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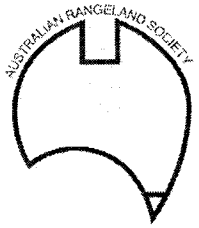

The Australian Rangeland Society

AUSTRALIAN GRASSLAND AND RANGELAND ASSESMENT BY SPATIAL SIMULATION (Aussie GRASS)

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INTRODUCTION

The quantitative assessment of the condition of Australia's grasslands and rangelands is difficult given the complexity of the biophysical system, including the interaction of high temporal and spatial variability in resources and climate. Aussie GRASS, a national collaborative research project, has developed a spatial modeling framework which allows the condition of Australia's grazing lands to be assessed and monitored in near real-time. The Aussie GRASS project helps to provide answers to rangeland and grassland issues such as: what is the current condition of our grazing systems; are they in a condition consistent with sustainable use; and what is the likely future trend in their condition?

AUSSIE GRASS MODELLING FRAMEWORK

The Aussie GRASS spatial model operates throughout Australia on a 0.05 degree grid (approx. 25 km2) basis (Carter *et al.*, 2000). Model inputs include daily climate variables, soil type parameters, pasture community parameters, tree basal area and stocking rate. Aussie GRASS is a daily time step model that is run operationally in batch mode at the end of each month following receipt of monthly rainfall and climatic data (minimum and maximum temperature, radiation, vapour pressure, evaporation). The Aussie GRASS model is based on the GRASs Production (GRASP) model which is outlined in detail in Littleboy and McKeon (1997); and the conceptual framework in McKeon *et al.* (2000). As well as running in near-real time, analogue climate years are selected using the SOI phase system (Stone *et al.*, 1996) and the model run three months into the future using the ensemble of analogue years to produce a distribution of key variables including pasture growth. Products from the operational model run are available within 3-4 days of the end of each month. The model has been extensively calibrated and validated using a variety of data sources (Carter *et al.*, 2000; Dyer *et al.*, 2001; Hall *et al.*, 2001; Richards *et al.*, 2001).

PRODUCTS AND APPLICATIONS

The Aussie GRASS model generates information on a number of processes and variables important to assessing grazing land condition including soil water, pasture growth, biomass, cover, and pasture utilisation. A range of products is made available via the CINRS' Long Paddock web site – www.LongPaddock.qld.gov.au (Peacock *et al.*, 2002), including rainfall maps (monthly totals and percentiles) and pasture growth percentile maps. These products complement other CINRS products including satellite maps of NDVI greenness, relative greenness and sea surface temperatures; reports (A3 full colour summary of seasonal conditions in Queensland); and fax hotlines (black and white maps, graphs and seasonal climate advice). Applications of the Aussie GRASS model and associated products include the objective evaluation of drought and Exceptional Circumstances (in the context of 110 years of climate data) in Queensland, New South Wales, South Australia and Victoria; intra agency seasonal condition assessment and reporting (e.g. hotspot identification, input to various management strategies); salinity hazard mapping; input to greenhouse gas inventory development;

"safe" carrying capacity calculations; degradation alerts based on pasture growth and utilisation; fire risk assessment; and a general increase in awareness of and managing for climate variability impacts by both agency personnel and landholders.

CONCLUSION

The Aussie GRASS model integrates a range of data inputs at a variety of temporal and spatial scales to produce monthly estimates of resource condition and trend that are made available to users via the internet. The continental scale at which the model operates (0.05 degrees) means that the outputs are ideally suited for use by agency personnel, larger pastoral companies and users wanting an industry overview. The model was originally developed to provide objective assessments of drought but has in recent times been used for a variety of purposes including the effect of tree clearing on deep drainage in Queensland, methane production from grazing animals, and changes in soil carbon. The use of the climate forecasts in Aussie GRASS provides a mechanism to value add to these applications in a manner of direct relevance to individual producers. An example of this is the support of improved management of stock numbers based on predicted pasture growth.

REFERENCES

Carter, J.O., Hall, W.B., Brook, K.D., McKeon, G.M., Day, K.A. and Paull, C.J. (2000). Aussie GRASS: Australian Grassland and Rangeland Assessment by Spatial Simulation. In 'Applications of seasonal climate forecasting in agricultural and natural ecosystems - the Australian experience'. (Eds G. Hammer, N. Nicholls and C. Mitchell.) pp. 329-49 (Kluwer Academic Press: Netherlands.)

Dyer, R., Café, L., and Craig, A. (2001). The Aussie GRASS NT and Kimberley Sub-project Final Report to Climate Variability in Agriculture Program (CVAP). Queensland Department of Natural Resources and Mines, Brisbane.

Hall, W., Bruget, D., Carter, J., McKeon, G.,Yee Yet, J., Peacock, A., Hassett, R. and Brook, K. (2001). The Aussie GRASS Final Report to CVAP. Queensland Department of Natural Resources and Mines, Brisbane,

Littleboy, M. and McKeon, G.M. (1997). Subroutine GRASP: Grass production model, Documentation of the Marcoola version of Subroutine GRASP. Appendix 2: Evaluating the risks of pasture and land degradation in native pasture in Queensland. Final Project Report for Rural Industries and Research Development Corporation project DAQ124A.

McKeon, G.M, Ash, A.J., Hall, W.B., and Stafford Smith, D.M. (2000). Simulation of grazing strategies for beef production in north-east Queensland. In: 'Applications of seasonal climate forecasting in agricultural and natural ecosystems – the Australian experience'. Eds: G. Hammer, N. Nicholls and C. Mitchell.) pp 227-52 (Kluwer Academic Press: Netherlands.)

Peacock, A., Flood, N., Ahrens, D., Brook, K., Chilcott, C., Bruget, D., Carter, J., Collett, L., Crimp, S., Day, K., Hall, W., Hassett, R., Henry, B.K., McKeon, G.M., Paull, C., and Stone, R. The LongPaddock website: climate management information for rural Australia. Proc. *12th Biennial Conference of the Australian Rangeland Society,* Kalgoorlie, September, 2002.

Richards, R., Watson, I., Bean, J., Maconochie, J., Clipperton, S., Beeston, G., Green, D. and Hacker, R. (2001). The Aussie GRASS Southern Pastures Sub-project Final Report to CVAP. Queensland Department of Natural Resources and Mines, Brisbane.

Stone, R.C., Hammer, L. And Marcussen, T. (1996). Prediction of global rainfall probabilities using phases of the Southern Oscillation Index. *Nature* 384, pp 252-5.