. With depressed cattle prices and the ongoing drought conditions experienced for over five years, the committee believed there was a need to provide information and ideas on diversification into feasible alternative enterprises.

Diversification is a key concept that has been highlighted by many agricultural and economic groups over recent times. The committee felt that a forum focussing on diversification specific to the more arid areas of western NSW and south western Queensland was needed.

The committee believed that diversifying didn't necessarily mean starting something new from scratch such as emu or Boer goat production; it could also mean altering and improving existing products such as wool to meet new markets. Two examples of this include chemical-free wool production and growing finer wool. By altering an existing product, producers can access new and more profitable markets while keeping capital costs associated with new enterprises to a minimum.

The long-term viability of landholders has a direct impact on the communities that service them. Therefore the expo was viewed as an opportunity for economic development that could have long-term benefit to the whole community.

With this objective in mind the committee looked at developing a user-friendly forum that could be accessed by all community members. In addition to exhibits on different enterprises, the committee felt that workshop presentations on aspects of investigating and setting up alternative enterprises were essential to ensure that interested people were aware of what was required when diversifying.

Five workshops were developed:

- Your backyard has value added to it!! (focus on niche marketing).
- Where do I start? An overview of factors to consider.
- Financial planning and assessment of new enterprises.
- Getting started in a new industry - sources of help and information.
- Export opportunities.

In addition to the workshops and exhibits, a booklet was produced detailing the proceedings from the workshops, information from exhibits and issues associated with Western Lands leases. As the latter concerned the majority of

landholders, it was necessary to inform people of how the Act could affect those that choose to diversify into alternative enterprises.

In all, there were 28 exhibits on the day. Eleven of these were alternatives that were considered possible in the western areas of NSW and south west Queensland. They included:

- farmstays / tourism (times two)
- production of essential oils (using woody weeds)
- hemp
- olives
- chemical-free wool growing
- emus
- Boer goats
- alpacas
- jojoba

Due to the success of this year's expo, the committee has decided to make the expo an annual event. A date has yet to be set for 1997. Anyone wanting further information on the expo or a copy of the booklet describing the workshop proceedings, please contact me at the above address or phone 068 721321.

TWO DECADES OF RESEARCHERS GET TOGETHER AT MIDDLEBACK

Mark Stafford Smith, CSIRO, PO Box 2111, Alice Springs NT 0871

To the cheerful patter of rain on the tin roof, about 40 people gathered for a reunion at the shearer's quarters at Middleback Station at the end of September. Middleback, on the Eyre Peninsula, is the site of the Middleback Field Centre, brainchild of Bob Lange, then from the University of Adelaide, and the Nicolsons who run the station. The shearer's quarters have supported a population of university students and researchers since the early 1970s, all of whom have known and loved the kitchen with its old wood cooker, and its archaeological herb collection, more-or-less representative of the entire period of modern occupation.

The Rangelands Society Conference in nearby Port Augusta represented an ideal opportunity for a get-together, and ex-students, mostly from Adelaide but also from as far as Alice Springs and Armidale, caroused and gossiped for an evening with three generations of Nicolsons. The following day people dispersed to photopoints and old research sites across the station, updating readings which have run for 20 years and more. The Field Centre 'diary', to which most visitors add their activities, reminded one of the diverse nature of the research, from studies on sheep grazing impact and piospheres, to the basic ecology of mistletoes and bats, to tree survival in the face of rabbits, and the dynamics of vegetation under a variable climate. And closer to the shearer's quarters, who had not observed mouse behaviour behind the kitchen cupboards, or the frenetic activity that follows a centipede falling out of the ceiling into a bowl of cereal?

The Middleback Field Centre itself was opened in 1979, so look out for the 20th anniversary celebrations next!

ABSTRACTS THE RANGELAND JOURNAL Vol 18 No 1 1996

The Influence of Recent Grazing Pressure and Landscape Position on Grass Recruitment in a Semi-Arid Woodland of Eastern Australia

Val Jo Anderson, Ken C. Hodgkinson and Anthony C. Grice

This study examined the effects of previous grazing pressure, position in the landscape and apparent seed trapping capability of soil surface micro-sites on recruitment of the perennial grass *Monachather paradoxa* (mulga oats) in a semi-arid woodland. Seedling emergence was counted on small plots which had been kept moist for one month. The plots were on bare ground, or at grass tussocks, or at log mounds, sited in the run-off, interception and run-on zones of paddocks that had been grazed for six years at 0.3 and 0.8 sheep equivalents/ha. Few naturally occurring perennial grass seedlings emerged on any of the sites. The level of previous grazing pressure influenced the recruitment of grasses from natural sources as well as from seed of *M. paradoxa* broadcast on the soil surface; significantly more grass seedlings recruited in paddocks stocked at 0.3 than at 0.8 sheep/ha. Emergence of the sown grass did not differ significantly between the three zones in the landscape, but trends in the data suggest the interception zone may have been the most favourable. Recruitment from *in situ* grass seed was highest in the mulga grove (run-on) zone. Most seedlings of the sown grass emerged around the bases of existing perennial grass tussocks, but recruitment of volunteer perennial and annual grasses was more evenly distributed between the mulga log-mounds and perennial grass tussocks. It is concluded that very low levels of readily germinable seed of perennial grasses remained in the soil at the end of the drought and that areas with a history of high grazing pressure have less probability of grass recruitment when suitable rain occurs.

The Population Dynamics of Perennial Shrubs in a Western Australian Chenopod Shrubland in Relation to Grazing and Seasonal Conditions

Z.G. Yan, A.McR. Holm and A.A. Mitchell

This paper examines the responses of a chenopod community in arid Western Australia to various grazing treatments over an eight-year period. The population dynamics of the major perennial species are analysed in relation to grazing treatments and seasonal conditions. Continuous grazing and spelling had no discernible impact on community composition when compared with the nil-grazing treatment. However, continuous grazing increased population turn-over rate, which reflected a higher level of recruitment and mortality, when compared with the nil-grazing treatment.

In general, populations of all major perennial species remained stable or increased during the study period. Both mortality and recruitment were sporadic, corresponding to the erratic rainfall

events during the trial period. For the three major perennial species, *Maireana georgei*, *M. pyramidata* and *Ptilotus beardii*, linear regression analyses reveal that 38-74% of the variation in mortality and recruitment was caused by seasonal conditions.

An Integrated Approach for Maximising Local and Scientific Knowledge for Land Management Decision-Making in the New Zealand High Country

O.J.H. Bosch, W.J. Allen, J.M. Williams, and A.H. Ensor

Resolving the problems facing the world's rangelands requires a cooperative effort between land managers and researchers to make wise management decisions. This, in turn, requires the maximisation of knowledge from all sources. Years of experimentation with different management strategies to achieve different goals have provided land managers with much knowledge about their local land use systems. Unfortunately, this knowledge is not available to the community on a collective basis. Similarly, much of the valuable knowledge that scientists have accumulated is fragmented, held in different databases and, consequently, not always readily available, even to other scientists or land managers. In the New Zealand high country a community-based research framework has been developed to bring both local and scientific knowledge systems together into a single decision support system (DSS) that is directly accessible to all those involved in land management.

This DSS is continuously updated with, not only the results of ongoing research, but also the new knowledge gained by land managers as they manage their land on a daily basis - implementing management strategies and observing (monitoring) the results of their actions. However, for land managers to become more formally involved in the research process through "adaptive management and monitoring", they require user-friendly monitoring tools. For example, with the development of a vegetation monitoring model based on the abundance of a few key species, land managers can now participate as "researchers" in a large-scale ecological "experiment" to develop and evaluate a set of best management practices for the high country of New Zealand.

This cooperative research initiative affords scientists a better feeling for how their research field fits into the total system, and provides a better appreciation of the real problems facing land managers. At the same time land managers acquire greater technical expertise - building on both collective local knowledge, and an associated scientific awareness of their particular environment. Accordingly, this community-based research approach represents a framework through which scientists and land managers can cooperate to develop and work towards a common vision.

Run-Off and Soil Movement on Mid-Slopes in North-East Queensland Grazed Woodlands

J.C. Scanlan, A.J. Pressland and D.J. Myles

In grazed woodlands of north Queensland, cover from standing dry matter and litter had a major effect on reducing runoff. Run-off was greater from grazed areas than ungrazed areas, but this difference could be explained solely by differences in cover. Run-off was more than 30% of rainfall when soils were wet and high intensity storms of >40 mm were received. Black speargrass pastures showed greater run-off than Indian couch pastures even at the same level of cover.

Soil loss was also reduced by high levels of cover. When cover is at least 40%, then soil loss is greatly reduced compared with bare soils and is similar to soil loss from areas with almost complete cover. However, considerable amounts of soil can be lost in the form of suspended sediment in run-off water even when cover is dense.

Grazing Modifies Woody and Herbaceous Components of North Queensland Woodlands

J.C. Scanlan, A.J. Pressland and D.J. Myles

Tree density increased during a drought period in both grazed and ungrazed areas. Strips of grass with bare patches between them became obvious during the drought. These tended to disappear after two summers of above average rainfall. Over a six year period, the proportion of Indian couch rose from 35% to about 80% of standing dry matter in both grazed and ungrazed areas.

Indian couch pastures had more ground cover than black speargrass pastures for the same standing dry matter yield. Heavy grazing tended to reduce grass basal area of black speargrass more than for Indian couch.

Establishment of Woody Weeds in Western New South Wales. 1. Seedling Emergence and Phenology

C.A. Booth, G.W. King and F. Sánchez-Bayo

Germination and survival of seedlings of four woody weed species (narrow-leaved hopbush *Dodonaea attenuata*, turpentine *Eremophila sturtii*, punty bush *Cassia eremophila* var. *eremophila* and silver cassia *C. artemisioides*) were examined, together with their phenology, at four sites which differed in shrub density, grazing pressure and topography in the Bourke - Wanaaring region of western New South Wales over the period 1979 to 1982. Although emergence varied between species (*D. attenuata*: 5,000-30,000 seedlings/ha; *E. sturtii*: 3,000-10,000 seedlings/ha; *Cassia* spp.: 2,000-4,000 seedlings/ha), the conditions favourable to large scale establishment depended mainly on rainfall during late autumn and winter for germination and that of the summer following

germination for survival of all species. Turpentine required larger rainfall events or prior rainfall events for seedling germination. Soil disturbance enhanced seedling emergence, growth and survival of *D. attenuata* by increasing soil moisture content deep in the profile. Sandhill areas showed significantly higher emergence levels for *D. attenuata*. The higher emergence of seedlings on densely shrubbed areas was most probably due to higher soil seed loads. Micro-depressions and sandplains favoured survival of all species. Grazing, mainly by rabbits, had no specific impact on emergence of any of the species, but reduced the survivorship of *D. attenuata*. Predation by insects had a negligible effect.

The shrubs flowered in all years between July and October for hopbush, and May to September for turpentine and those that flowered were prolific. Seed loads had been dropped by late November. Generally, hopbush shrubs had attained 2 m before flowering but in one year 86% of those above 1 m high flowered. Turpentine generally flowered after it had attained 50 cm, although in one year one plant flowered when less than 25 cm.

Encroaching populations of shrubs should be controlled before they mature and form dense stands. Hopbush and turpentine control programs should be completed before the end of winter, just before annual seed set. Control of young establishing stands of hopbush should be undertaken before they reach a height of one metre and 50 cm for turpentine. Rapid expansion outside treated areas is unlikely, however, occasional 'outlier' shrubs should be controlled before they mature and produce seed.

Establishment of Woody Weeds in Western New South Wales. 2. Growth and Competitive Potential

C.A. Booth, F. Sánchez-Bayo and G.W. King

Growth and survival of hopbush (*Dodonaea attenuata*), turpentine (*Eremophila sturtii*) and punty bushes (*Cassia eremophila* and *C. artemisioides*) were studied in relation to the effects of grazing and shrub density at four sites in the Bourke-Wanaaring region of western New South Wales during 1979 to 1982. Hopbush shrubs grew faster than turpentine and punty bushes. Small hopbush grew better on open areas, while mature shrubs grew better in dense stands. Turpentine showed better performance in open areas, and punty bush growth was unaffected by shrub population density. All these species showed a high survival rate, particularly in height classes greater than 25 cm, and they kept growing even during drought periods. The effects of grazing on survival were inconclusive.

Hopbush and turpentine root development was rapid, attaining depths of over 1.1 m in wet soils, 14 weeks after germination. Mature plants in the field, both hopbush and turpentine, were observed to have extensive lateral root networks at either 22 cm or 30-70 cm soil depth respectively, as well as a tap root system. The characteristics of both species help explain the competitive advantage of these shrubs over herbaceous species, and their survival capability in times of drought.

Competition of hopbush with the perennial grass woollybutt (*Eragrostis eriopoda*) and annual herbage was also examined. In spring, survival of hopbush seedlings was favoured within woollybutt tussocks, this situation being reversed in autumn. Woollybutt biomass was negatively affected by the proximity of hopbush shrubs. Annual herbage seemed not to have any effect on hopbush survival, although shrub seedlings grew better under conditions of moderate herbage cover. Microtopography affected the establishment of both grasses and shrubs, with depressions favouring the growth of grasses at the expense of shrubs during periods of adequate moisture, and the growth of shrubs during drier times.

The findings suggest that the woody weed problem is unlikely to wax and wane and that turpentine may be particularly difficult to control. Maintenance of high levels of pasture cover from perennial grasses and annuals may slow down recruitment and growth in open areas with scattered parent shrubs, where control will be less costly, and may contain future spread.

Bias in Aerial Survey of Feral Goats in the Rangelands of Western Australia

Colin Southwell

Broad-scale aerial surveys of feral goat populations in the arid/semi-arid rangelands of Western Australia have used strip transect methods without correction for visibility bias to estimate minimum abundance. Improved accuracy of these minimum estimates is necessary for more effective control. Line transect methodology was used to assess visibility bias in aerial survey of feral goats in a 375,000 sq km area of north-west Western Australia. Visibility of goat groups decreased with increasing vegetation cover. In open country with little or no cover there was no decline in visibility within a 200 m strip from the transect line. In country with high vegetation cover visibility declined markedly with distance from the transect line, and it was estimated that only half the goat groups within the 200 m strip were seen. No size-bias in the estimation of mean group size was detected. The line transect results, and consideration of possible violations to the line transect method, suggest that previously published minimum estimates of feral goat abundance may be negatively biased by at least 30-40%.

Relationships Between Grass, Shrub and Tree Cover on Four Landforms of Semi-Arid Eastern Australia, and Prospects for Change by Burning

Rachel L. Daly and Ken C. Hodgkinson

Pastoralists want to understand and predict relative changes in grass, shrub and tree cover so they can manage effectively both their vegetation and the cost of its change. Relationships between the cover of grasses and of woody vegetation were determined in 1991 on four landforms typical of semi-arid

eastern Australia. Basal cover of grasses was very low and decreased as canopy cover of woody vegetation increased on the Rolling Downs and Lowlands, Plains and Alluvial Plains. In the Sandplains and Dunefields landform grass cover increased until woody vegetation cover was 10%. If pastoralism is assumed to be most efficient when woody vegetation cover is below a threshold of 5%, then about three quarters of sites surveyed on Sandplains and Dunefields and on Plains needed treatment to reduce shrub and tree cover. About half the sites surveyed on Rolling Downs and Lowlands and about one third of sites on Alluvial Plains needed treatment. It was determined that one or two prescribed fires or similar treatments would be sufficient to restore the desired vegetation balance. The survey confirmed perceptions that shrub and tree cover is unacceptably high for pastoralism throughout much of the region.

Estimating Landscape Resilience from Satellite Data and its Application to Pastoral Land Management

G.N. Bastin, G. Pickup, J. and A. Stanes

The infrequent large rainfalls which characterise arid rangelands provide rare opportunities for vegetation recovery following grazing. Improved understanding of how vegetation, and particularly herbage, responds at the paddock scale to such rainfalls should assist future land management. This may occur through simply adjusting grazing pressure in anticipation of, or following, future rainfalls, by changing paddock or waterpoint layout, or through land reclamation.

In this paper, we show how herbage response to rainfall can be determined from Landsat satellite data. We process these data into an index of vegetation cover and then produce a map showing where herbage response to major rainfalls is either above or below average for each landscape type. Derived map products show herbage response in conjunction with cover levels present before rain, and herbage yield. These products have been used by a cooperating pastoralist family in central Australia to test their usefulness for future property management.

Some insights were gained into additional property development but no definitive management strategies emerged for the property as a whole. The technology and its underlying ecological theory is complex and requires considerable explanation. For credibility, a close working relationship should exist between the technician and client. Our approach to landscape assessment is considered to have greatest application as a monitoring tool where future maps produced following major rainfalls should complement ground-based monitoring being conducted by the pastoralist family.

Assessing the Risk of Various Stocking Strategies in the Semi-Arid Savanna of Kwazulu-Natal, South Africa

G.P. Hatch, N.M. Tainton and G.F. Ortmann

Rainfall in arid and semi-arid environments is a major determinant of system dynamics which results in seasonal fluctuations in forage production. The influence of fixed and variable stocking strategies on the distributions of forage deficit period and net return for various range condition scenarios were examined using a bioeconomic model. Although the risk of forage deficits and financial losses were reduced with lighter stocking, this was at the opportunity cost of higher returns during wetter seasons. Increased stocking increased returns during wetter seasons, but at the cost of increased risk of forage deficits and highly negative returns during drier seasons. Flexible stocking may combine the benefits of each approach and reduce financial risk. The development of cumulative probability distributions will allow range users to assess the level of risk attached to different strategies. Incorporation of the ecological effects of stocking strategies as feedback into the model would be important to evaluate ecological risk.

Home Range Responses of Feral Goats

Colin Holt and Greg Pickles

The variability in size and the extent of overlap of feral goat home ranges are important considerations when formulating control strategies. Home range information suggests that once feral goats have been removed from an area, the area will remain cleared until an extension of species range occurs. However, because of the immense overlap of feral goat home ranges, many feral goats use a particular area and all these must be targeted.

Home range size also varies considerably between individuals and at different times of the year. Other studies have shown home ranges can be as large as 587.7 sq km for males, and 279.2 sq km for females. This means that a large expanse would need to be targeted if an area is to be cleared of all feral goats.

Feral goat home ranges generally extend over paddock and property boundaries because the standard pastoral stock fence is no deterrent to their movements. This highlights the need for a wide ranging cooperative approach to feral goat control by neighbours. Isolated feral goat control on one station will have limited effect.

The limited amount of data from this study suggests that aerial control activities had little effect on the home ranges of resident feral goats and so helicopter-based shooting can be used as an effective control tool without causing the reinfestation of previously cleared areas.

The Potential of Some Mechanical Treatments for Rehabilitating Arid Rangelands.

I. Within-Site Effects and Economic Returns

M.H. Friedel, J.E. Kinloch and W.J. Müller

We investigated the effectiveness of some central Australian efforts to rehabilitate grazed rangeland. Pitting and opposed discing, the most widely used mechanical treatments, are not always successful. While pits and furrows created by the treatments often carry more vegetation than the untreated areas, the amount of the increase may be too little to give an economic return. The best returns are likely where degradation is minor, where livestock are of high quality and where landholders collect their own seed. Exclusion of grazing in the initial stages will mean more vegetation later.

The Potential of Some Mechanical Treatments for Rehabilitating Arid Rangelands.

II. Identifying Indicators from Between-Site Comparisons

M.H. Friedel, W.J. Müller and J.E. Kinloch

In a companion paper we showed that degraded arid rangelands could rarely be rehabilitated economically with mechanical treatments like pitting and opposed discing. In this paper we develop environmental indicators based on rainfall, landform and soils, as a guide to the places where these treatments might work. In central Australia, soils had to be sandy clay loams or sandier and annual rainfall had to be at least 280 mm. Soil surfaces that were not too smooth, were reasonably easy to break and did not collapse in water were also likely to be best for treatment.

Mostly, land like this is probably not very degraded. We think that land needing mechanical rehabilitation would respond better to water ponding or large-scale ponding banks for water harvesting. We also think that native species should be tried as alternatives to foreign species like buffel grass, which can invade sensitive areas.

For a simple gauge of the success of different rehabilitation treatments, we suggest counting all perennials with a basal diameter of ≥ 5 cm within a standard area.

Recruitment of Curly Mitchell Grass (*Astrelba lappacea*) in North-Western New South Wales

M.H. Campbell, A.M. Bowman, W.D. Bellotti, D.J. Munich and H.I. Nicol

The recruitment of *Astrelba lappacea* was studied from 1986 to 1995 in a pasture in north-western NSW where the density of plants had declined from 1 to 3 plants/sq m in 1970 to 0.023 plants/sq m in 1986. Three treatments were imposed:

ungrazed - sprayed - slashed, where annual weeds were treated with herbicides and slashing to reduce competition during recruitment; ungrazed-only; and grazed-only.

The seed bank of *A. lappacea* was measured on four occasions and densities of *A. lappacea* plants determined after major rainfall events mainly in summer and autumn.

On the ungrazed treatments the seed bank of *A. lappacea* increased from 0 in 1988 to 908, 898 and 286 germinable seed/sq m in, respectively, 1992, 1993 and 1995. Flowering and seedling recruitment occurred each year from 1988 to 1995 but seedlings only survived to become mature plants from the 1988 and 1992 recruitments. The major reason for the death of seedlings was dry conditions in the latter half of the year (110 to 135 mm of rain/six months). Frosts and competition from Brassicaceae weeds (mainly *Raphistrum rugosum*) in winter and spring also contributed to death of seedlings. Recruitment of seedlings and their survival to mature plants was higher on the ungrazed - sprayed - slashed treatment than on the other treatments. Recruitment and survival on the ungrazed-only treatment occurred because Brassicaceae weeds did not establish when recruiting rains fell in summer. Plant density increased from 0.023 plants/sq m in 1986 to, respectively, 0.86, 0.64 and 0.004 mature plants/sq m and 7.88, 6.37, 0.10 seedlings/sq m on the ungrazed - sprayed - slashed, ungrazed-only and grazed-only treatments in 1995.

On the grazed-only treatment the methods used to detect seeds revealed none in the soil during the experiment. However, some seeds were present because there was a low level of recruitment - none of which survived to mature plants. The number of mature plants declined from 0.023 to 0.004/sq m indicating that under the present grazing system the complete elimination of *A. lappacea* from pastures in north-western NSW is possible if some form of managed recruitment is not devised.

CALL FOR COUNCIL NOMINATIONS Queensland and South Australia

Ron Hacker, President Australian Rangeland Society, PO Box 865, Dubbo NSW 2830

Council will move from New South Wales to Queensland in May 1997. The following Council will be based in South Australia. Nominations are now called for positions on the Queensland Council.

The positions of:

President

Vice President

Honorary Secretary

Honorary Treasurer

Subscription Secretary

are to be filled from the QLD membership. A position of Vice President is to be filled from the SA membership.

Nominations signed by two financial members of the Society and countersigned by the person nominated must reach the Secretary by 10 April, 1997.

SOME THOUGHTS FROM THE PRESIDENT

Ron Hacker, President Australian Rangeland Society, PO Box 865, Dubbo NSW 2830

For those 300 or so who made the trip to Port Augusta there is no doubt that the Society's 9th Biennial Conference will be a memorable event. The organisation was a credit to Carolyn Ireland's Committee while the foresighting exercise, which involved participants in the analysis of four possible scenarios for the future of the rangelands, proved a stimulating if at times uncomfortable exercise - uncomfortable in the sense that the hypothetical future was in some cases a bit close to current reality. This aspect of the conference program was bold and imaginative and not all of the benefits may have been anticipated. I believe that the process of analysing the scenarios in small groups (excellently facilitated by some hastily trained recruits) resulted in very positive dialogue between a wide cross section of interest groups and contributed substantially to the "interchange of ideas and information" which is one of the Society's fundamental reasons for existence. We need to build continually on these opportunities if we are to realise our potential as the major national forum for discussion of rangeland futures. At the end of the day we did not identify a preferred future for the rangelands - perhaps an impossible task given the regional variation which was highlighted in many ways throughout the meeting. But we did consider the implications of four possible alternatives and I expect that subsequent analyses of these responses will identify some common imperatives which, if actioned, should help ensure that our rangeland industries and communities are as well placed as possible to cope with whatever the future ultimately delivers. That should also ensure that they are in the best possible position to determine their own preferred future within the limits that the external environment will impose.

These thoughts will be very much in mind as Council and the Policy Working Group finalise the Society's response to the Draft National Strategy for Rangeland Management. Consideration of the Draft was deliberately held over until the results of the Port Augusta meeting were to hand. It was apparent from general discussion at the meeting that there is much concern about the Draft Strategy. Many seemed to feel that it failed to reflect adequately the issues identified in the regional workshops, that the document is not owned by the rangeland communities, or that the strategies, objectives and actions are vague. Graeme Robertson's address to the conference left no doubt that the working party has had a hard time in reaching agreement on the wording. Indeed in some instances agreement has not been reached and the draft contains alternative proposals. However, in a national strategy generalisation is inevitable. While all of the regional flavours may not be captured the Draft does emphasise implementation through government-community partnerships with a strong focus on regional planning, and the objectives are broad enough to accommodate the regional strategies already developed by Catchment Management Committees and similar organisations. Carriage of the Strategy at local, regional and State levels should be feasible within existing structures. Of more concern is the responsibility for actioning those

components which require cross-border coordination or a national approach. Unless this responsibility is assigned to a representative, dedicated and adequately resourced organisation, we run the risk that some of the vital components will be implemented in a piecemeal fashion, or not at all. Establishment of a National Rangelands Commission was suggested by some of the working groups at the Port Augusta meeting but attracted little support from the floor of the conference. Nevertheless such an organisation could have responsibility for carriage of the strategy at the national level. While ultimate responsibility may rest with the Ministerial Councils (ARMCANZ and ANZECC) a dedicated organisation would seem essential if the Strategy is to fully realise the benefits it is intended to achieve. I would welcome comment from members regarding this issue, or the Strategy generally.

Finally, the Society has accepted an offer from Queensland to host the next conference in late 1997 with Prof. Eugene Moll as Chair of the Organising Committee. This is earlier than the usual two yearly cycle but has been influenced by the timing of the International Rangeland Congress which will convene in Townsville in July 1999. We can all look forward to a generous dose of northern hospitality over the next few years.

NEXT RANGELANDS CONFERENCE

Prof. Eugene Moll, Dept. of Management Studies, University of Queensland, Gatton QLD 4345

Planning is already underway for the next Rangelands Conference. This conference will be held in late 1997, ahead of the normal two-year interval so as not to clash with organisation of the International Rangelands Conference in 1999.

The 10th Biennial Conference of the Australian Rangeland Society will be held at the Gatton Campus of The University of Queensland (in the centenary year of the Queensland Agricultural College). This will be in the first week of December 1997 and I have notionally booked residence accommodation and conference facilities. A range of motel accommodation will also be available.

The Conference theme will be centred on communication in the bush and on the attitudes of city people to the bush - possibly something like "where city meets the bush". Arrangements will be made for some specialised workshops. Some that already have been requested are Remote Sensing and GIS, and Women in the Bush. Any other requests will be considered. At this stage it is proposed to hold a three-day meeting and at the end, to possibly organise a range of field trips.

A program and first brochure will be available early in the new year. The important thing for now is that Society members and others enter the conference date in their diaries - and COME TO GATTON in the first week of December 1997.

THE NATIONAL RANGELAND STRATEGY

A Personal View

David Wilcox, 54 Broome Street, Cottesloe WA 6011

(Ed. David recently presented his views on the Draft National Strategy for Rangeland Management at a workshop in Perth convened by Agriculture WA. This article represents his thoughts alone. It should not be interpreted as representing the Society's response to the Draft Strategy. This response is currently being compiled by the Policy Working Group and Council.)

My first and abiding impression of the Draft National Strategy for Rangeland Management is that it opens the doors for the first time to the whole of the incredibly complex rangeland environment. This is the first time that I have read a document on the rangelands which did not deal just with sheep and cattle production or with conservation. It has attempted to draw together the responsibility we share for our national patrimony with its fragile resources and it identifies the common causes of many different individuals and groups in society. It also points out the financial and social pressures which affect users of the rangelands and which compel them to manage these lands in the way in which they do.

The Working Group charged with the formation of the Strategy has attempted, with a great deal of effort and with a not inconsiderable financial investment, to tap into the beliefs and prejudices of the people who have interests in the rangelands. They organised 30-odd workshops attended by 1385 people. From these workshops the Working Group has developed a set of principles on which the Strategy is founded. There are 18 of these.

The workshops also produced a whole range of issues which the Working Group arranged into eight principles for management and from these, they defined goals in nine distinct areas. There are 39 objectives which need to be achieved and there is an impressive catalogue of 38 strategies from which 128 actions essential for appropriate rangeland management can be derived.

At this stage in my reading I began to question the potential value of the Draft Strategy. It is inordinately long on actions. There are enough actions to keep groups and individuals, official and non-official bodies, and the governments of Australia and their advisers busy for more than a quarter of a century; far longer than the scope of the Vision set out in the Strategy.

I believe that the Strategy will be of no particular value except as a pious statement of intent unless it is supported by a Plan of Action which is achievable. We need, as a matter of urgency, to arrange the listed Actions into some form of hierarchy so that we may move forward to the common goal.

Given the large number of laudable things which we might do, how do we decide on what needs to be tackled first? Is it the

parlous state of conservation, or the dire economic straits in which conventional pastoralism finds itself?

The failure to identify a logical course of action is a fundamental flaw in the Draft Strategy. There is no hierarchy of imperatives for action. On Page 44, the Draft states that an Action Plan will be spelt out and that it will deal with the roles and assigned responsibilities needed for implementation at all levels. The Strategy here falls well short of even modest expectations. For one thing it is very short on information on the process which will be adopted. There was just one page on the development of the Strategy beyond the Draft stage and only two paragraphs on a confused methodology. The text states, for example, that "proposals with significant funding implications will be subjected to prior cost-benefit evaluation". On what basis will the cost-benefit analyses be carried out? How long will be the term? Does this mean that expensive, but necessary, actions (for example large scale rehabilitation programs or the re-settlement of some current pastoral lessees) may be abandoned because it is not possible to make a positive cost-benefit evaluation of these tactics?

The questions which naturally arise are:

Who will prepare the Action Plan?

Who will define the hierarchy of actions on

- a state basis,
- on a Commonwealth basis?

Who will take up the running? Will it be the government, or will it be some amalgamation of groups (or NGOs) with government?

What will the public, i.e. those with an interest in rangelands, do? Do we identify those causes dear to us and lobby the two levels of government to provide the resources necessary to pursue them. How are we to organise, fairly, community representation? Does the Arid Lands Coalition, the NFF and ATSIC represent all the public? What about the representation of all those who in recent Australian Rangeland Society surveys said that they were concerned about the rangelands, visited them and wished that they be maintained in good condition?

It is fair to ask who will place "the objectives and action *and their linkages* into priority order so that they are addressed according to their urgency, importance, cost and other factors".

This question is of fundamental importance to all rangeland users. If I were one with financial and other ties to this land I would be clamouring and badgering for inclusion in the body which determines priorities for action and sets the scene for implementation in the first years - for we can be sure that a Strategy will be developed and that it will contain objectives and goals.

Government agencies will be reporting on the extent to which goals are achieved. Presumably then, if progress does not meet anticipation, some action will be taken so that the performance indicators which will be defined in the Strategy are met. It is clearly very important that the objectives should be selected with care.

At present the Draft requires the Technical Working Group of the joint Ministerial Councils (ANZECC and ARMCANZ) to

define the performance indicators. What if the priority actions are not your preferred hierarchy? Or worse, if you were not involved in the ranking of the objectives which determined the scope of these indicators.

It is not fair to be destructively critical of a document on which oceans of blood, sweat and tears have been spent. I felt that the section dealing with the conservation of the natural environment was the strongest of all nine sections. It set a number of achievable goals, particularly those on reaching agreements between agencies for the development of quick, cost-effective methods for biodiversity appraisals. It recognised the use of rangelands for conservation **and** other purposes which saw the needs of conservation met midst other competing demands.

Finally, I would like to make some observations on pastoralism which might lie outside the thrust of the Strategy, but which might help to resolve some of our dilemmas. Pastoralism is a political and social reality which is unlikely to disappear. People and companies were licensed to use natural grazing land but were not given guidance, until very recent times, on how the land should be used. Not surprisingly the rangelands began, in time, to produce at far below their capacity - especially after the vegetative capital built up over millennia was exhausted. In consequence habitat was lost, animal species were eliminated and even some plant species were put at risk. Public opinion and the newly emerging interest in ecology began to stir for the removal of, or at best a reduction in, grazing on public land. I went down the path of stock reductions myself about 25 years ago with little effect except for some unpleasant argument and some pungent criticisms.

Why are we still arguing about the right treatment for the rangelands a quarter of a century later?

In my view rangeland professionals have not been proactive enough in selling the merits of conservative grazing practices to the public, to conservationists or to the grazing industry. Is this the reason why, except for South Australia, land users do not have to accept the responsibility for their management decisions?

Scientists seem to shrink inwardly when asked by their master and the community to recommend rangeland strategies which will serve the needs of conservation and of other users. Instead of seizing the opportunity to display some professional judgments they propose, instead, whole rafts of new initiatives and pleas for research.

I believe that we do not need more research on the use of vegetation and its associated habitats in order to define best management practices which will make rangeland use sustainable. Of course we will always need some additional research to refine the processes, but there must be hundreds of years of collective wisdom in Australia which could be harnessed to develop proper grazing management strategies which will encompass the objectives of conservation and appropriate use of the resources.

Why isn't it done?

Perhaps those of you who should be concerned with the development of the Action Plan should call first for a compilation and analysis of the facts about land use in the arid zone. An Action Plan for the future could stand firmly on a base of knowledge and confirmed wisdom. Surely we don't need to begin again with the invention of the wheel.

My message then is - **wholehearted involvement in the next stage of Strategy development and particularly in the search for common ground with other rangeland users.**

HIGHLIGHTS FROM FASTS NEWSLETTERS July - October 1996

Joe Baker, FASTS President

July Newsletter

The Prime Minister has invited FASTS (Federation of Australian Scientific and Technological Societies) to join his Science and Engineering Council (PMSEC), where the voice of 40,000 working scientists will be heard at the highest levels of policy formulation.

August Newsletter

The impact of the Budget on science and technology (S&T) is still being weighed up. In a year when "a good result" was measured in terms of how little the cuts were, S&T probably came out as well as any other sector. The full effect of Budgetary measures will become clearer when we see how the universities cope with life in Poverty Street, and industry responds to the huge cuts in incentives to undertake R&D. The failure of Government to support overdue salary increases in universities is a national disgrace. The effect on the Cooperative Research Centres (CRCs) is uncertain. Although direct funding was increased, the CRCs are sensitive to the climate in universities and industry. It is all part of a complex interlinked science and technology domino effect in Australia. One unsavoury aspect of the Budget was Treasurer Peter Costello's statement that CSIRO was to receive an extra \$115 million. This was pure "pea and thimble" stuff - CSIRO has to pay the whole amount back to Government through asset sales and a new "efficiency dividend" applied to research work.

FASTS has been invited to nominate candidates for the Australian Research Council.

Career prospects for young research scientists. This issue is bubbling to the surface, as more young scientists wonder why

they ever bothered, when they discover the unrewarding salaries and employment conditions on offer. And this after 10 years hard work through degrees and post-doc experience! FASTS has been discussing this issue with a number of Members and allied groups, and a concerted campaign is being planned.

October Newsletter

The Prime Minister and several Ministers heard FASTS' first presentation to PMSEC. It was a great opportunity to raise some of the issues confronting this sector, and to talk about the value of S&T to the community. Many politicians do not appreciate the good things from S&T but see science in a negative light, with costly needs (education, training, job creation) and as generators of problems like CFCs, chlorinated hydrocarbons, and radioactive substances. PMSEC is a chance to publicise the good things coming from Science and Technology. The next meeting is in March 1997, and I once again invite you to consider the key issues to raise. They should be of national relevance.

FENNER CONFERENCE ON SUSTAINABLE HABITATION IN THE RANGELANDS

Nick Abel, CSIRO Division of Wildlife and Ecology, PO Box 84, Lyneham ACT 2602

The theme of the Fenner Conference this year was the sustainability of human habitation in the Australian rangelands. It was intended to develop ideas on sustainability emerging from the ARS Conference at Port Augusta, and influence the implementation of the National Strategy for Rangeland Management (NSRM). Keynote speakers covered the concept of sustainable habitation (Brian Walker); possible futures (Don Blesing and Martin Andrew); the National Strategy for Rangeland Management (Graeme Robertson); and a social perspective on the rangelands (Denzil Mills).

Participants divided into groups, each focusing on one region - the Kimberley (WA), the Goldfields (WA), Dalrymple Shire (Queensland), Victoria River District (NT), Lake Eyre Basin (SA), or the Western Division of NSW. An information profile was provided. Participants were asked to propose an achievable social, economic and environmental scenario for twenty years in the future, and a strategy for achieving it. Scenarios were presented to the whole Conference. Two synthesisers responded. One, Andrew Campbell, complemented the groups on the abundance of good ideas, but felt the scenarios were influenced too much by current practices. The second synthesiser, Graeme Robertson, noted the compatibility of the scenarios with the NSRM, the diversity of rangeland regions, and the importance of local empowerment, tempered by concern for the values of non-resident stakeholders.

Selected stakeholders also responded to the scenarios. Pam Waudby, for the pastoralists, stressed security of tenure, community involvement, and the unheralded conservation initiatives already under-way. David Ross, representing Aboriginal groups, focused on employment, the neglect of land rights, Aboriginal heritage, and infrastructure for remote communities. The conservationists' respondent, Georgie Stewart, questioned the commonality of understanding among participants of the term "biodiversity", and the compatibility of biological conservation with economic growth. She stressed the importance of effective conservation outside reserves. Matt Hingerty of the NSW Minerals Council discussed the adequacy of linkages from mines to local economies, and emphasised the need for flexibility in the granting of access to minerals. Researchers were represented by John Pickard, who pointed to the imbalance between our fair ecological and our poor socio-economic understanding of the rangelands, and our ignorance of its Aboriginal and European cultural heritage. Jenny McLellan represented the regional economies. She emphasised the long-term commitment of communities to their regions, the wealth they generate, the need to ensure retention of this wealth, the importance of effective land and water management, access to health and education, Aboriginal land use, employment, and local empowerment.

As a means of furthering the debate on appropriate uses for the rangelands, the Conference was very useful. It has contributed to development of the concept of sustainable habitation using specific regions, drawn out the similarities and differences between them, focused attention on the need to break away from pre-occupation with the present, and brought out the issues and conflicts which we must address if sustainable use of the rangelands is to be achieved.

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