

Rangeland monitoring in South Africa: a proposal

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Six good reasons why we should care about what's happening to the country's rangelands:

1. They constitute by far the single most important land cover of the country and therefore have an overriding effect on a number of critical ecosystem goods and services of the country.
2. Foremost among these is the sustainable provision of high quality water, considered by many to be the single most important commodity underpinning our economic development.
3. They function as the largest terrestrial means of carbon sequestration simply on account of their scale.
4. The importance of rangelands to the agricultural economy cannot be reliably estimated because a substantial number of beneficiaries are informal.
5. Rangelands provide a national matrix for the conservation of biodiversity that cannot be

achieved by protected areas alone, especially in the face of anticipated species and biome shifts in response to climate change.

Medicinal plants are worth R270 million per annum on the informal market, many of which are harvested from rangelands (Mander 1999).

Society cannot afford deterioration of these services over time, and is therefore concerned about degradation of rangelands. The immediate users of rangelands, be they commercial ranchers or communal pastoralists, have an obvious dependency on their rangelands, but the pressures of meeting immediate demands has often resulted in undue pressure being placed on rangeland resources. Rangeland degradation rarely occurs as a sudden, cataclysmic event, but occurs rather as a slow decline in resource quality over decades in which the original condition is most commonly not clearly remembered by land users or managers. Recognition of the original condition is confounded in our country by the pronounced

variability in rainfall we experience from year to year. Rainfall cycles occur over a periodicity of approximately 18 years in southern Africa, so that a gradual decline in rangeland quality is likely to be considered simply part of inter-annual variation. The only means whereby we may ascertain if resources are degrading is through monitoring.

Rangeland monitoring has a strong tradition in South African rangelands, and has been pursued for achieving three main objectives:

1. To serve decision-making of a land user through providing information required for amending management actions in order to improve production goals or other management objectives. In other words, monitoring is conducted for contributing to adaptive management. By necessity, such monitoring has to occur on an annual (or nearly so) time scale if it is to be of any relevance. I term this *tactical monitoring*.
2. *Strategic monitoring*, by contrast, is to serve decision-

making of regulatory bodies and policy makers. It occurs therefore, by definition, at a substantially larger spatial scale than tactical monitoring but may not require a similarly intense temporal resolution.

3. Monitoring has often been conducted for scientific purposes, motivated by a desire to understand variability occurring at a time scale beyond accurate recall of human personnel. It is also the only means of recording the impact of rare events, such as floods, which often have a disproportionate influence on subsequent ecosystem functioning. Monitoring for this purpose has traditionally been most widely practiced on conservation proper-

ties, but its relevance for livestock production has become increasingly recognized with the development of 'state-and-transition' thinking (Westoby *et al.* 1989).

Rangeland monitoring seems to offer such obvious benefits at a number of levels that one would expect to find it firmly entrenched within resource management de-

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partments such as agriculture, water affairs and forestry, and conservation, and to be widely practiced by individual land owners concerned about the sustainability of their operation. Is or has this ever been the case? My own informal review of range monitoring in this country leads to the conclusion of 'Plenty ventured, very little gained'. A plethora of monitoring efforts were initiated across the country, mainly in the 1970s and early 1980s, but few examples can be found of those which persisted for longer than ten years. Considerable thought was invested in the design and execution of monitoring programmes, and sound principles were developed (e.g. Mentis 1984). Many of the monitoring programmes initiated during this era were notable for their intensity of sampling and high quality of data concerning mainly botanical composition.

Few extant examples of these efforts can be uncovered today, begging the question of whether they were intrinsically unsuited for their original intention or whether circumstances conspired against their continuation. Perhaps the answer is best revealed by some of the more successful cases. The Game Farming section of the Agricultural Research Council in the lowveld adjacent to Kruger National Park has maintained veld monitoring on a large number of properties for over fifteen years. Some self-apparent reasons for the success of this exercise has been the contin-

ued presence of a 'champion of the cause', a team of staff dedicated to the function of monitoring, the complexity of the product was commensurate with the client's needs, and an 'economy of scale' was created by a single group serving a large number of users, thereby ensuring cost-effectiveness of the operation.

Any number of conservation areas can be identified in which excellent monitoring programmes were initiated and maintained for a few years until an inevitable turnover in staff occurred, following which collapse of monitoring occurred. Exceptions support the generality – some reserves have amassed exemplary data sets owing to the single-mindedness of certain individuals. Smaller reserves were also soon faced with the time demand of collecting and processing data. The additional time required in collecting a second year of monitoring data lies not in the field sampling, which may even possibly become more efficient, but in the exponentially increasing amount of time required for accurate matching of data and analysis. Numerous examples exist throughout the country of a sound, well designed baseline having been established with one or two follow up surveys, thereafter ending with not even a whimper. Similarly, a number of private land owners had veld monitoring programmes laid out during farm planning exercises but soon found that the demands of maintaining these increased over time be-

yond their capacity. Monitoring programmes do not usually yield quick returns, which brought into question their value. The costs for a private land owner are proportionately far higher than for an organization, which further eroded continuance of monitoring on private land of livestock producers.

Examples in which monitoring has been maintained also generally serve to highlight that few have ever served their original function of tactical decision making. The value of these data sets for scientific research has, however, been increasingly recognized (e.g. Short *et al.* 2003, Knapp *et al.* 2004). Even efforts which became defunct a long time ago may be resurrected for addressing questions concerning the extent and amplitude of change (e.g. Short *et al.* 2003). Considering the small number of formal products which ever emerged from monitoring efforts, this would seem a research opportunity waiting to be realised.

A way forward

There is every need for decision makers in this country to have a

clear and accurate strategic understanding of the state and direction of change of rangelands on account of the many essential services they contribute. A chief concern is whether our rangelands continue to degrade. The current benchmark for the country is the recent analysis by Timm Hoffman and colleagues (1999), but this analysis was based primarily on expert opinion and considered a time-frame of only the ten years prior to expert interviews (approximately the 1990s). The profound insights of this groundbreaking work need to be supported by ground-based information covering a more appropriate time interval for the degradation process if we are not to base

our efforts for the future on a false foundation.

This paper proposes that the legacy of earlier work could form a basis for a contribution toward such a goal. We need to know not only if rangelands are being degraded, but the rate and extent to which they are (have) being degraded, which environmental milieus or geographic areas are most vulnerable, and, if

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possible, to identify the most appropriate management actions by their long-term consequences. The most obvious approach for achieving such a goal would be to monitor trend at a national scale using remote-sensing technology, in conjunction with ground-truthing. Ground-based methods also offer a resolution of insight that cannot be achieved with remote-sensing methods.

Setting up ground-based monitoring of rangelands *de novo* may prove to be a task too daunting to contemplate, but using efforts of the past offers an opportunity for a cost-effective assessment of trend in rangeland condition over the past 30 or so years. Key attributes of such an effort are the following.

- A substantial number of monitoring efforts were established in the 1970s and 1980s, and some even before then. Most became defunct within ten years.
- Phytosociological studies have been conducted extensively throughout all the main rangeland areas of the country, the majority of which were undertaken during the same time period as monitoring was widely established.
- Collectively, this set of studies covers all the main influences

on the organization of natural vegetation, including climate gradients, edaphic variation, land uses and management.

- This data set is not restricted to former white-owned, livestock-producing properties. A number of the former 'homelands' and 'independent states' were extensively surveyed during approximately the same period of time (e.g. the work of the Agricultural and Rural Development Research Institute [ARDRI], based at the University of Fort Hare, Alice, Eastern Cape)
- Sample size is exceptionally large, imparting confidence that sound conclusions could be realised through such an effort.
- In general, plots on these studies were adequately geo-referenced (despite being placed prior to Global Positioning Systems), such that meaningful follow-up studies can be conducted. In addition, the majority of key personnel involved in establishing these efforts are still accessible, but this will undoubtedly change with every passing year.
- This intended project does not have to buckle under the anticipated bureaucratic strain of a national effort because it is easily implemented on a pro-

vincial or regional basis.

- Individual products will have substantial value in their own right, but the collective value of a number of products should far exceed the sum of individual values.

The project is eminently suitable for the training of a number of postgraduate students and of technicians, which would do well to offset the decline in human resources concerned with rangelands and vegetation management that has occurred over the past decade.

We are conducting some preliminary pilot investigations in order to examine the feasibility of pursuing this programme in KwaZulu-Natal. We therefore invite any interested parties in KZN to contact Alan Short at Alan.Short@dae.kzntl.gov.za. Should anyone else be interested in initiating a similar activity elsewhere in the country. Please contact Tim O'Connor in order to discuss how SAEON might assist with implementation of the project.

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