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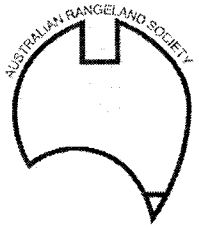

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FORTY YEARS OF MONITORING PASTORAL LANDS IN CENTRAL AUSTRALIA

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ABSTRACT

This paper summarises the historical development of point-based monitoring systems in Central Australia and the soil and vegetation changes that have been observed. Three main point-based monitoring systems have been implemented on pastoral lands since the 1960s, each using slightly different methods. The geographical spread of sites varies across the region, as does the frequency of recording. In combination with seasonal effects, this makes it somewhat difficult to build a picture of what changes have occurred on Central Australian pastoral lands. Recent results would suggest that there has been a general stabilisation of soils, an increase in perennial vegetation cover and widespread establishment of woody species. It is apparent that buffel grass has recently colonised areas where it has not previously been recorded.

INTRODUCTION

Central Australia is the area roughly bounded by Tennant Creek (NT), Birdsville (Qld), Oodnadatta (SA) and Warburton (WA). This paper deals with the area of Central Australia that lies within the Northern Territory. The southern part of the Northern Territory contains about 85 pastoral leases covering an area of about 300,000 km^2. The main pastoral enterprise is beef cattle production and most pastoral businesses in the area are family-owned.

A nine-year drought in the late 1950s and early 1960s had a devastating effect on the country and the pastoral industry in Central Australia. In 1965/6, the Northern Territory Administration was so concerned about the condition of the country that it requested the New South Wales Soil Conservation Service to undertake a survey of the soil erosion problems in the Alice Springs district. The major aims of the surveys were to set safe grazing capacities and recommend methods for the prevention and control of soil erosion (Condon et al. 1969abcd, Bastin et al. 1983). Several field surveys were conducted and the condition of soils and vegetation were described at various sites (Condon et al. 1969a). These locations were not permanently marked and were destined to fade into history until one of the members of the original survey team (Geoff Cunningham), agreed to attempt a relocation of the sites 27 years later. A combination of good field notes and an excellent memory saw 154 old sites relocated, photographed and reassessed (Cunningham 1995). These sites, along with four new ones, are now marked with steel pickets and are fittingly known as the "Cunningham" sites.

A combination of above-average rainfalls and low cattle prices in the early to mid 1970s led to large herd build up in Central Australia (Chisholm 1983). The inevitability of a return to dry conditions prompted the NT Government to continue refining safe grazing capacity estimates. Appreciating the need for objective soil and vegetation data to help substantiate and refine these estimates in the future, a series of fixed recording sites was installed. Station land resources were mapped and pasture yield, composition and various other site characteristics were recorded. Vegetation condition state was determined by the method of Lendon and Lamacraft (1976). By the end of 1978, a total of 222 Grazing Capacity Assessment (GCA) sites had been established on 12 stations in Central Australia (Bastin et al. 1983).

Over time, the emphasis of the GCA program moved away from estimating grazing capacities and focussed more on providing better advice and information to pastoralists. Following a workshop in 1980, the GCA sites became known as Range Condition Assessment (RCA) sites to reflect this new purpose. In response to observed woodland thickening, the measurement of tree and shrub cover, and the density of juvenile woody species were added to the suite of parameters that were measured.

Details of the data collected and the methods used appear in Bastin (1989). Over time, the quality of land resource mapping was improved, and together with CSIRO officers, objective methods of vegetation assessment were developed and evaluated (e.g. Foran et al. 1986, Friedel & Shaw 1987, Friedel & Bastin 1988, Friedel et al. 1988a, Friedel et al. 1988b, Shaw & Bastin 1989). However, towards the end of the 1980s it was felt that the resources being invested in the program weren't justified by the benefits that were being gained from it. There was a growing concern that the interpretations of the data collected were too subjective and often merely described seasonal variation. Greater benefit was considered likely from research and extension targeted at emergent land management issues such as rabbit damage and shrub encroachment. Land resource assessment programs continued separately when funds became available through the National Landcare Program (and later, the Natural Heritage Trust). About 50% of stations had been mapped and 917 GCA/RCA sites installed before the program ceased in 1990.

The implementation of a new Pastoral Land Act in the early 1990s revived point-based monitoring in the Northern Territory. A major thrust of the Act is "the prevention or minimisation of degradation of, or other damage to, the land and its indigenous plant and animal life" (Parliament of the NT 1994). To determine whether this is being achieved, the Act provides for "the monitoring of pastoral land so as to detect and assess any change in its condition". The former NT Land Conservation Unit proposed a two-tiered monitoring system that was acceptable to the Pastoral Land Board. Tier 1 is a point-based system similar to RCA and Tier 2 is a satellite-based system incorporating scientifically rigorous ground data. Tier 1 was designed primarily as an extension program to raise awareness of pasture response and land condition within the pastoral industry. Information from the sites is used by the Pastoral Land Board to provide regional summaries of land condition. The establishment of sites under the Tier One monitoring scheme commenced in the Alice Springs area in 1994 and incorporated some of the existing RCA sites where they were considered suitable. Where the existing sites were deemed unsuitable, or RCA sites did not exist, new photo-points were installed at the rate of one site per paddock or per grazing area. There are more than 750 Tier 1 sites in Central Australia and about 30% of these are old RCA sites. The Pastoral Land Board's intention is to reassess these sites every three years and to encourage landholders to continue the monitoring between government visits.

In addition to the point-based sites described above, there have been many other monitoring activities undertaken on pastoral lands in Central Australia. These activities have usually been designed to measure the results of specific research projects. They include rabbit and cattle exclosures (Foran et al. 1982, Foran et al. 1985, Foran 1986), rehabilitation sites (Centralian Land Management Association 1997), vegetation study sites (Friedel et al. 1993) and grazing study sites (Phillips et al. 2001).

FINDINGS

The Cunningham Sites

Photographs taken during the 1960s droughts showed that vegetation cover was low and that the soils were unstable on many sites (Condon et al. 1969a). Erosion was recorded at 83% of sites and 45% of sites had nil pasture cover. When the same sites were relocated in 1993/5, erosion was recorded at 18% of them (Cunningham 1995). This suggests that soil stability had increased and/or that some of the erosional features of the 1960s had healed. Only two sites showed nil pasture cover in the 1993/5 reinspection (Cunningham 1995). Both of these sites also had nil pasture cover in the 1960s. Perennial pasture species were found on 95% of sites in 1993/5 (Cunningham 1995). Increases in tree density had occurred at 65% of sites and increases in shrub density had occurred at 83% of sites (Cunningham 1995). The most common tree species to have regenerated were Acacia estrophiolata, A. aneura and Atalaya hemiglauca. The most common shrub species to have regenerated were Senna eremophila and Eremophila longifolia (Cunningham 1995). Of the Cunningham sites visited in 2001/2, the trends described above appear to be continuing. After three years of above-average summer rainfalls, many sites show even greater densities of woody species and marked growth of individual plants (D. Walsh pers. obs.). Buffel grass (Cenchrus ciliaris) has colonised some Cunningham sites since 1993/5 (D. Walsh pers. obs.).

The RCA Sites

The RCA dataset, consisting of several thousand records, is the most objective, extensive and comprehensive record of historic soil and vegetation state at known locations in Central Australia. During the RCA program, much of the information collected was used to substantiate interpretations of land condition state and to provide land use advice on a confidential (and individual) landholder basis. Some sections of the dataset have been summarised and the findings reported to the wider community (e.g. Bastin 1992), however regional summary of the entire dataset remains an opportunity for the future.

It has been proposed that palatable perennial grasses declined in the 1980s from the high levels present after the wet years of the 1970s (G. Bastin pers. comm.). An investigation of the 143 RCA sites that were assessed in both the 1970s and 1980s showed that a decline in perennial grass dry matter occurred on 45 sites. Ninety sites showed an average increase of 19.2% and a further eight showed no change (R. Dance unpublished). This suggests that a decline in palatable perennial grasses was accompanied by an increase in perennial grasses of relatively lower palatability. These sites have not been reassessed since the 1980s, however, recent visits to a range of RCA sites indicate that palatable perennial grass species are doing very well (D. Walsh pers. obs.). This is likely to have been assisted by a series of above-average summer rainfall seasons. Indeed, pastoralists have commented that they are seeing palatable perennial grasses in places that they haven't seen them for years.

Like the Cunningham sites, the RCA sites demonstrate a general increase in the densities of woody species. In 1969, Condon et al. (1969a) stated that witchetty bush (Acacia kempeana) was not regenerating and that this species might die out. The series of unprecedented wet years in the mid 1970s led to massive germination of this species and it subsequently became regarded as a "woody weed"! Recent visits to RCA sites confirm that this species is continuing to germinate. Germination has recently accelerated in the southern part of the district due to reduced rabbit numbers and above-average rainfall (W. Dobbie pers. comm.). Today, there is debate as to whether woody species are a problem or not. Some pastoralists believe that high densities of woody species suppress grass growth and should be controlled, whilst others believe that they are just part of a natural cycle and will decline in time. The available technical evidence indicates that excessive woody vegetation does greatly suppress pasture production (R. Dance unpublished). This pasture suppression may be less apparent in very dry or very favourable seasons (R. Dance pers. obs.).

The Tier 1 Sites

Although some lessees have taken photographs on an annual or opportunistic basis, most Tier 1 sites have been fully reassessed only once by a Pastoral Officer. The assessments therefore provide a limited perspective of trend and the data collected are not intended for rigorous statistical analysis. Year 2001 assessments of specific Tier One sites with an RCA history suggest that species composition and perceived condition class remain similar to that recorded in 1983, but there has been an increase in shrub cover. Sequential assessments of Tier 1 sites largely reflect a change in cover and pasture composition from a predominantly winter-rainfall forb-dominated drought response in the mid-1990s, to a summer-rainfall grass-based flush that commenced in early 2000. This has been highlighted at sites where successive annual assessments have been conducted over the last three years. For example, productive country has commonly demonstrated a dramatic switch from a copperburr (Sclerolaena spp.) dominant pasture with sub-dominant annual grasses to an annual grass (Enneapogon and Aristida spp.) dominated sward. Palatable summer-growing perennial grasses were generally present but of very low abundance immediately following the long period of winter rainfall predominance. The Tier 1 sites indicate that the recruitment of palatable perennial grasses has been recorded mainly under canopy cover or in drainage areas.

DISCUSSION

"This country has had it, nothing will ever grow here again". That was the belief of many experienced people in Central Australia towards the end of the 1958-1966 drought (T. Leigh pers. comm.). However, the capacity of the country to respond appears to have been underestimated. Thirty-five

years after the devastating drought we are witnessing what could arguably be the highest vegetation cover seen since pastoral occupation. Of course, this has not been a linear progression, with several droughts having occurred during the intervening period.

The Cunningham series contains some of the oldest monitoring sites in Central Australia. Over 37 years, these sites have demonstrated a general stabilisation of soils, an increase in perennial vegetation cover and widespread establishment of woody species. These trends are highly consistent with data and observations from the younger, but more extensive, network of RCA sites. Shorter-term changes, such as the recent appearance of buffel grass where it has not previously been recorded, have been captured by all three monitoring systems.

The wide range of "seasonal" response that can be observed on monitoring sites makes the determination of range trend very difficult in Central Australia. Exclosure studies have confirmed the overriding influence of seasonal conditions, particularly over relatively short time periods (Foran et al. 1982, Foran & Bastin 1984, Foran et al. 1985). This is partly because large areas of Central Australia are characterised by annual short-grass and forb pastures that respond dramatically to rainfall, but can be completely absent during droughts (Condon et al. 1969a). The timing of rainfall events throughout the year also has a large influence on species composition. Consistent change only becomes apparent after years of observation and this lag effect makes it hard to determine the causes of the change. For these reasons, there is some reservation about the usefulness of point-based monitoring for detecting meaningful change in range condition. Some pastoralists in Central Australia believe that arid rangelands operate at cycles measuring hundreds of years rather than tens of years (G. Heaslip, A. Smith, pers. comms). They believe that judgements made on the basis of a few years' worth of data from a limited number of sites are misleading. To the people with these beliefs, the value of photo-point monitoring rests in recording seasonal responses and prompting memories of certain events.

The Future

The NT Government has been developing and testing satellite-based monitoring throughout the Northern Territory (Karfs et al. 2000). Satellite monitoring is considered necessary in order to assess large tracts of country within a reasonable time frame and to provide reliable regional summaries of land condition and trend. The Tier 2 monitoring system is considered to be a scientifically valid tool contributing to the assessment of land condition for the purposes of the Pastoral Land Act and for providing feedback to lessees.

An increasing number of Central Australian lessees are undertaking their own monitoring. The industry's landcare group (the Centralian Land Management Association) currently employs a project officer to assist producers with their point-based monitoring sites. The Centre Land Watch program uses existing sites (Cunningham, RCA, Tier 1, exclosures and pastoralists own sites) and provides help with site locations, plant identification, GPS use, pasture assessment and more. New sites are installed with the lessee at their request. A major aim of the Centre Land Watch project is to integrate the different monitoring systems on each lease in order to reduce the confusion that producers are experiencing. Centre Land Watch offers a flexible, tailor-made service that allows pastoralists to monitor what they want at a frequency that they determine and, in the case of Tier 1, to capture information between government visits.

It is worth emphasising that much of the early information collected from Central Australian monitoring sites has never been thoroughly summarised. The Centre Land Watch project is confirming the position of all possible historic and contemporary sites to ensure that they can be revisited in the future. This process will also determine what percentage of sites have gone "missing" and how many have experienced a change in their circumstance (due to changes in infrastructure, land tenure etc.). Given that these records become more valuable with every passing year, there is enormous scope to revisit sites, analyse the data and reveal new knowledge about Central Australian pastoral lands.

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