The Australian Rangeland Society

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Range Assessment Newsletter

Produced by Officers of the C.S.I.R.O. Riverina Laboratory on behalf of the N.S.W. Range Assessment Committee

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No.74/3 November, 1974

EDITORIAL

The Committee wishes you the Season's greetings, and we look forward to 1975 as a year when each of us will achieve considerable personal satisfaction in our work and worthwhile progress shall be made in the concerns of "Range Research" and "Range Management" in Australia.

The feedback from the recipients of the Range Assessment Newsletter has been very pleasing, with a number of letters to the Editor, which are all printed in this issue, and more than enough articles contributed for this issue. The number of copies of the Newsletter distributed has risen from about 130 with No.74/1 to the present figure of about 230. Many of the people who were not on the original list have requested back copies, but our stock of No.74/1 is exhausted. It is possible to reprint it, but we need a reasonably large number of requests to justify the cost of re-run. Therefore we would like those of you who missed receiving No.74/1 to write to the Editor requesting a copy (or copies), even if you have previously indicated that you would like to receive one.

In general terms the correspondence seems to have been very worthwhile. We leave it to you to make your own judgments. However, the specific response sought by some contributors has not been all that they had hoped.

Also included in No.74/3 are an abbreviated article from a group in South Africa, which gives some insight into their approach to the "evaluation of natural pastures", and a description of a method under development from John Childs, on which he seeks immediate feedback. We hope that you will feel free to communicate directly with contributors, to reduce the time lag, but if you do so, the Committee would be very grateful to receive a copy of your comments for the benefit of the whole readership of the Newsletter.

In response to an enquiry, we need to point out to all readers of the Newsletter that its contents are for discussion purposes only and should not be quoted or referred to in publications.

Next Newsletter. Contributions should reach the Editor by 1st March, 1975 to meet a mailing deadline of 1st April. The next issue will be No.75/1, March 1975. There is a strong feeling that the Newsletter may undergo some changes in 1975, e.g. changing the name to Range Research Newsletter (see letter from Wal Whalley). These matters will be considered carefully, and we hope that there can be some discussion about the purpose and name of the Newsletter at the time of the inaugural meeting of the Australian Rangelands Society.

GRAEME TUPPER
On behalf of the Committee

THE AUSTRALIAN RANGELANDS SOCIETY

The inaugural meeting to form an Australian Rangeland Society will be held in Canberra on Sunday, 19th January, 1975. If you wish to obtain more details, please contact Mr. D. G. Wilcox, Agricultural Adviser, Department of Agriculture, Jarrah Road, South Perth, W.A. 6151; Telephone 67 0111, as soon as possible.

THE GRAZING GAME

A workshop on "The Grazing Game" will be held in Canberra on 28-30th January, 1975. The objectives are to catalyse game development, compare games and gaming techniques, and to discuss the use of games for determining perceptual attitudes. Enquiries should be addressed to John Armstrong, CSIRO, Division of Plant Industry, P.O. Box 1600, Canberra City, A.C.T.2601.

LETTERS

From - T. W. G. Graham, Agrostologist, Department of Primary Industries, Research Station, Biloela, Qld.

While not being considered a part of the "arid" rangelands we do have in our region extensive areas of native pasture which are largely the basis of the beef industry. I couldn't help but agree with J. A. Taylor's comments in Newsletter 74/2 - "A point of definition".

From - A. E. R. Wild and P. A. Keane, Soil Conservationists, N.S.W. Soil Conservation Service, Cooma, N.S.W.

We were interested to read your editorial in the Newsletter 74/2 July, 1974, concerning the definition of Australian "rangelands".

We would also basically agree with the comment by John Taylor.

An area of predominately native pasture with which we are concerned is the rainshadow area of the southern tablelands of New South Wales (part of the Monaro).

Plant growth in the rainshadow areas is limited in summer and autumn due to low moisture, while temperature is the major limiting factor in winter.

Consequently, agriculture is largely limited to grazing of the native pastures. Deterioration of these pastures and subsequent erosion has been spectacular in some areas, but only minimal in others.

Topdressing and the use of exotic species may be considered a marginal venture in these areas.

We therefore consider that concepts and methodology developed in arid and semi-arid "rangelands" research should be co-ordinated with research into the problems of the more humid grazing lands of Australia.

We suggest that research into the use of climatic indices, such as that developed by Fleck (1971) should go hand-in-hand with the collection of range site data, whatever the geographic location of the grazing lands.

(Reference: Fleck, B.C. - "Investigations of a Method for Classifying Seasonal Conditions." Journal of Soil Conservation Service of N.S.W. 27:2, 135-144.)

Concerning Taylor & Whalley's contribution to the Newsletter, we do not completely agree with their assessment of *Aristida* species as decreasers. We would suggest grazing management has probably involved heavy pressure on the *Aristida* species before seeding could take place, thus falsely creating the impression that these species decrease under increasing grazing pressure. *Aristida* species increased in proportion to the other species under moderate grazing. We would therefore suggest that these are actually increasers. Perhaps the assessment for some species as increasers, decreasers, etc., should be based on their reaction to "moderate" as opposed to "light" grazing?

From R. D. B. Whalley, Senior Lecturer, Department of Botany, The University of New England, Armidale, N.S.W.

On looking over the first two issues of the Range Assessment Newsletter, I heartily agree with your comment in the editorial of the second issue that the titles and aims of the Newsletter are too narrow. The impression is very strong that much time and effort is being expended on range assessment methods. But just what are we trying to assess? The answer comes quickly, the "health" of the rangelands. But before we can assess the "health" of the rangelands we need to be able to recognise rangelands in good health or in poor health. Are we in a position to do this?

The trouble with trying to adapt American methods of range condition assessment, as I see it, is that these American methods are based on an ecological theory which is not entirely applicable to Australian conditions. Here I find myself in strong agreement with Dean Graetz who expressed similar sentiments in his excellent and thought provoking article in the latest issue of the Newsletter. In the American situation, a range in excellent condition is taken as one which closely approximates the pristine situation. The degree of departure from this condition can then be taken as a measure of the degree of deterioration. Therefore the pristine condition is established as the management goal, and in many cases is attainable provided appropriate management techniques are applied. The same is not true in Australia.

In many areas, or should I say in most areas, a return to anything resembling the pristine situation is probably unattainable even were it desirable. There have been such vast changes in ecological conditions since European settlement and since the introduction of domestic livestock that a return to the pristine condition is virtually unattainable. Therefore it is unrealistic to set the pristine condition as an attainable management goal and we have to select alternate goals. Unless attainable management goals can be formulated, any attempt at condition assessment is doomed to failure.

I therefore agree with Dean Graetz's statement that we should make a fresh start. However, I differ from Dean in that I feel we should go even further back. For each class of country, or range site if you like, ideal species assemblages should be set-up as management goals. These have to be based on local knowledge of the value of individual species to the type of livestock production in any particular area. In the first instance, these assemblages may be wild guesses. I agree with Allan Wilson that such information is required now. Therefore the best approach seems to be to make the best guess possible, and then refine this guess as further information becomes available. It is important, however, to set up management goals which can be used as reference points for any particular piece of rangeland.

Another point for concern is the assumption implicit in many of the articles and comments, that the manipulation of stock numbers and classes of livestock are the only management practices available in many areas. I do not believe that this is the case. By looking for differences in the life histories and reproductive biology of both the desirable and undesirable species in any particular area, it ought to be possible to devise management procedures which will favour the desirable species to the detriment of the undesirable species. To my knowledge the only place where this approach has been successfully used in Australia is Suijdendorp's work in Western Australia. I also believe that such manipulations can only be successful when suitable seasons occur. Therefore the management goals become long term goals, but the manager knows the direction in which he ought to be heading and therefore is in a position to assess his progress. Seasonal variability then becomes, not a bug-bear, but an aid to the manipulation of species assemblages in the desired direction.

If range management is to become an established and useful science in Australia, then range condition and trend assessment must be placed in its proper perspective. It must not be an end in itself but a tool which is used to assess the progress or the lack thereof towards attainable management goals. I would therefore suggest that the name of the Range Assessment Newsletter be changed to the Range Research Newsletter, the implication being that range assessment is only one of the tools available in the arsenal of the land manager.

From Gerald F. Gifford, Associate Professor, Watershed Science Unit, College of Natural Resources, Utah State University, Logan, Utah, U.S.A.

Just a few comments from an interested outside observer. First, please retain my name on your mailing list as I have enjoyed reading your first two Range Assessment Newsletters. Secondly, I would agree that perhaps the title and aim of the Newsletter are too narrow, as is also the current Australian concept of range. However, I believe that both will change as a broader spectrum of people become involved in range resource management decisions. Certainly John Taylor's suggestion (A Point of Definition) needs immediate action. Someone suggested at the last U.S./Australian Range Workshop in Alice Springs that range improvements should first be applied on those areas which represent the greatest potential. This concept should also hold for range research efforts as applied to your more humid rangelands.

Thirdly, I'd like to toss out some encouragement to the various Australian educational institutions to offer some training in the field of Range Management (or Range Science). If the Australian National University (A.N.U.) can crank out 55 Foresters each year, and find employment for them, then surely there is a niche to be filled by people trained in range. I believe the leadership will have to come, though, from somewhere other than the A.N.U., at least initially.

And last, but not least, a comment on the article by Dean Graetz. I cannot see how the proposed methodology (Range Assessment in Australia: Some Thoughts Thereon) will work without some reference to an established ecological baseline, an ideal if you will, toward which to manage. The item number one (page 11, July issue) is useful only if the present community is a desirable one, and if so, based on what? Seedling establishment is certainly important, but of which species? Again, based on what? I realize the immense problems involved in defining ecological relationships (what with past rabbit and domestic livestock grazing pressures as well as vast climatic fluctuations) on Australian rangelands, but I fail to accept the "great background of ecological ignorance of the behavior of our range ecosystems" as being overpowering. At least I know what the problem is and what the concept entails. What I don't know, for instance, is what the grand old term plant vigor means (items two and four, page 11, July issue). Everyone can apparently see it, but nobody knows for sure what it is. Is a condition class this vague? I don't think so. I might argue that plant vigor only has meaning when interpreted against an established ecological baseline. Certainly this would be true in considering landscape-stability features. In any case the basic philosophy offers no argument--that of doing the job correctly. I agree completely, and I wish everyone involved in the effort the best of luck. If you find anything that works, we would appreciate knowing about it over here.

From L. E. Woods, Chief Agronomist, Animal Industry & Agriculture Branch, Department of the Northern Territory, Darwin, N.T.

Reading the July issue of the Range Assessment Newsletter has prompted me to write to you on two topics.

The first is that in a recent visit to the United States it appeared that the general definition of rangeland among United States scientists covered all native pastures, not just those of the arid zone as is the case among Australian scientists. I do think it worthwhile that the Newsletter should cover a wider range of topics connected with arid zone native pastures than just methods for their assessment.

The second topic I would like to comment on is what seems to me to be a misconception amongst a proportion of the people concerned with rangelands. This misconception is that the only satisfactory vegetative cover for our arid areas is the original climax vegetation.

I would first propose that a unit of rangeland should be put to its most productive use, consistent with the long term conservation of the soil resources of that unit. Land "use" in this proposition is not limited to grazing by cattle or other livestock. It could also include tourism and recreation use, use for controlled flora and fauna conservation, the harvesting

of one or more of the plant species, or a combination of these and other uses.

It is recognised that there could be cases where any form of land use would lead to degradation in the long term. This could include use for tourism and recreation, and in these cases it may be necessary for the unit of land to remain completely untouched.

However, in general, it would appear that with many, perhaps in the majority of our range land units, a certain amount of pastoral production or other land use can be obtained whilst still preserving the soil resources. In this situation, from observations in the Northern Territory, it appears that a dis-climax plant community may be often more productive than the original climax community, and at the same time be equally effective in preventing soil degradation. Such a dis-climax plant community might include one or more introduced species. In other cases it will comprise a different association of the native species present.

I feel that range assessment methods, and the attitudes of people concerned with rangeland, should include such dis-climax plant communities along with the original climax communities as desirable goals.

From A. D. O'Brien, Regional Research Officer, Department of Agriculture, Agricultural Research Station, Grafton, N.S.W.

I like the R.A. Newsletter and its discussive style. I hope it can be kept going. I am one who would like to see it develop further, with the backing of an Australian Society, to cover more aspects of natural pastures; in particular such management aspects as the roles of burning and seeding rests in the Australian context, also the ± values of different animal supplements in management stability of different Australian natural pastures, etc. (I also don't particularly care for the term range in Australian usage as I think it will drive a barrier between the scientist/educator and those it is hoped will apply the work, the pastoralist/grazier. What is wrong with the term natural pasture which can be defined to cover both native and naturalised species?).

I most earnestly support John A. Taylor's comments in No.74/2 Newsletter. It should become a responsibility of an Australian Society to foster the recognition of "the need for studies to enable sound management of all Australian natural pasture lands". I would go so far as to include those forested lands used for grazing, where grazing may not be the primary use but where grazing considerably influences the stability of the ecosystem.

The problems of natural pasture management are not confined to the semi-arid and arid regions. Nor are they passing problems in the more humid zones. Because of limitations in available capital, seed and fertilizer supplies; capacities of markets to absorb continuing rapid increases in production, etc., it would be many generations before all the sub-humid and humid zones could be fully "pasture improved". However, because of socio-economic circumstances of owners and the large areas of non-private land even this long term possibility won't be realised. There will always be a large proportion not improved by any other means than adjustment of management of the natural pasture.

Research aimed at reduction in deterioration, finding ecological stability, or getting small increases in production of natural pastures, because it applies to such large areas can be as economic a research investment as animal production research; which is supported because the small increases in production can be multiplied over large numbers of animals.

From G. L. McClymont, Dean, Faculty of Rural Science, The University of New England, Armidale, N.S.W.

Re: Range and Rangeland Terminology

In connection with the note in the July Rangeland Assessment Newsletter it might be of interest that for the last few years the Faculty of Rural Science has included "rangeland management" as one of the potential fields of specialization for the postgraduate Diploma of Science in Agriculture. The field is described in the relevant brochure as -

"Rangeland Management - plant, animal and agricultural ecology, pasture improvement, physiology and nutrition of the grazing animal, grazing management, interactions of wild life and livestock, economics of range utilization."

At least one and possibly two officers of government departments will probably be undertaking study for the Diploma specializing in this field in 1975.

Rangeland "status and trend assessment", and "management" are also established terms in our teaching in Agro-Ecology and Agro-Systems courses.

From B. R. Roberts, Professor, Department of Pasture Science, University of the Orange Free State, Bloemfontein, Republic of South Africa.

Grazing Land Evaluation - Where Are We?

We have had a good kick-off with the first two Range Assessment Newsletters - well done. Your comment that the Committee has not been deluged with feedback tempts me to comment on numerous statements in No.74/2. The game is well under way and is apparently already being played with the enthusiasm of novices, the tactics of veterans, the flair of self-confident specialists and the spectacular performance of test hopefuls.

The Editor asks what, how and who will measure condition criteria. These questions deserve consideration but I would like us first to ask why each of us is in this game. Is the condition game a new and interesting avenue for the research purist, or is it the much needed basis for practical management and resource conservation. Lets face it - the ecological hypotheses and statistical niceties of this game can be very seductive to those of our team who are inclined toward either the philosophical or the exactitudes of modern specialization. Perhaps at this stage we should, in anticipation, be wary of the specialist who understands everything about his subject except its purpose in the whole scheme of things.

We may see grazing land assessment as a long term research project aimed at monitoring of vegetation changes and, if pushed, we can probably list a number of good-sounding reasons to justify such industry. We may also see assessment of condition as a practical tool in the hands of the producer and advisor, specifically aimed at decision-making in property management. At this embrionic stage let us be careful that our criticism does not discourage our team members whose keenness we appreciate. At the same time let us examine our credentials and reasons for joining the team. Can we agree i) that we're concerned with natural pastures (in any rainfall zone and by any name) and ii) that these natural pastures require good management to assist in maintaining or reclaiming them? Can we also agree that in view of the evidence of deterioration available (Roberts, 1972; Leigh, 1974), early practical proposals be advocated on the basis of present, albeit incomplete, information? Lastly, can we agree that there are a number of good reasons why we proceed with our efforts to develop locally meaningful assessment methods for our own areas, while swopping notes through the Newsletter?

We are dealing with a real need. We have a patient whose state of health changes. We are looking for ways not only to take his temperature but to intelligently deduce the treatment indicated by our diagnosis. There is a real danger that our important work will be discredited as a sterile intellectual exercise if it becomes dominated by academic barbarians who have no appreciation or concern for the economic and social effects of our failure to provide not only a good thermometer but also good diagnostic guidelines to treatment. We must be concerned with scoring natural pasture, not with scoring personal points or making academic mileage out of this exercise.

At this stage we can expect individual members of our team to emphasize (and probably over-emphasize) only small fragments of the game we're playing. This is normal when most players are keen to make an original contribution. It is important to consider the role which information on successional stages may play in our approach. It is important to consider that many "climax" species are neither useful nor desirable. It is important to clarify what we mean by "desirable" plants. It is important to realize that certain species are sensitive to management while others are practically animal-proof.

It has been said that management effects are only peripheral within the over-riding climatic controls in semi-arid and arid grazing lands, so it is important to consider that in some degraded situations we may get no response to management as a result of defective moisture regimes precluding any future ecological momentum. Sure, objectivity is important, but so is perspective and extrapolation. Certainly repeatability is important, but so is simplicity and thus, acceptability, to those for whom the technique is intended. It is worth noting that South Africa has used ecologically-based veld management for 40 years without ever using formalized condition assessment. Australia, having advocated virtually no ecologically-based management, now starts with a comprehensive effort to develop an assessment methodology. There are good and important reasons for these basic differences in procedure, which could be evaluated in a future Newsletter.

If the possibility of many degraded soil and vegetation types not responding to strategic sparing, grazing and burning doesn't haunt us as prospective condition assessors, it should. Our entire effort could stand or fall by the very real possible difference between Australian and American or South African ecological responses.

Lastly, could we plead for an avoidance of high-sounding jargon in our team effort - "if you know what you're talking about, you can afford to use language which others can understand".

References

Roberts, B.R. 1972. Ecological studies on pasture condition in semi-arid Queensland. Report, Dept. Primary Industries, Charleville, Qld., Australia.

Leigh, J.H. 1974. Diet selection and the effects of grazing on the composition and structure of arid and semi-arid vegetation. *In* "Studies of the Australian Arid Zone. II. Animal Production." Ed. A.D. Wilson, pp.102-126, (CSIRO, Melbourne).

From C. Lendon, Division of Land Resources Management, Alice Springs Field Centre, Alice Springs, N.T.

Dean Graetz's long article in your last Newsletter deserves comment. He should be thanked for many provocative thoughts, challenged on many others, and some of the spectres he raises should be buried.

The first few paragraphs of the article annoyed me sufficiently (because of their inaccuracy) to make me plough through the remainder with some care. Why has it become fashionable to knock the North American methods of range condition assessment? This is excusable only if they have been tried and found wanting for Australian rangelands - but to "completely disregard" techniques that have been used elsewhere in the world would be simply foolish. Worse, to assert that they are "inadequately based in ecological theory etc." is quite misleading; for one, the Quantitative Climax method has survived because it works - which must say something for the successional theory on which it's based.

One practical point that Dean omits to mention is that the sort of testing that the three Range Condition Workshops gave the American methods provided some invaluable insights into the format of a useful field method: what features make for speed, simplicity etc. Had we started from scratch it would have taken years of tedious field testing, in sweaty heat and crawling flies, to learn that lesson, I suspect.

This raises another argument which has also become fashionable since the workshops, and is implicit throughout Dean's article: Let's forget about Range Condition - Range Trend's the Thing! (Or, why worry about range condition when it's range trend that monitors what's happening to the range resource.) The answer is also to be found, unilluminated, in Dean's paragraphs. The two

concepts, range condition and range trend, are distinct and yet cannot be divorced from each other; like the two sides of the same coin. If one is concerned about the potential of our rangelands, then one must aim to know the current status (condition) in order to gear management in the direction of a stage-by-stage progression toward that potential.

You've got to construct a ladder before you can climb it. What seems to be worrying Dean is that we don't know enough about our plant communities to be able to manage them in a predictable way. So we can't make assessments of range condition... we can - by mobilising (quantifying) the knowledge of experienced rangemen. We may first have to construct our "successional frameworks" (Taylor and Whalley) - and if we're wrong, subsequent workers will make the necessary alterations. One reason for pressing ahead with work on range condition is that our rangeland administrators, those responsible for setting stocking rates today, need deliberate assessments of range condition now, not some time in the never-never, after we've monitored trend for a few brief decades.

Range assessment is a big field, it's in its infancy in Australia and so we have many problem areas. But one aim of range assessment is clear: to identify and measure those management strategies that will improve the condition of Australian rangelands to a point that is both stable and productive. Can we improve condition classes through grazing management alone? It may still be a hypothesis in Australia - but I suggest it's a crucial one, worth getting out in the field and testing.

Range assessment has been the vehicle that has brought many widely-scattered rangemen together over the past couple of years. Many beneficial contacts have been made and some common goals established. We need more work on these common goals - more results from the field - and fewer portents of gloom and pessimism at this early stage.

In spite of Dean's warning, there will be false starts, and some re-runs. We're on the third re-run in Central Australia but we've built on to the first two.

Let's not lose sight of the fact that we are working towards establishing the base that will put conservative land-use into practice. So cheer up in Article No.2, Dean!

THE MAN WHO COUNTS

IT IS NOT THE CRITIC WHO COUNTS,
NOT THE MAN WHO POINTS OUT HOW THE STRONG MAN STUMBLED,
OR WHERE THE DOER OF THE DEED COULD HAVE DONE BETTER,
THE CREDIT BELONGS TO THE MAN WHO IS ACTUALLY IN THE ARENA,
WHOSE FACE IS MARRED BY DUST AND SWEAT AND BLOOD,
WHO STRIVES VALIANTLY,
WHO ERRS AND COMES SHORT AGAIN AND AGAIN,
BECAUSE THERE IS NO EFFORT WITHOUT ERRING AND SHORT-COMING,
WHO DOES ACTUALLY STRIVE TO DO THE DEEDS,
WHO KNOWS THE GREAT ENTHUSIASM, THE GREAT DEVOTIONS,
WHO SPENDS HIMSELF IN A WORTHY CAUSE,
WHO AT BEST KNOWS IN THE END THE TRIUMPH OF HIGH ACHIEVEMENT,
AND WHO, AT WORST, IF HE FAILS, AT LEAST FAILS WHILE DARING GREATLY,
SO THAT HIS PLACE SHALL NEVER BE WITH THOSE COLD AND TIMID SOULS,
WHO KNEW NEITHER VICTORY NOR DEFEAT.

(Dedicated to the fly-covered field workers in range assessment)

- (Contributed)

THE BASICS OF RANGE ASSESSMENT

John A. Taylor, Department of Natural Resources, U.N.E., Armidale, N.S.W.

Range assessment in Australia is fraught with contention and scepticism. This is largely due to the interpretation and application given the concepts of condition and trend. In view of the confusion over such basics as:

1) the implications of the terms - condition, trend, site, key species, and reference area;
2) the assumptions of the concept of range assessment;
3) the aims and purpose of both condition and trend assessment;

it is no wonder the 'art' of range assessment has a rather dubious image. Collaboration (perhaps a workshop?) is urgently needed to resolve these conflicts and develop guidelines for the rational development of but a tool of range management.

Techniques for estimating pasture composition have been proposed, yet little attention has been given to the accuracy and precision of the resulting data. This is particularly disconcerting in view of the use made of such estimates in formulating condition standards and delineating condition classes. Just how much variability is to be expected and accepted in botanical estimates?

The value of relict or reference areas has been questioned because the absence of the grazing animal is unnatural, the climax (?) is not a realistic and attainable goal of management, and secondary succession after disturbance will probably not result in the same community as existed under pristine conditions. Yet a knowledge of the pristine state is useful to gauge the effect of past management, and invaluable in the opportunistic acquisition of successional data. The role of the reference area is in the development phase. Once the long term goal of management has been set, the reference area should merely serve to indicate the vegetative expression of short term climatic variations. 'Tail-chasing' will result if the reference area is considered of greater value.

To date, these basics of range assessment have been stumbling blocks, largely because of preoccupation with the development of 'a method'

RANGE CONDITION AND TREND - SOME IMPRESSIONS OF THE CONCEPTS AS APPLIED IN WESTERN U.S.A.

Dr. V. R. Squires, CSIRO, Division of Land Resources Management, Riverina Laboratory, Deniliquin, N.S.W.

A voluminous literature exists on grazing management in the U.S.A., most of it dating from the 1930's. Management of the grazing animal was seen as the solution to rangeland deterioration. In the past, rangeland management was based on single factor reasoning. Managers (both at the level of the individual rancher and at the land management agency level) were trained to think primarily of one aspect of the rangeland, usually centred around one kind or class of economically important outputs from these ecosystems. Much management was even single species oriented, e.g. cows, crested wheatgrass, or mule deer.

More recently there has been a swing away from these concepts. Single factor reasoning has been forced to die a violent death. The range manager now has to organize his thinking to consider multiple uses of complex natural systems. This has meant a re-orientation of the philosophy of range condition assessment. Range condition class for Hereford cows may not necessarily be in the same condition for elk or for the recreationist. Mathematical models and high speed computers are now being used to sort out and evaluate the multitudinous factors comprising range ecosystems. Thus 'big picture' ecology dominates range science in the U.S.A.

A factor which has contributed to the changing concepts of range condition and trend is the wider acceptance of the polyclimax community philosophy in development of tentative range condition guides. The philosophy recognises that there are clearly developed continua in the environment and points to the inappropriateness of condition guides based on modal community groups developed in a limited geographical location. It is thought that range condition guides based on the modal concept of community groups can lead to misinterpretation of site potentials, application of management practices not particularly appropriate to many sites, and to erroneous mapping based

on site potential or range condition. Since the land manager is responsible for every hectare under his jurisdiction, guides must be developed and written which are applicable to as much land as possible. They must be acceptable and understandable to field personnel. They must be developed for polyclimax 'transition zones' or 'intergrades' as well as for the modal conditions. Range condition guides based on modal plant community groups are generally inappropriate because site potentials within plant associations vary considerably and because transition zones are ignored. The use of condition guides in trend interpretation must be limited to suggesting site potential and approximating range condition as a guide for assuming that upward trend is possible or that downward trend has occurred. These guides should not be used as a measure of trend because they cannot measure a specific site. Since each site may be considered as some point on a continuum gradient, condition guides based upon such a gradient will more accurately evaluate specific sites.

Another factor which has had a big bearing on the way in which the concepts of 'range condition and trend' have been applied is the almost universal acceptance of rest-rotation grazing as a system of grazing management. The previously cherished concept of 'proper' grazing (use 50%, leave 50%) has had to be re-evaluated. Under the rest-rotation system utilization may exceed 70% on some occasions, without detriment to the health of the community. One of the objects of rest-rotation grazing is to improve or maintain trend in an upward direction.

Assessment of range trend on grazing allotments commonly involved sampling from areas heavily used by livestock and are designed to provide a measure of animal effects on the range. Their location is further qualified by placement in range types reasonably similar to major kinds of vegetation on the allotment. Unfortunately, livestock have scant regard for modal conditions representing community groups. Furthermore, allotment boundaries are not located around modal conditions. As a result many of the samplings used for administrative purposes are not placed in modal sites. Community group condition guides seem to be seriously deficient in estimating range condition, interpreting trend, and in appraising management alternatives on these sampling locations. Too often, environmental factors measured at sampling locations are significantly different from those suggested by community group guides.

Trend evaluation is commonly associated with condition evaluation, but a very important distinction must be noted. Trend is evaluated on a specific site, a site which has its own unique environment. Condition guides, on the other hand, are based on sampling many sites from which numerical data are statistically evaluated. Thus, condition guides are mathematical abstractions, representing only averages of site characteristics and modal environmental potentials - they are not a true measure of actual condition or potential on a specific site. It is with specific sites that land managers have to deal. The formerly large grazing allotments under control of the Bureau of Land Management (B.L.M.) or the Forest Service (U.S.F.S.) have now been largely subdivided to implement the system of rest-rotation grazing. Range trend evaluation has continued but often enough the same sampling sites as were used before (based on modal plant community groups) are used now. The applicability of the results of trend evaluations is now being seriously questioned in some quarters.

To sum up, I was left with the impression that there is little research effort going into range condition and trend assessment. The trendy thing to do is to get involved with 'big picture' ecology at the research level. Meanwhile back at the ranch (and in the B.L.M. and U.S.F.S. grazing allotments) there is considerable concern about the real value of the trend evaluations and some interest in ways of overcoming the shortcomings of the present system. There is some urgency for this because of public concern (downright opposition from some quarters) about use of public lands for livestock grazing and the associated rangeland deterioration which many people assume is a natural concomitant.

EVALUATION OF NATURAL PASTURES : QUANTITATIVE CRITERIA FOR ASSESSING CONDITION IN THE *THEMEDA* VELD OF THE ORANGE FREE STATE

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INTRODUCTION

Despite the vast amount of research on veld management since 1934 in South Africa, until recently (Roberts, 1970), no attempt has been made to formalize the basis of veld condition assessment. For veld management to achieve maximum but stable long-term animal production, the use of this natural resource should be monitored by those people most closely associated with it, i.e. the extension officer and the farmer. They are concerned with general productivity and stability and need to recognize vegetative and edaphic symptoms of condition so that correct management may be applied to improve and/or maintain productivity.

The fundamental tenets forming the basis of the condition assessment approach employed in this study are as follows:

(a) That animal production in the region is based on natural grazing land.

(b) That this natural grazing land is dynamic and changes in response to climate and management.

(c) That certain combinations of plants are more productive than others over the long term, through such factors as their particular acceptability to animals, nutritive value, productivity of dry matter and their ability to stabilize the soil as far as is possible under the edaphic conditions of the region.

(d) That both the botanical composition and the density (cover) of the grass and herb component of the vegetation can be altered by management, within the primary control of climate.

(e) That botanical composition and cover can be employed to deduce past treatment as well as to formulate management requirements for the future.

(f) That the level of production of the natural grazing land may be influenced by management, only within the limits of the overriding effect of seasonal climate.

The rationale employed in many condition assessment studies stands or falls by the acceptance or otherwise of a causal relationship between the status of the plant/soil complex and management, within the constraint of moisture availability. This being the case, the concept of condition here encompasses the overall level of ecological balance in the ecosystem and does not refer simply to the amount of feed available from a particular site at a given point in time.

This paper aims to (i) examine the practical significance of criteria of veld condition, (ii) explain the use of "ecological benchmark" sites and (iii) propose procedures for using and interpreting scoresheets as a basis for management decision making.

The approach presented here is aimed at grassland in the 400-575 mm rainfall zone.

CRITERIA OF CONDITION

While the species concerned and the density of the grass cover will depend on the climate and soil of the area being studied, four criteria are usually employed in judging veld condition, namely cover, botanical composition, vigour and soil surface condition. Of these criteria, the first two are the most useful and generally the most practical to estimate. They also form the basis of carrying capacity and are directly related to rainfall. See Figure 1.

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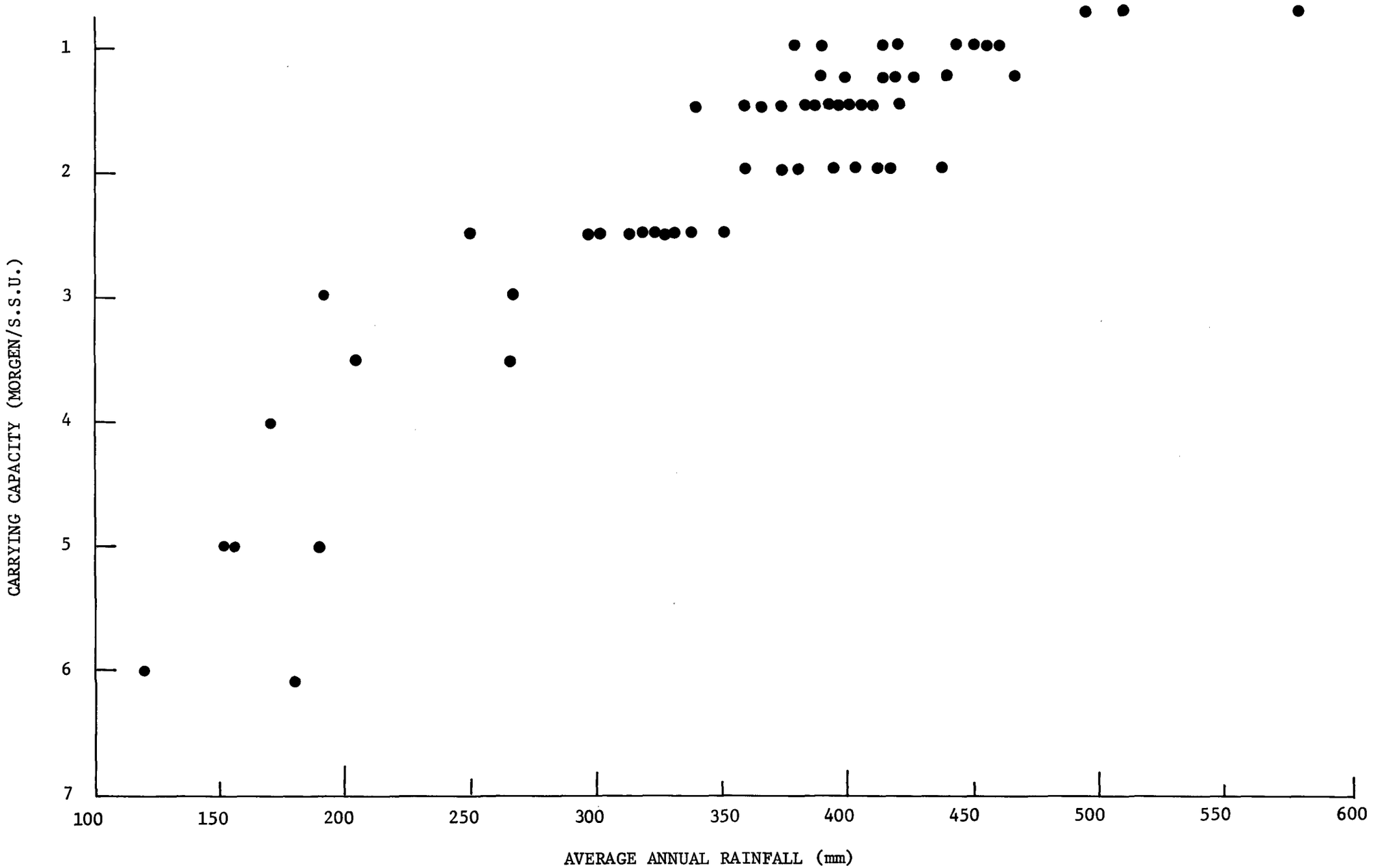


FIGURE 1: Relationship between recommended carrying capacity and rainfall in 58 soil conservation districts of the Orange Free State (Van den Berg, 1971).

Cover

More specifically cover refers to "basal cover", i.e. the percentage of the soil surface area covered by the bases of the grass tufts. As a general rule, the higher the basal cover, the greater the potential carrying capacity of the veld, the lower the percentage run-off and the more stable the soil. Also, in a given situation, the higher the cover the more likely are "useful" (desirable) grass species to be present.

For each situation and soil type within each climatic region, there is a practical maximum basal cover figure and in assessing the condition of veld in terms of cover, each camp (paddock) should be judged relative to this. The relationship between cover, organic matter and degree of erosion is shown in Table 1.

TABLE 1: Relationship between vegetal basal cover, bare soil, soil organic matter and degree of erosion (Herbst and Roberts, 1974).

Average Basal Cover Class[1]	Bare Soil (% of surface area)[2]	Soil Organic Matter[3]	Degree of Surface Erosion[4]
32.7%	14.7%	48.7%	0
30.0%	21.5%	34.5%	1
26.6%	28.6%	27.4%	2
23.3%	29.2%	28.5%	3

1. Based on a survey of 56,000 points (3 mm) over 66 km^2, classified according to erosion rating.
2. Total surface area = vegetal basal cover + % bare soil + % bare rock + % dung.
3. Loss on ignition of topsoil to a depth of 23 cm.
4. Ocular estimation of degree of soil loss on a scale of 0-3 at 102 sites.

Botanical composition

This refers to the relative abundance of "desirable" (useful fodder plants) and "undesirable" (weeds, unpalatable grasses, encroaching shrubs, poisonous plants, etc.) species which make up the veld. Of utmost importance in assessing botanical composition, is the correct definition of which species constitute the "desirables" in a particular region and situation. Many criteria have been used in the past to define desirable grasses,but for practical veld judging, the three basic criteria are palatability (acceptability), productivity and perenniality. To these may be added such features as nutritive value (and digestibility), and ability to withstand biotic stresses (grazing, fire, insects) and drought.

Studies in the Orange Free State and Northern Cape indicate that before meaningful evaluation of veld can be attained, a considerable amount of basic information concerning individual grass species is required. Meaningful lists of desirable and undesirable species cannot be finalized for each situation (soil type or topographic position) in a particular district without these basic studies. Provided a species meets the requirements mentioned above, whether it is a climax species of not, is of less importance. In most districts, a start to deciding which are desirables may be made by listing those which are annuals, or unacceptable to animals when in the flowering stage, or are such small plants that their productivity is very low. Having eliminated these latter species, the remainder may be examined and possibly further classified as "desirable" and "highly desirable".

Vigour

Vigour refers to the present "state of health" or vitality of the veld grasses. It is the criterion which is first to reflect the short term effects of climate and management on the veld. Many factors have been used to assess vigour, e.g.

(a) presence and "healthiness" (amount, leaf size, leaf colour) of new growth,
(b) presence of seed stalks,
(c) evidence of seedlings, young plants, dying or deaf tufts,
(d) size of tufts and range of tuft sizes.

Because of difficulties (e.g. separating seasonal from management effects) in setting clear and well-based standards of vigour assessment, this criterion of condition has so far not been as useful as cover, or botanical composition. However, because of its particular value as an early symptom of condition, its assessment should be given the close attention of specialists in this field.

Soil surface condition

Soil surface condition refers to the overall characteristics of the surface of the soil in as much as these reflect fertility, infiltration, erosion and soil losses. Local data on the relation between cover and infiltration are shown in Table 2.

TABLE 2: Relationship between basal cover, botanical composition and infiltration rate in 16 paddocks (Van den Berg, 1972).

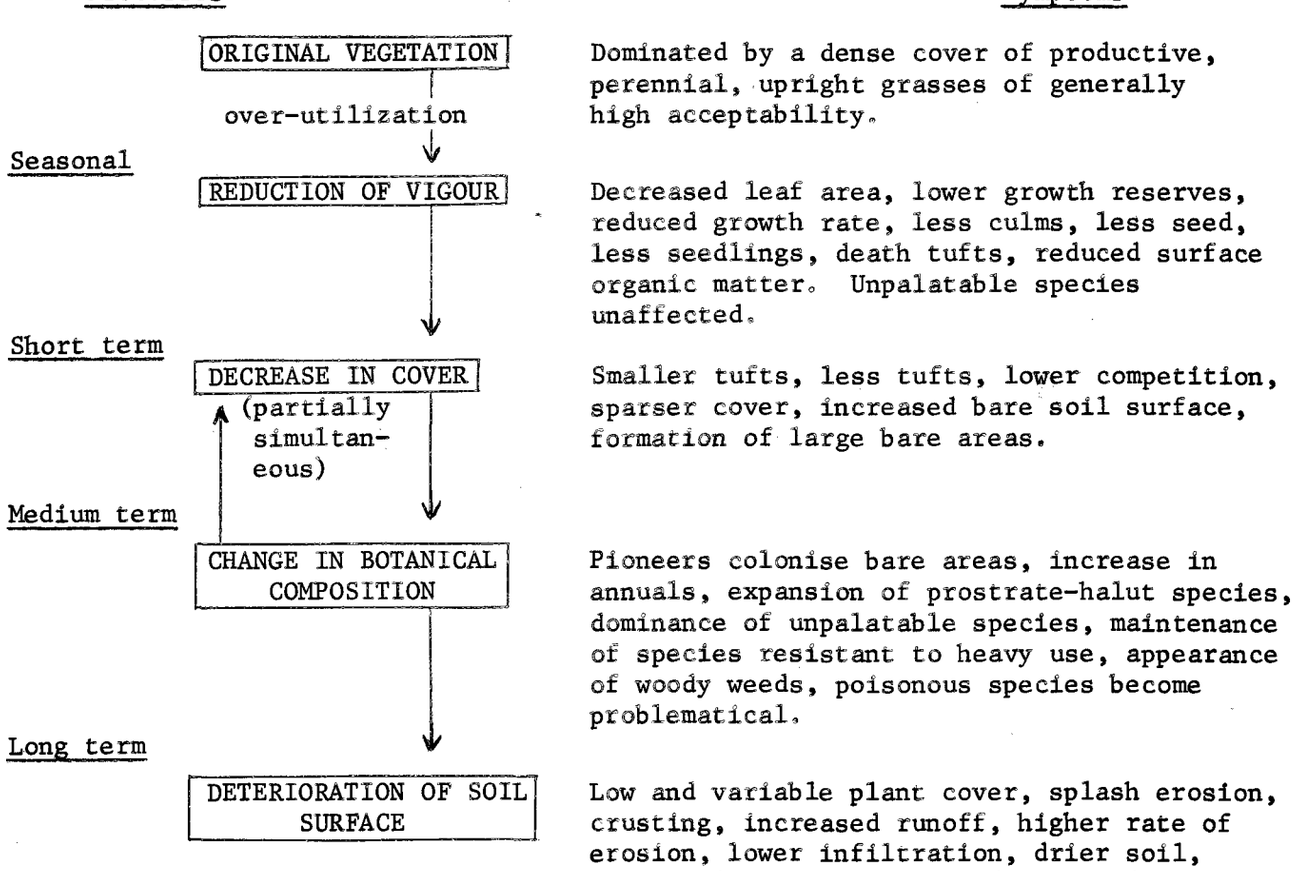
Total Basal Cover (%) (a)*	% Climax spp. (b)	% Pioneer spp. (c)	Infiltration Rate[1] (mm/hr)
10.2	7.2	1.8	191
11.2	6.1	4.3	145
12.3	5.0	6.9	80
9.6	3.9	5.4	95
9.9	5.1	3.1	133
11.6	3.4	4.0	75
11.3	2.5	7.1	66
11.5	4.9	5.9	109
10.2	3.1	6.6	72
11.5	4.3	7.0	66
10.5	2.9	6.7	89
10.3	3.1	6.9	72
12.9	3.7	8.9	69
11.7	2.7	8.1	76
11.5	3.1	7.8	73
12.4	11.9	10.4	55

* % cover of subclimax spp. = a - (b + c)

1 Ring infiltrometer measurements

Factors such as surface organic matter (litter), crusting, splash erosion, surface wash, pedestalling of tufts and other signs of soil movement are often considered in judging soil surface condition. With the exception of organic matter, these factors reflect changes in runoff which have proceeded for some time, and poor surface condition should thus generally be regarded as a symptom of advanced detrimental change. Soil movement is the end result of earlier changes in cover. The sequence of the processes in condition change are illustrated in Figure 2.

FIGURE 2: Theoretical sequence of processes in grassveld deterioration



NEED FOR LOCAL ECOLOGICAL BENCHMARKS

From the foregoing it may be seen that before any system of condition assessment can be applied, it is necessary to develop "standards" concerning the species components of each of the stages of veld reclamation for each type of site. It is also necessary to define "excellent condition" at least in terms of botanical composition and cover and to ascertain whether in fact such composition coincides with the "climax" vegetation of the site concerned.

Clearly some method is required to determine how far the vegetation is able to develop floristically and cover-wise, and then within the range thus established, to identify communities ("seres") which correspond to condition classes ranging from poor to excellent. In such an investigation, a comparison is made of relic areas of "original" vegetation and areas which have a history of some degree of protection from overuse, with areas displaying different floristic and cover values within the same type of site (soil and rainfall).

A number of basic questions needs to be answered before any system of assessment can be applied (Roberts, 1972):

(a) Which species are present and which species could or should be present?

(b) Which species dominate the community and which species could or should dominate the community?

(c) Has the vegetation changed since domestic stock were introduced? If so, in what ways has it changed, and can the reason for these changes be clearly identified?

(d) To what degree are the various species of plants utilized by animals?

(e) What is the productivity and nutritive value of the species present?

(f) Are any species toxic or otherwise harmful to grazing animals?

Many other questions could be added to the above, but in basic terms what is required is firstly the determination of those species which may be regarded as "desirable" in any area, and secondly, the assessment of how far removed the present vegetation is from the potentially "best" vegetation, as measured by its capabilities of sustained high animal production and maintenance of soil stability.

REQUIREMENTS OF A MEANINGFUL CONDITION ASSESSMENT SYSTEM

As opposed to precise techniques of quantitative botanical analysis in which some form of point, line, quadrat or charting apparatus is used to determine botanical composition and cover, condition assessment schemes are usually required to be used for more rapid general estimation of the state of grazing land in the practical situation.

Thus, although the requirements of a successful condition assessment system may differ according to the aim of the assessment, the size of the areas concerned and the manpower available, certain characteristics may be listed as basic to all successful systems.

These would include the following (Roberts, 1972):

(a) rapidity
(b) simplicity without loss of repeatability
(c) quantitative estimation of criteria
(d) applicability in good and bad years (seasons)
(e) applicability to grazed and ungrazed sites
(f) usefulness in guiding management decisions
(g) preferably, but not necessarily, acceptable to land users.

VELD CONDITION SCORESHEETS

After trials in a variety of veld types, the following scoresheet is suggested as a basis of condition assessment in semi-arid grassveld:

TABLE 3: Simplified veld condition scoresheet

Farm: Date:

Camp (Paddock): Assessor:

Criterion	Score (0-5)	Weighting Factor	Total
Cover density		x 3	
Botanical composition		x 5	
Vigour		x 1	
Soil surface		x 2	
		Final Score	

As mentioned earlier, vigour and soil condition are often difficult to estimate reliably and it is suggested that in such cases, cover and botanical composition should form the basis of the condition assessment. Because cover and composition are regarded as the more important criteria, they were weighted accordingly in the scoresheet.

Scoresheet interpretation

By examining the values for each criterion, the specific requirements of the camp concerned may be determined, e.g. if cover is high but botanical composition is low, then selective grazing may require attention. If cover is low, seeding rests may be

indicated. If vigour is low, more recuperation rests between grazings may be indicated. If soil surface conditions are poor, total rest or winter grazing only may be indicated.

The scoresheet should be followed by a second sheet on which the present shortcomings and requirements of the camp concerned are enumerated and this in turn should be followed by a third sheet on which proposed remedial management is listed.

FIELD SAMPLING FOR CONDITION ASSESSMENT

Basic to any form of reliable sampling is that it should be representative of the population as a whole, while not being larger than is required for a predetermined level of accuracy. In American range parlance, the term "key area" is used to denote an area of a camp which may be taken to reflect the degree of utilization of the camp as a whole. Such a representative area would normally also typify the general edaphic and floristic conditions prevailing in the camp overall. Sampling sites of this type are required for condition assessment purposes and a multitude of suggestions on the methodology of sampling for this purpose has been proposed and published. Since circumstances dictate procedures, in the majority of cases it is left to the assessor to satisfy himself that his sampling assessment area:

(a) Has the same ecological potential as the greater portion of the camp being assessed,

(b) has been used to a similar degree by the grazing animals as the camp as a whole,

(c) is truly representative of the present condition of the camp overall.

A number of sites midway between the watering points and fences of the camp being assessed should be closely inspected and examined for each of the four main criteria. The position of waterways, licks, resting places or other atypical areas should also be taken into account when selecting sampling sites. Annual assessment of veld condition is sufficient in most cases. Assessment at the end of the growing season holds certain advantages and standardizes the time of assessment.

In the initial phases of assessment, the use of the so-called "step-point" method helps to establish a more reliable basis for botanical composition and cover estimates. This method consists of making a mark on the point of the assessor's right shoe and recording the species under or nearest this mark at each 300 steps. The total number of tufts recorded under the mark gives a very rough estimate of cover, while all those recorded as nearest species are considered together with those under the mark, to form a basis for scoring botanical composition. With sufficient experience, this method may be replaced by more rapid visual estimation. Vigour and soil surface condition are judged in the field relative to the optimum conditions which are known to prevail in well-managed veld ("benchmark sites") in similar situations in the same area. For beginners, the use of enlarged close-up colour photographs of the various levels (excellent, good, fair and poor) of each criterion are of great help in establishing standards, which all workers in the area can use as reference points.

GENERAL COMMENT

The effect of emphasis on Clementsian successional theories in South African thinking in the sphere of vegetational dynamics has resulted in an overrating of the label "climax" as applied to veld plants in the grazed ecosystem. This connotation denotes no more than developmental superiority, but because Nature has no vested interest in the Animal Industry, "climax" species have neither superior acceptability nor a higher nutritive value than species in the lower areas and may not persist under grazing. However, "climax" species do have a competitive advantage, are generally long lived and produce reasonable yields.

The American concepts of "Increasers" and "Decreasers" may be useful in condition assessment in a variety of situations (Dyksterhuis, 1949), however, the reasons for individual species decreasing or increasing requires careful analysis, before Increasers can be classed as undesirable without qualification and *vice versa*.

Further research into the yield of animal products and the loss of runoff and soil from the alternative communities within each potential veld type should contribute much to the verification of the procedures proposed here by the writers.

In application of this dynamic ecological approach, clearly the correct estimation of site potential is essential for accurate and meaningful results, since all assessments using this approach are simply an attempt to judge the degree by which the present vegetation and soil situation deviates from the potential or possible best situation which may or may not be the "climax".

In developing an assessment system based on local standards, decisions are required on at least four major issues, and in the following sequence:

a) The criteria of condition to be employed

b) The intensity and accuracy of sampling required

c) The actual scoresheet details

d) The weighting of criteria according to importance.

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CONDITION ASSESSMENT FOR THE SHEEP INDUSTRY SURVEY - SOUTH WEST QUEENSLAND

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The following method of assessing grazing land condition is broadly based on the Deming-Two phase method of production potential determination. There are additional elements which have been derived from Roberts (1972) and the experiences of Dawson and Boyland (pers. comm.) in surveying the South Western area.

Objective

My purpose is to have an evaluation of resource condition on some of the mulga properties within the Sheep Industry Survey - South West Queensland (Childs, 1973). This is being done so that the level and degree of use of the soil-plant resource can be related to the climate,animal and financial resource parameters.

This method has been devised as a fairly quick and practical method by which one person can evaluate the soil and plant resources of a chosen area.

The method is a three phase method and the scoring system is based upon the work of Roberts (1972) and the results of research conducted by the staff at the Charleville Pastoral Laboratory.

Procedure

Determinations are to be made of the following factors. The scoring method is as detailed in the accompanying scoring sheets.

Phase		Section
A.	Herbage	Key Species Frequencies
		Basal Cover
		Plant Vigour
B.	Woody Plants	Shrub Density
		Edible Tree Density
		Inedible Tree Density
C.	Soil	Soil Surface Condition
		Litter Cover
		Surface Characteristics

Field Method

(a) The Land Systems Map of the Western Arid Region Land Use Study - Part 1 will be used to select sites on the properties in the Sheep Industry Survey - South West Queensland.

The sites selected will be the "Soft Mulga Lands" classification of that Study.

(b) The site will be between 0.3 and 0.6 km from a watering point, fenceline and/or roadway.

(c) Two triangular transects, arranged so as to evenly sample each site, will be paced out on each site; 400 paces to each side of the triangle.

The wheel point method has not been chosen because I will be working on my own and the wheel point is too difficult for one person to manoeuvre over fallen timber and shrubs, and also allow the taking and recording of readings.

(d) Key Species Frequency (See Score Card, and Condition Scoring Key, Column AI)
Key Species Frequency will be sampled using 0.5 m^2 quadrats, placed lengthwise at the toe of the boot after every 10 paces. Presence or absence of each key species, as listed in the Score Card, will be noted within each quadrat. Presence will be recorded in the "Presence" column of the Store Card. The total for each species will be obtained at the completion of each triangle. The initial list of Key Species will be as suggested by Roberts (1972) for Soft Mulga.

(e) Basal Cover (See Condition Scoring Key, Column AII)
Basal Cover will be determined by scoring using reference photographs of different basal cover percentages as determined by E. Christie (pers. comm.).

(f) Plant Vigour (See Condition Scoring Key, Column AIII)
Plant Vigour will be estimated by a comparison of the vigour of each group; the key species, the useful species, and the worthless species. Vigour estimation will take account of number of new leaves and shoots, tillering, and the extent of reproduction (seedheads) of individual plants in each group.

(g) Shrub, Edible Tree and Inedible Tree Densities (See Condition Scoring Key, Columns BI, BII and BIII)

Shrub density, edible tree density and inedible tree density will be determined by a scoring system using reference photographs of known shrub and tree density. Each of the above three groups in the woody plant phase will be determined individually.

(h) Soil Surface Condition (See Score Card Section 2, and Condition Scoring Key Column CI)

Soil surface condition will be determined from the analysis of a bulk sample of 18 separate samples, from each of the triangular transects separately. Each sample will be from the 0-10 cm layer. There will be 6 samples from each side of the triangle from the centre of every quadrat placed.

The soil analyses are being included at the suggestion of Noel Dawson and Des Boyland. Their Western Arid Region Land Use Study - Part 1 has indicated the importance of soil surface condition as an indicator of plant condition. This correlation will be tested as part of this project.

The soil analysis will be to determine available phosphorus (0.1 N $(NH_4)_2SO_4$ extraction) and organic carbon levels.

(i) Soil Surface Description (See Score Card Section 2, and Condition Scoring Key Column CII)

An assessment of soil surface characteristics and extent of erosion will be made at each of the quadrats from which a soil sample is taken.

(j) Litter Cover (See Score Card Section 2, and Condition Scoring Key, Column CIII)

An assessment of litter cover will be made at each of the quadrats from which a soil sample is taken.

(k) Additional information collected on each of these sites will be stocking history (including stocking rates used and time of their alteration), type of animals grazed on the site, and whether the paddock has experienced any spelling or fire treatments. Also, production information will be collected in terms of animal turnoff, animal condition and wool cuts. This information will be collected as a routine part of the Sheep Industry Survey. Financial information will also be collected.

(l) A reference photograph will be taken at each corner of the triangular transect, facing towards the centre of the triangle.

(m) If possible key benchmark sites of not less than 0.5 ha will be located and exclosed on at least 3 sites within the survey area. By this means it is hoped to separate the animal and climate effects.

Scoring

The scoring levels of each factor are given in the Condition Scoring Key.

The weightings given to each factor are given in the Condition Assessment Scoring Card.

The weighting elements are assigned individually to each section within the three phases. This is based upon the research experience within this area. The weightings and scorings are arbitrary at this stage. This project will be used to evaluate the method suggested, and the scorings, as well as to evaluate resource condition on the selected sites.

Procedure

It needs to be noted that the sites have already been mapped and are clearly defined and easily recognisable on each property. From the work of Dawson and Boyland, site description has already been done.

The initial assessment was made between March and September of 1974. The assessment was determined as part of the second data collection phase of the Sheep Industry Survey - S.W. Qld. There are 30 properties within the survey sample which lie within the area mapped by Dawson and Boyland. On at least 6 of these 30 properties there are two separated areas of "Soft Mulga Lands" systems which will be assessed

separately. This made a total of 36 possible sites.

It is planned to analyse this information to determine any correlations between stocking history factors, production factors and the condition rating at each particular site. It is then necessary to assess the relevance of this to the whole paddocks and whole property. It is essential in comparing properties and/or paddocks on mulga country that their financial performance be related to the rate at which they are utilizing their natural resources. In this way, the short term exploiters with good financial performance, are not judged without the condition of their soil and plant resources also being assessed.

The results of different methods and intensities of husbandry of property resources, and of the interactions between these resources, is our field of concern.

Points of note so far (October 1974)

1. It has been almost impossible to find an area of mulga which has not had timber felled between 1965 and the present date. Because of the succession of years in which mulga felling has been employed to feed sheep, no significant areas of "Soft Mulga Land" remain untouched on the Survey properties. Major felling and consequent heavy grazing occurred in 1965, 1967, 1969, 1971 and 1972 in this Region.

2. The frequencies of each of the key species appears (without statistical analysis to date) to be very dependent on the year in which mulga felling, and therefore very heavy grazing pressure, occurred. It appears possible to predict with some degree of confidence, from the particular pattern of frequencies of key species and *Aristida jerichoensis*, the tree and shrub densities and the soil description, what year mulga felling took place.

3. It appears, from assessment of areas such as shearing shed paddocks, that intensive grazing for a short but particular period of time, results in a particular key species composition. In comparison with adjacent paddocks of the same land system, and exposed to continuous and less intense grazing pressure, the species composition may be quite different. The species *Monachather paradoxa*, found to a quite high frequency in the continuously grazed area, has been entirely absent from the intensive, periodically grazed area.

4. The time since felling of the mulga scrub appears to have a large effect on basal cover. It also appears to have a large effect on the spatial distribution of grasses. Colonisation appears to be initiated under the fallen branches. Time since felling appears to be associated with changes in the texture of the surface soil.

5. The correlations between animal productive and reproductive performance, and the condition of the paddock, will be difficult to analyse and interpret. Many compounding factors are involved, with stocking rate being only one of them.

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S.I.S. - S.W.Q.
SCORE CARD

Section I

Items	Presence (recorded thus:- 1)	Total Times Present	Frequency
Key Species (Laterites)			
Monachather paradoxa			
Digitaria ammophila			
Digitaria brownei			
Eragrostis eriopoda (R)			
Themeda australis			
Thyridolepis mitchelliana			
Panicum decompositum			
Total Key Species Frequency			
Aristida jerichoensis noted only			
Shrubs			
Eremophila			
Cassia			
Other			
Total Shrubs Frequency			
Trees Edible			
Mulga			
Wilga			
Other			
Total Edible Tree Frequency			
Trees Inedible			

Section II

	Litter					Soil Surface Description				
Transect sides										
Triangle No.1										
1.1										
1.2										
1.3										
Triangle No.2										
2.1										
2.2										
2.3										

Soil Surface Condition	Avail. P		Org. C	
Value for each bulked sample transect	1.	2.	1.	2.

S.I.S. - S.W.Q.

CONDITION SCORING KEY

Phase A

AI Key spp. frequency %	AII Basal cover	AIII Vigour	Score
70 - 40	10 - 5	Key spp. predominate	5
40 - 30	5 - 2	Mediocre spp. "	4
30 - 20	2 - 1	Poor spp. "	3
20 - 10	1 - 0.5	Shrub spp. "	2
10 - 0	0.5	No vigorous plants	1

Phase B

BI Shrub density/ha	BII Edible tree density/ha	BIII Inedible tree density/ha	Score
0 - 40	35 - 140	0 - 18	5
110 - 440	0-35 140 - 220	18 - 44	4
440 - 1100	220 - 440	44 - 110	3
1100 - 2200	440 - 660	110 - 440	2
> 2200	> 660	> 440	1

Phase C

CI Soil surface condition	CII Soil surface description	CIII Litter	Score
High C,P	Soft (s)	Matt (m)	5
High or med C,P	Loose (l)	Uneven cover (u)	4
Med, C,P	Hard and stable (h)	Infrequent (inf)	3
Low C, med P	Hard and scalded (hs)	Isolated (is)	2
Low C,P	Pedestalled (p)	None (n)	1

Condition assessment	Score rating
Excellent	120 - 96
Good	95 - 72
Fair	71 - 48
Poor	47 - 24

S.I.S. - S.W.Q.

PROPERTY CONDITION ASSESSMENT CARD

Property..... Zone ..... Paddock ..... Area ..... Land Systems..... Stocking History..... .... Stock Numbers: Sheep..... Cattle..... Stock Condition..... Stock Turnoff: Sheep..... Cattle..... Branding % .....L.M.%..... Wool cut/head.....	Date..... Paddock Map

Condition assessment	Factor Score (from Condition Scoring Key)	Weighing Factor	Factor Ratings
Key species frequency % Basal cover % Vigour		x 4 x 3 x 2 (9)	
Shrub density Edible tree density Inedible tree density		x 3 x 3 x 1 (7)	
Soil surface condition Litter Soil surface description		x 3 x 3 x 2 (8)	
Total rating for the 3 phases			
Condition assessment			

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Mr. J. C. Noble, of the CSIRO Riverina Laboratory and at present a post-graduate student in the School of Plant Biology, University College of N. Wales, Bangor, attended the XII International Grasslands Congress in Moscow earlier this year, and he has supplied us with some relevant paper titles from the Congress.

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