

There are too many cattle in Central Australia just now. About half a million are grazing on properties in the Alice Springs region—an all-time high. They have bred up during the remarkably wet last 3 years and, because cattle prices are low, property-owners are holding onto their stock in the hope that markets will improve. But such wet years can't go on much longer—they never have before. What happens then?

## Cattle, sheep, and the arid heart

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*It seems that in Australia we have yet to come to terms with the difficulties of using our vast arid zone.*

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Last year the area received 760 mm of rainfall, while the long-term average is only 280 mm. During the last drought, the 300 000-sq-km area under grazing was only able to support about 130 000 head of cattle. Even if the rainfall merely eases to a less-unusual level than now, thousands of cattle will have to be sold for slaughter, moved out of the region, or (as is more likely) just left to die on the properties. As the vegetation dries out before stock numbers plunge, it will be greatly overgrazed and take a terrible pounding. It may never fully recover.

What's happening now around Alice Springs is the classic situation in Australia's arid zone. It has happened before, both around Alice Springs and in most other dry parts of the continent. Near Alice, stock numbers reached a peak of 350 000 in 1959, and then plummeted to only 130 000 during the ensuing drought. In the Western Division of New South Wales the drought of 1901–02 reduced the

sheep population there from 13½ million to 3 million. (Depending on the season, sheep numbers there now oscillate at between 2 and 5 million.) Similar events occurred at about the same time in South Australia, and in the north-west of Western Australia during the late 1930s.

It seems that in Australia we have yet to come to terms with the difficulties of using our vast arid zone—a region where drought is a normal state of affairs, and years of high rainfall the exception.

This article looks at some of the difficulties and options available when using our arid country—a zone whose area it's very difficult to define. Obviously deserts like the Simpson desert are arid, but so are many slightly less dry regions. The fact that plants need more rainfall to survive and grow in the hot tropical north than in the cooler southern parts of the continent complicates things still further. Thus in the south, wheat crops and improved pastures can be grown on areas

with average annual rainfalls down to only 250 mm (10 in.), but in the north they need 760 mm (30 in.).

As grazing has up to now been the main land use in much of Central Australia, the region can be regarded as rangeland—an American concept, but one that can probably be usefully applied here in Australia. Mr Ray Perry, now Chief of

Riverina of New South Wales, and at Alice Springs.

### Man-made landscape

Much of the three-quarters of Australia known as the arid zone was in its pristine condition only 100 years ago. Probably none of it is now. We don't really know what it originally looked like, because

to make a rapid cash return ensured that, almost everywhere, the dryland vegetation was asked to carry more stock than it could bear in the long term—leading to the crashes in sheep and cattle numbers mentioned earlier.

Thus, in the Western Division of New South Wales, the rise of stock numbers occurred during the 1870s and 1880s during a long period of good seasons. High wool prices during much of this period encouraged pastoralists to spend massive sums on improvements, and to incur heavy debts. Livestock numbers were increased to recoup outlays. Then the rabbit appeared during the 1890s and greatly added to the pressure on the already extended rangelands. The drought at the turn of the century was the straw that broke the camel's back. Many pastoral enterprises went bankrupt.

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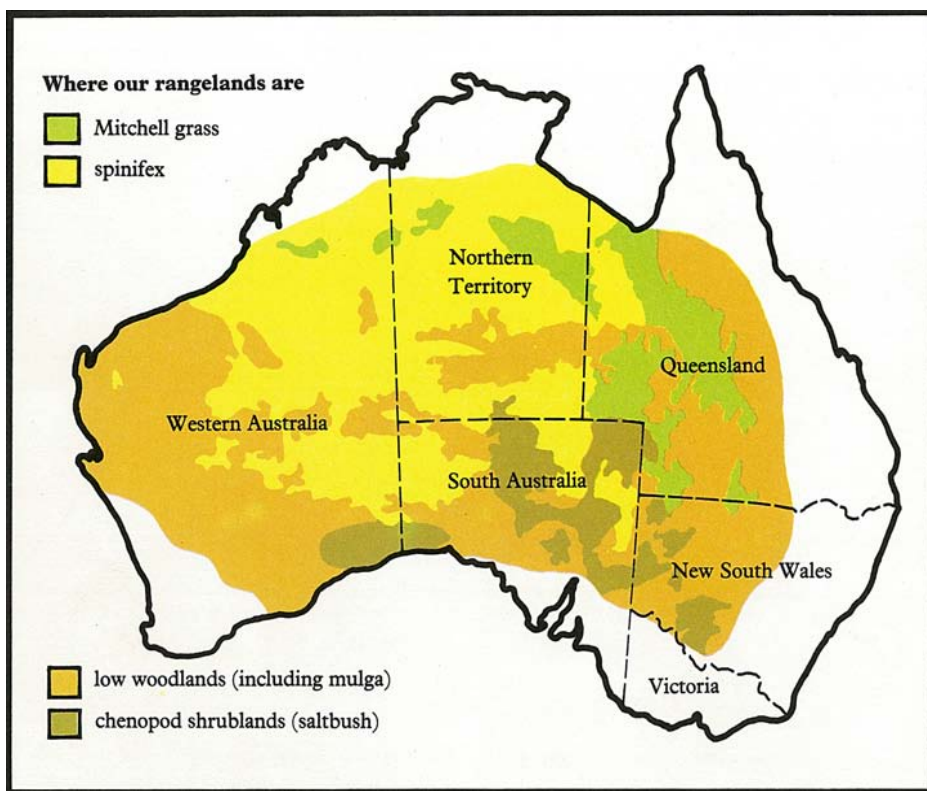
How has the land fared through all this? Not knowing what the vegetation was like originally, we can't be certain. Not all the vegetation of the arid zone has yet been surveyed, but in all States the picture is one of degraded vegetation and landscapes. Over the whole of arid Australia Mr Richard Condon (formerly with the Soil Conservation Service of New South Wales and now Commissioner of the New South Wales Western Lands Commission) and Mr John Newman of the Soil Conservation Service have estimated that 30% shows severe degeneration and another 30% minor damage. Erosion is going on in some areas at a rapid rate.

However, the damage, although great and quite possibly irreversible in places, is probably not irreparable over the continent as a whole. So the nation can still make choices about the land's future.

### Huge National Park?

One choice advocated from time to time is that the arid zone should be abandoned and left to its own devices as a sort of huge National Park—hopefully to recover and return to its stable pristine condition. Even if abandonment were to be politically possible, we can't in fact be at all certain that it is a feasible option.

We still don't know how most types of



the CSIRO Division of Land Resources Management, has defined rangelands as 'those areas of the continent where rainfall on a given piece of land is inadequate for economic crop production or pasture improvement'. On this definition they comprise 74% of Australia, and include land in all the mainland States. (They also include vast areas of unoccupied desert.)

Oddly enough, in spite of the area of our arid lands, and the fact that they support nearly one-third of the national sheep and cattle herds, they have until recently received very little scientific study.

Today, all the mainland State governments have research staff looking into the problems of the arid zone, and universities—notably the Universities of Adelaide, New South Wales, and Western Australia—have been taking an interest. Seven years ago CSIRO began a program by setting up the Rangelands Research Unit under the leadership of Mr Perry. Although this unit has been merged into the new Division of Land Resources Management, the program continues, mainly from bases at Deniliquin in the

hardly anybody described it. Since then, practically all of it has been heavily grazed by sheep or cattle, so the landscape is man-made.

Before European settlement the Aborigines probably had only a small effect on the region. Ludwig Leichhardt noted that they occasionally harvested scrub for building shelters, and that they periodically used fire to assist in driving game, or to attract game to the burnt areas. But the main influences on the land would have been the vagaries of the arid climate, natural fires, and to a much lesser extent the grazing of kangaroos and other native animals.

Then 130 years ago settlement of the four eastern States began. It had been completed there by the 1870s. It wasn't until the 1930s that the present pastoral areas became fully occupied over in Western Australia.

With the European settler came his sheep and cattle, which subjected the land to entirely new pressures. A combination of the settlers' optimism and land tenure and financing systems that forced settlers

arid vegetation will react if they are protected from grazing. Few areas have been fenced off for any length of time. Protecting saltbush country on the University of Adelaide's Koonamore station in South Australia hasn't yielded particularly encouraging results. However, the vegetation in the regeneration area surrounding Broken Hill, which has been protected for more than 30 years, has responded well.

Nevertheless, a number of factors don't encourage optimism. For one thing eroded land would have to be stabilized. This would be prohibitively expensive in an area where no income was coming off the land. In addition, there are man-made influences other than sheep and cattle grazing that may well prevent much of the degraded vegetation from fully recovering, or even recovering at all.

Rabbits now inhabit the whole of the southern half of the arid zone. They graze the vegetation much more heavily than kangaroos, wallabies, and other native herbivores. Certainly instances are known where they have prevented young trees and shrubs from establishing themselves. For example, during the dry year of 1957 on what is now the Fowlers Gap Arid Zone Research Station of the University of New South Wales, rabbits ring-barked and killed young cypress pine seedlings. As it happened, these seedlings were the first sign of pine regeneration in the memory of pastoralists in the Western Division of New South Wales.

In addition to rabbits, wild camels, donkeys, horses, and goats also inhabit parts of the arid zone.

Mr Perry points out that conserving our arid lands is not a matter of trying to get them to revert to what they were 130 years ago. They have been changed forever. What we now need to seek is a new man-made equilibrium. This will require management no matter what the use. To abandon the land is merely to duck the issue.

So, assuming that we continue to use our drylands, we will probably continue to graze them. Mining, tourism, and preservation of specific features of the

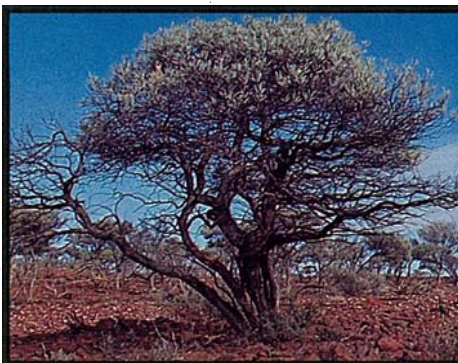
landscapes in national parks will account for limited areas. Irrigation is of course another way of using arid land, but we haven't the water resources to permit irrigation on more than a limited scale.

### Slow mining

But can an equilibrium be struck with the present grazing use? Or can this practice

only be a form of slow mining, eventually causing the land to become so degraded that we will have to abandon it anyway? The little information available suggests that reaching an equilibrium may be possible, but doing so is as much a political challenge as a technical one.

Any long-term production from our rangelands depends ultimately on the



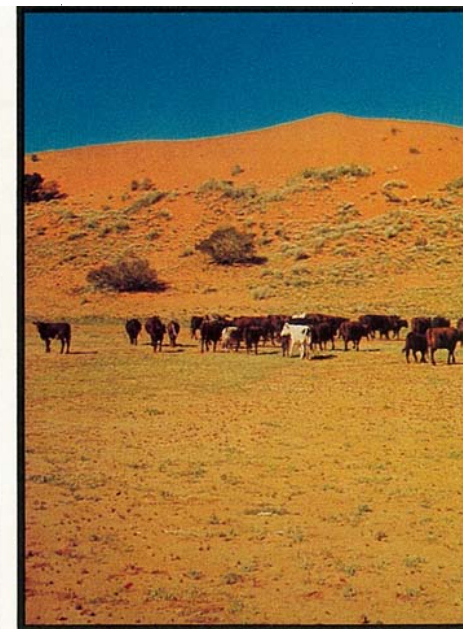
This old mulga tree survives, but no young ones are growing up in the area to replace it.



South Australian saltbush country probably looking much as it did before Europeans arrived.



When the vegetation is grazed out, dust storms and sheet erosion follow.



Cattle on arid 'pasture' in South Australia.

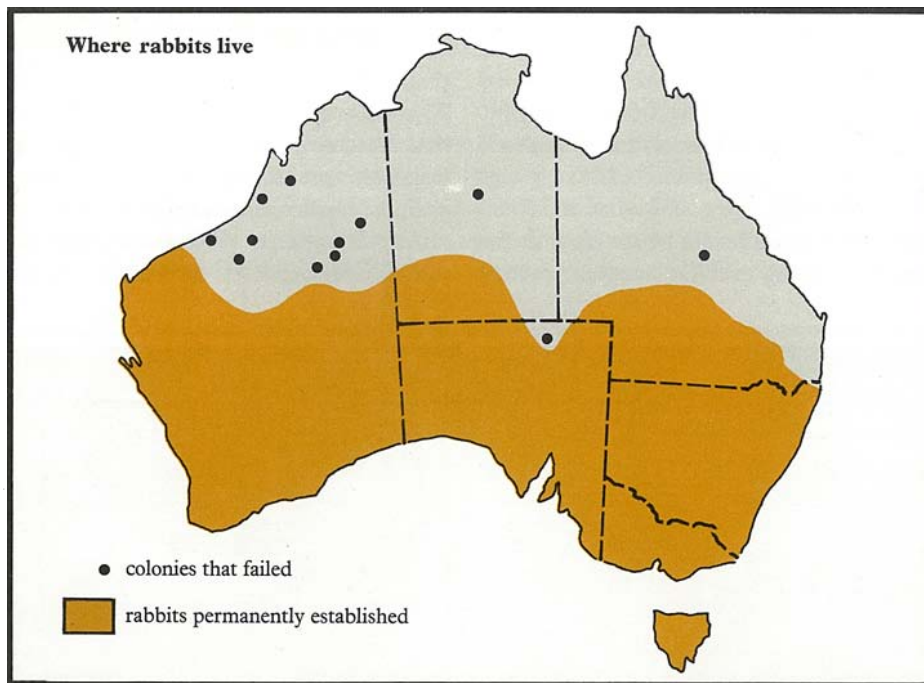
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The contrasts of the arid zone: the same place near Ivanhoe, N.S.W., before and after rain—in March 1973 (left) and June 1974.



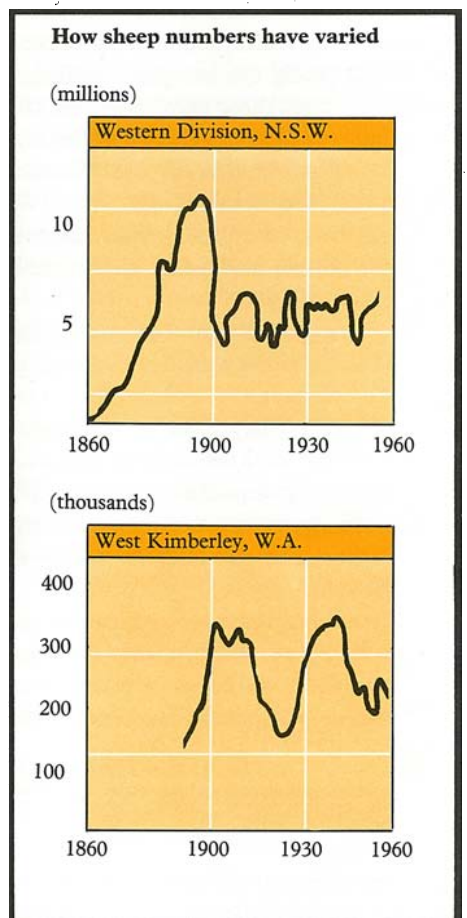
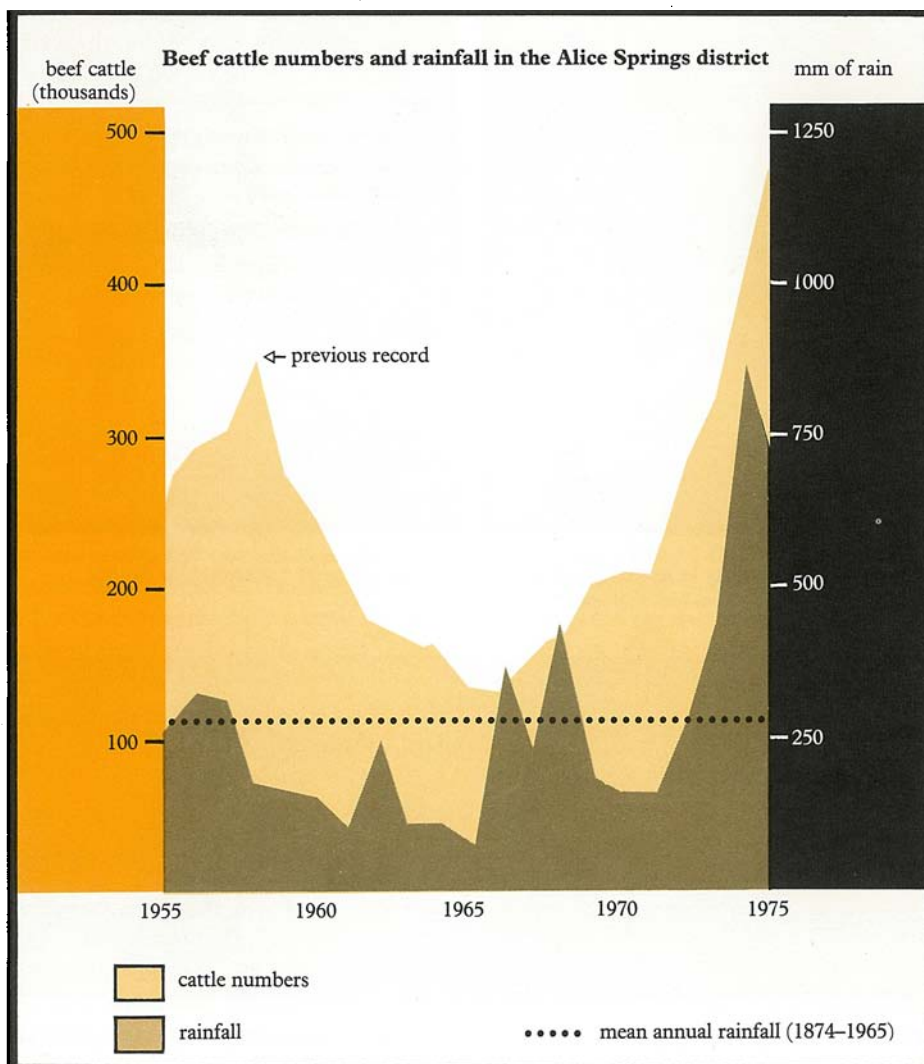
**Rabbits would probably ensure that much of the arid zone would not return to its pristine condition even if sheep and cattle were removed.**

production of the plants growing on them. Thus, either the vegetation must be maintained so that it remains as similar as possible to its pristine condition, or else it must be manipulated to produce a combination of species that will carry more stock and yet remain stable.

The only economic way that the vegetation can be manipulated is to vary the intensity with which it is grazed. But to do this we have to know two things—how the plants that make up the vegetation react to grazing, and how the animals themselves behave when feeding.

Grazing animals do not in fact behave like lawn-mowers, chewing all before them. Instead they select the particular plant species most to their liking. Cattle, sheep, kangaroos, and other grazing animals all select different, if overlapping, arrays of food plants.

In addition, grazing domestic stock need water—especially during hot dry weather. So when natural water is short they don't stray more than a certain distance from watering points. Thus the location of watering points can control the way sheep and cattle graze the vegetation.



**Cattle or sheep numbers in arid country often lag behind the rainfall. Thus they often continue to rise at the start of a drought—so increasing the damage to the vegetation.**

Quite how far sheep and cattle will walk from water in search of forage isn't certain. The generally accepted rule of thumb has been that sheep will walk about 5 km and cattle 8 km. However, at what is now the Deniliquin laboratory of the Division of Land Resources Management, Dr Vic Squires found that sheep grazing saltbush country scarcely touch forage located more than 2½ km from water until lack of feed forces them further afield. At the Division's Alice Springs laboratory Dr Bill Low and his colleagues have found that cattle will walk 8–13 km in search of their preferred feed, regardless of the time of year.

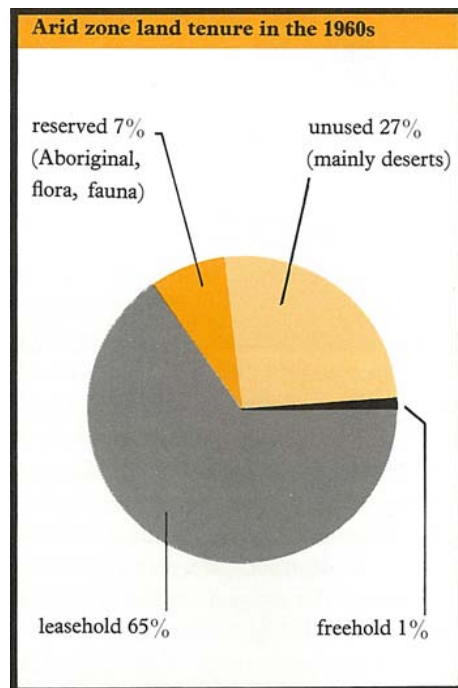
Some information is available on how individual plants react to grazing, but we need much more. For example, at the CSIRO Deniliquin laboratory, Dr John Leigh, Dr Allan Wilson, Mr Bill Mulham, and Dr Owen Williams have proved that stocking saltbush country too heavily will convert it into a grassland because the bushes cannot survive severe defoliation. But grasslands do not provide adequate feed or ground cover during droughts. The researchers have therefore

suggested that overgrazing saltbush country, which covers about 6% of the total land area of Australia, may be undesirable because the shrubs act as a reserve of drought feed as well as helping to prevent erosion.

Thus on saltbush, as well as on other types of vegetation, only as many animals can be allowed to graze the vegetation as can be supported without jeopardizing the productive capacity of the range in the future—something that frequently hasn't happened in the past. So running very large numbers of domestic stock to make the biggest possible short-term profit, or even merely to service too-great financial commitments, cannot be compatible with getting continuing productivity from the rangeland.

### Tenure and holding sizes

In the wetter, more-populated areas of Australia, most of the land is freehold. Arid Australia is different. Here nearly all the land is held under some form of leasehold—giving the land-administration authorities, in theory at least, the power to ensure good management.



**Nearly all of Australia's grazed arid lands are leasehold. So State governments can dictate their management if they choose to.**



**Furrows help restore vegetation to this gaunt landscape bared by overgrazing.**



**Circular banks trap water and seed on a bare eroded 'scald' in central New South Wales.**

Generally, it hasn't worked out that way so far, partly because governments are subject to conflicting pressures. For example, in western New South Wales property sizes have increased or decreased over the years, depending on the rainfall and the political climate. Here as in other States the idea of a few people or pastoral companies having a monopoly over the huge arid areas has run against the national ethos, and has always been opposed. This attitude spawned the concept currently used by the Western Lands Commission of a 'living area' or 'home maintenance area'. This is defined as 'an area which when used for the purpose for which it is reasonably fitted would be sufficient for the maintenance in average seasons and circumstances of an average family'. Unfortunately the very idea of 'average' seasons and economic circumstances has led to official over-optimism of the amount of stock that properties can carry, with the result that many have been too small.

Over the border in South Australia, property sizes have always been bigger. On the whole the arid lands of that State are in better shape.

As well as being subject to political pressures, land administrators have had the disadvantage of not possessing an objective system for monitoring the condition of the land. This is a problem that scientific research can solve.

If he wants to maintain production in the long term, the grazier's object is to

obtain the highest possible income without damaging his capital asset (his land). Presumably the land administrator is more interested in how the land fares. How does either know that the land is holding its own?

### Bad memory

Scientific researchers have found that the human memory is very bad at recalling what an area looked like 20–30 years ago. So it is extremely difficult for an individual to know if his pastures are slowly going down hill. The very extremeness of the climate makes it even more difficult to remember their past condition, since a piece of ground looks startlingly different during a drought compared with its appearance during years of better rainfall. Thus after a drought, when a run of good rains brings rank stands of grass growing where there was nothing before, it's very hard to believe that the pasture hasn't fully recovered. There is the widespread attitude among the grazier community that arid zone pastures always come good after a drought.

But what has happened over the years is that after each succeeding drought the pasture has seldom 'come good' quite as well as it did after the previous one. This explains the decline in stock numbers in arid lands once they had reached their peak.

### Range condition

In attempting to come to terms with working out the productivity of arid pastures, Australian researchers have introduced from America the concept of the 'health' of a piece of rangeland. They look at its present condition, and trend—whether its condition is improving or deteriorating. It should then be possible to work out the carrying capacity of any type of landscape, or a property, either in the long term or, given the particular rainfall conditions prevalent, at any particular moment.

However, the very idea of 'range condition' brings its difficulties, as inevitably people interpret it in different ways depending on their interest. To the ecologist a piece of range in good condition is one on which little degradation has taken place. To the grazier it may be one 'with a good body of feed'. The land administrator may have a different idea again.

Mr Perry has pointed out that any method of assessing range condition must be simple, rapid, and repeatable, so that different observers get the same answers

regardless of the climatic conditions prevailing at that moment. In addition, if the idea is going to be used as a basis for management by land administrators as well as property-owners, it should be able to stand up to legal scrutiny as well as being scientifically sound.

Meeting all these conditions sounds quite a tall order. Nevertheless, researchers at the Division of Land Resources Management's Alice Springs and Deniliquin laboratories are currently working respectively with the Department of the Northern Territory and the Soil Conservation Service of New South Wales trying to improve existing methods of assessing range condition and trend so that they are both practical and scientifically sound.

Some years ago at the Soil Conservation Service, Mr Condon, Mr Newman, and Mr Geoff Cunningham developed a method of assessing range condition that allowed them to recommend safe carrying capacities for individual properties in the Alice Springs area of the Northern Territory. The then Northern Territory Administration approached the Service to investigate soil erosion and pasture deterioration around Alice Springs following the 9-year drought that ended in 1965. (Incidentally, on many properties in that area stock numbers are at present well above their recommended levels—hence the forecast of a population crash put forward in the opening paragraph of this article.)

The Soil Conservation Service is now working through all of the 2000-odd properties in the Western Division of New South Wales, recommending safe carrying capacities.

### Flooding and erosion

Using a rather different technique, two Western Australian government officers—Mr David Wilcox and Mr Ed McKinnon—were able to make recommendations for the safe carrying capacities of leases on the Gascoyne River catchment inland from Carnarvon.

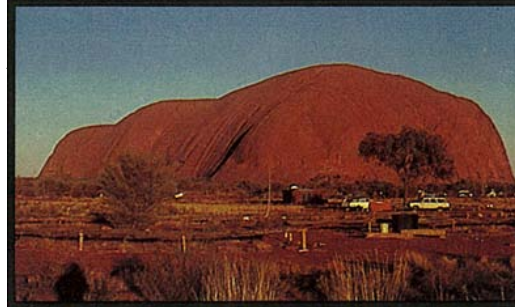
Worst-ever flooding in Carnarvon in February 1961 caused the State government to study the catchment. The main cause of the flood? Grazing stock had degraded the vegetation cover and so increased the run-off.

Mr Wilcox and Mr McKinnon found that only about one-third of the 60 000-sq-km catchment could be regarded as being in a satisfactory condition. Half was degraded and had some erosion. The remaining one-sixth (about 10 000 sq km)

was badly eroded and would soon become irreversibly degraded unless it was protected from grazing completely.

As a result of their report, the Western Australian government is carrying out a policy of destocking many of the properties on the Gascoyne catchment.

The methods of Mr Condon,



Visual pollution at Ayers Rock: the view from the main sunrise-observation point includes the camping area in the foreground.



Uncontrolled groups of tourists form wide tracks near the base of the Rock.



This creek bed at the base of Ayers Rock is an eroded track. It formed after heavy rain in 1974.



Bared tree roots show sand loss from 'Sunset Strip' dune near Ayers Rock after trampling by tourists had killed the vegetation.

Mr Newman, and Mr Cunningham depend on compiling inventories of such factors as the soil types, run-off, tree density, drought forage available, pasture composition, the proportions of the rainfall that fall in summer and winter, and the extent of erosion. So they require pretty detailed information.

To produce such an inventory of the Alice Springs area, the three researchers were able to use as a basis the land system surveys carried out by the former CSIRO Division of Land Research. In the Northern Territory, these surveys have given a nearly adequate cover. Elsewhere the various State governments are now

carrying out similar surveys. On the Gascoyne catchment Mr Wilcox and Mr McKinnon had to build up their own inventories, starting completely from scratch.

Once rangeland has become degraded and erosion is happening, what then?

*continued on page 10*

## Conservation and the pounding of tourist feet

Tourism is a big industry in parts of arid Australia, especially around Alice Springs. Most tourists only visit very limited areas in the drier parts of the continent, but within these areas they may cause considerable problems. This is particularly so in the arid-zone national parks.

National parks are set up to preserve landscapes and other important features as part of the national heritage. They also attract tourists. At times, the concentration of tourists upon these supposedly protected areas can be very great indeed.

The best studied and oldest arid-zone national park is the Ayers Rock-Mt Olga National Park dedicated in 1958. By 1969, the area was becoming so battered that the Reserves Board of the Department of the Northern Territory commissioned a series of reports on how the Park could be managed to cater for more and more tourists, and yet remain in a relatively pristine condition. In all, the Reserves Board commissioned five reports before publishing the 'Ayers Rock-Mt Olga National Park Proposed Master Plan' in 1973. Consultants' reports considered the Park's development, its economics, and the impact of tourism. Two reports from the Reserves Board itself considered the state of the local environment, and where the ring road around Ayers Rock should be positioned.

By the early 1970s the National Park was catering for about 2500 people each day during the peak season of August and September. Projections suggested that the number would rise to no less than 5000 per day within the foreseeable future. For many people the attraction of Ayers Rock is its isolation, and obviously a visitor rate of 5000 per day would do much to remove this feeling.

The tourists themselves were considerably affecting the vegetation and physical features of the areas surrounding Ayers Rock and Mt Olga—by trampling on plants, compacting the soil, littering, defacing Aboriginal rock paintings, and throwing pieces of rock from the Rock itself, or merely by walking up the marked

path to the top of the Rock, thus wearing away the surface. The dune known as Sunset Strip, from where 70–80% of all tourists visiting the park view the rock at sunset, was also taking a considerable pounding, with the result that on parts of it the spinifex cover had died off altogether, leading to erosion.

In addition, the services needed by the tourists were taking their toll. Possibly most damaging to the surroundings of the Rock was the position and construction of the ring road. A zone of mulga surrounds much of this remarkable monolith, and its existence depends on run-off flowing through the huge numbers of small drainage lines radiating from the Rock itself. The ring road crosses these, and has effectively acted as a levee bank preventing drainage downstream. Large areas of mulga have consequently died of drought.

This drainage problem could be solved with proper construction of culverts to allow water flowing off Ayers Rock to follow its original drainage lines. However, the road also passes through areas of very erodible soils, so it was recommended that the road be completely rebuilt on a new alignment further away from the Rock, outside the mulga zone.

The tourist village was also causing problems (and still is). The camp site is almost bare, and garbage disposal from the motels of the village is very poor. Almost certainly the village will be moved to a new site further away from Ayers Rock and rebuilt to a much higher standard.

At the same time tourists will have to be controlled much more carefully to minimize the damage they cause. Even such radical proposals as banning private cars from the Park have been considered. Everybody would have to be taken round the Park by buses leaving the village each day—not a prospect with much appeal to the more adventurous members of the community who may have already driven 3000 km or more through rugged conditions before arriving in the area. However, in 1970–71, 54% of all the 31 000 tourists

visiting this National Park during the year came by coach, compared with only 29% by car and 17% by aircraft.

Other national parks in arid country already have similar problems, but on a smaller scale. For example, each year about 24 000 people visit the historic site at Mootwingee, some 140 km from Broken Hill. This small park covers only 500 ha. Its main attraction is its Aboriginal rock paintings. Most of these visitors arrive during either the May or the August–September school holidays. The much larger Kinchega National Park, which covers about 40 000 ha near Menindee, received 49 000 visitors last year and very probably about 55 000 will visit it this year.

A problem at Kinchega (as well as at Ayers Rock) is people driving off into the bush to camp. In arid country a single car leaves tracks that can be seen for many weeks or even months afterwards. Other people tend to follow these tracks, and unofficial roads can thus quickly form. Motor cycles are also a problem.

All this shows that in future it will be essential to supervise people in the arid national parks very carefully. It would be ironic indeed if the result of setting up national parks in arid Australia was to attract so many tourists that they destroyed the very landscapes that the parks were meant to preserve.

'The Proposed Master Plan for the Conservation of the Environment of the Ayers Rock-Mt Olga National Park.' J. A. Lacey. (Northern Territory Reserves Board: Alice Springs 1973.)

'Ayers Rock-Mt Olga National Park Environmental Study, 1972.' P. T. Hooper, M. M. Sallaway, P. K. Latz, J. R. Maconochie, K. W. Hyde, and L. K. Corbett. (Australian Government Publishing Service: Canberra 1973.)

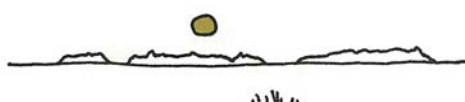
'A Study of the Impact of Tourism at Ayers Rock-Mt Olga National Park.' J. D. Ovington, K. W. Groves, P. R. Stevens, and M. T. Tanton. (Australian Government Publishing Service: Canberra 1973.)

It's easy to see gully erosion that happens on sloping land, but a good deal of arid Australia is gently sloping or very flat indeed. Here, the much less visible sheet erosion is the danger. Under these circumstances soil still moves, but the surface remains flat. Either wind or water may cause sheet erosion. Rainwater running off the land surface doesn't become concentrated in gullies, but instead moves in sheets—taking soil with it. Wind can have the same effect. In either case the cure is to get enough vegetation to cover the eroding areas.

### Keeping the cover

The problem is, how much is enough? Remembering that the grazier has to run his stock to obtain an income, leaving more vegetation cover than is necessary could mean the difference between economic success and failure of his enterprise. As usual the answer isn't yet too clear.

In one of the few studies so far carried out, Dr John Marshall at the CSIRO Deniliquin laboratory some years ago looked into how much protection against wind saltbush gives to the soil. Using mathematical models and wind-tunnel tests, Dr Marshall found that soil erosion would be negligible in plant communities dominated by 66-cm-high bladder saltbush when the average distance between bushes was 180 cm or less. On the other hand, bluebush (with an average height twice that of bladder saltbush) should provide equal erosion protection with spacings of up to 310 cm.



Some range types often contain a good deal of bare ground even when they are in a pristine condition. So the presence of bare ground doesn't necessarily mean that the pasture has become degraded. Inevitably therefore some erosion was going on even without Man's intervention.

The plant's problem is to get enough water to survive and grow, and where the annual rainfall may be 250 mm or less this can be quite a problem. Mulga communities have solved the problem by often growing in clumps or groves with areas of bare ground between them. Rainwater runs off the bare areas onto the groves, so increasing the amount of water that these receive. Thus the vegetation is very delicately balanced on the soil so that the individual trees get a maximum of rainwater, but erosion doesn't proceed too

fast to permit them to survive. Obviously too much grazing could very easily upset this delicate balance. Erosion often follows if the mulga groves are destroyed.

### Controlling erosion

But if mistakes have been made and large areas bare of vegetation have already appeared, what can be done? Fencing the bare areas off, and hence protecting them from grazing, can be successful where the annual rainfall is more than 350 mm. But with less rainfall than this some other treatment must also be applied.

For example, scalds are areas of bare clay. They form when the sandy topsoil layer blows off, exposing a clay layer underneath. Seeds from nearby vegetation will be washed or blown across the hard clay surface without any chance of being able to germinate and take root. Putting in furrows or banks in a pattern such as a spiral or grid-work to trap the seeds and water helps, but is expensive.

Building circular banks so that water and seeds become trapped in ponds has worked well too. A cheaper method now often preferred is to use a machine to dig a series of shallow pits to trap the water.

Nevertheless, regardless of the method used, the cost of erosion control is very high. But in arid country the return per hectare is very low, and in some States the cost must be borne by the lessee without any government subsidy to help him. So prevention is very much better than cure.

As it happens, loss of the vegetation and erosion caused by overgrazing aren't the only problems that the arid zone grazier may have to contend with. Oddly enough, the exact opposite—thickening of the vegetation—can be a problem, especially in the semi-arid low woodlands. Dr Graham Harrington of the Deniliquin laboratory is studying an area with this problem north of Cobar in western New South Wales. It is part of a large region of woodland—dominated mainly by bumble box (a eucalypt), mulga, and white pine—that stretches north into southern Queensland.

When settlers first arrived in the 1870s they saw expanses of open wooded grassland interspersed with shrubs. But now the shrubs have thickened and little or no grass grows between the trees and shrubs—even after good falls of rain. This land that once carried sheep at the rate of one animal to 3.5 ha now can only support the much lower stock concentration of about one sheep to 8 ha. In fact, since as early as the 1890s, the local settlers have been seriously concerned that the

long-term productivity of the area would not be maintained.

Possibly a major cause of the shrub thickening has been a lack of fires. Before settlement, wildfires would have burnt the woodlands from time to time, thinning the standing timber and keeping the seedlings down. Now the vegetation will not even carry a fire. In addition, ring-barking may have increased shrub growth, and the selectiveness of the sheep in choosing their feed no doubt favoured the shrubs that they wouldn't eat. In particular, false sandalwood (*Eremophila mitchellii*) has taken over.

Incidentally, preliminary experiments using goats to graze down the shrubs have not so far met with much success. Like sheep, the goats have proved very choosy about what they will eat, and by and large seem to go for much the same feed.

### More about the topic

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