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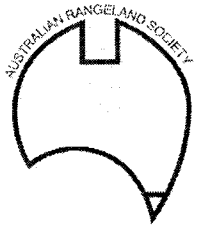

The Australian Rangeland Society

MONITORING SEASONAL CHANGES IN RANGELANDS BY SATELLITE

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ABSTRACT

Satellite images, derived from NOAA data, can describe seasonal changes that occur in rangelands. Change in green pasture cover are the major cause for changes between monthly satellite images. Despite a State-wide distribution of images, use by Departmental staff and producers appears restricted. Integration of NOAA data with spatial models may help overcome some of the current limitations.

A NEED

Australian rangelands are managed using a variety of strategies, but no one strategy alone will ensure the most effective use of the grazing resource.

In grazing enterprises, decisions in herd management, strategies to maintain feed reserves and plans for property development are all examples of activities that require a current "picture" of the grazing resource. Broad scale NOAA imagery can provide such a "picture" at a scale suitable for rangeland management and at a frequency that ensures that changes in the rangeland are detected.

Government agencies that are involved in monitoring regional seasonal conditions in rangelands need to evaluate how effective rains have been and over what parts of the region conditions are poor. For a timely assessment NOAA imagery can meet this need and will provide a current base from which future trends may be foreshadowed.

WHAT DOES NOAA IMAGERY INDICATE?

The reflected radiation types (namely red and near infra-red) that form part of the NOAA NDVI (Normalised Difference Vegetation Index) image indicate the chlorophyll content of vegetation and thus the image can be used to depict density of green foliage (Tucker and Sellers 1986). The minimum ground resolution that NOAA can detect is 1 km^2.

Ground truthing of NOAA imagery for a range of native pasture types in Queensland was undertaken during 1989 to 1991 (Filet *et al.* 1990). The most consistent relationship was between green pasture cover (%) and NDVI. At some sites the yield of pasture also affected NDVI. The sensitivity of NDVI change varied between pasture types. In western arid Queensland, increases in forb green cover (e.g. 5% change) of the mulga lands were detected immediately, whereas in blackspear grass pastures in eastern Queensland, significant changes in green grass cover (e.g. 10 to 15%) were required for changes in NDVI to be detected.

A wide range of seasonal conditions were experienced during ground truthing and a time series of images, at either a property, regional or state scale, clearly showed when and where seasonal conditions had increased or reduced the cover of green vegetation.

LIMITATIONS TO INTERPRETATION

The presence of woody perennial overstorey or understorey will cause the NDVI to remain high while the pastures below are no longer green. This problem can be overcome to some extent by interpretation of a series of images rather than an individual "one month" image.

Rangeland interpretation with NOAA imagery is limited to the comparisons within the same pasture community type. Because of the low resolution, individual species identification by the image is not feasible.

ACCESS TO SATELLITE IMAGERY

The NOAA imagery for the east coast of Australia is purchased from CSIRO Division of Oceanography, Hobart, each month. The data is supplied preprocessed which includes compositing of imagery from ten NOAA passes, calculation of NDVI, rectification of the image and a reduction in the effect of cloud (Dudgeon *et al.* 1990). This imagery is available within a few days of the compositing period. Australia wide NOAA coverage, produced fortnightly, is also available, but there are delays in processing the data.

There are moves to establish a consortium of NOAA data users to lower the cost of imagery for participating organisations.

CURRENT USES

In Queensland, monthly NOAA images are distributed to stock inspectors at all regional QDPI centres. During the 1991/92 "drought", NOAA images were used by some officers when liaising with local drought committees. Individuals who made most use of the images for clients were those who had experiences with maps and/or spatial information.

The QDPI Drought Research Group has produced a tree foliage map of Queensland from NOAA imagery. Significant correlations between ground and air photo measurements of tree foliage projected cover were measured for a range of tree covers. This map will ensure valid interpretation of seasonal changes in pasture conditions under trees.

FUTURE NEEDS

Integration of NOAA satellite imagery with spatial models (e.g. pasture growth models) will allow production of maps which may foreshadow future seasonal rangeland conditions.

To ensure benefits for all Australian rangelands, a timely supply of Australia wide data is required. The reliability of the data will also be improved as better methods for cloud identification are developed.

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