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EVALUATION OF A MODELLING APPROACH TO ESTIMATE DYNAMIC SOIL COVER

Stephan Heidenreich and John Leys

NSW Department of Infrastructure, Planning and Natural Resources, Gunnedah NSW 2380

INTRODUCTION

Soil cover levels have been listed in the Catchment Management targets of the NSW Catchment Management Authorities (CMAs) because of the strong link between soil cover and erosion. Total soil cover can be divided in to the dynamic (herbaceous) and non-dynamic (rock, litter and cryptogams) components. A pilot program was established to test dynamic soil cover modelling techniques. The AussieGRASS model, developed by the Queensland Department of Natural Resources and Mines has been calibrated to estimate total dry matter (TDM) (Carter *et al.* 1996). Dynamic soil cover estimates can be derived from modelled TDM data via equations similar to the ones described for perennial grass pastures by Murphy and Lodge (2002).

METHODS

Annual average cover

The validation data presented are from the 334 Rangeland Assessment Program (RAP) sites monitored annually at similar times of the year over the last 13 years. They were compared with modelled AussieGRASS data for each RAP measurement in space and time. Limitations of the data include: some systematic difference between measured and modelled cover (eg. tree litter measured but not modelled), only one equation per vegetation community to convert TDM to combined plant and litter cover, and climate data availability varies significantly across NSW.

RESULTS & DISCUSSION

The time series of measured and modelled annual average cover values (Fig. 1) follow the same trend, neither diverging or converging over time. This indicates the long term stability of the model.

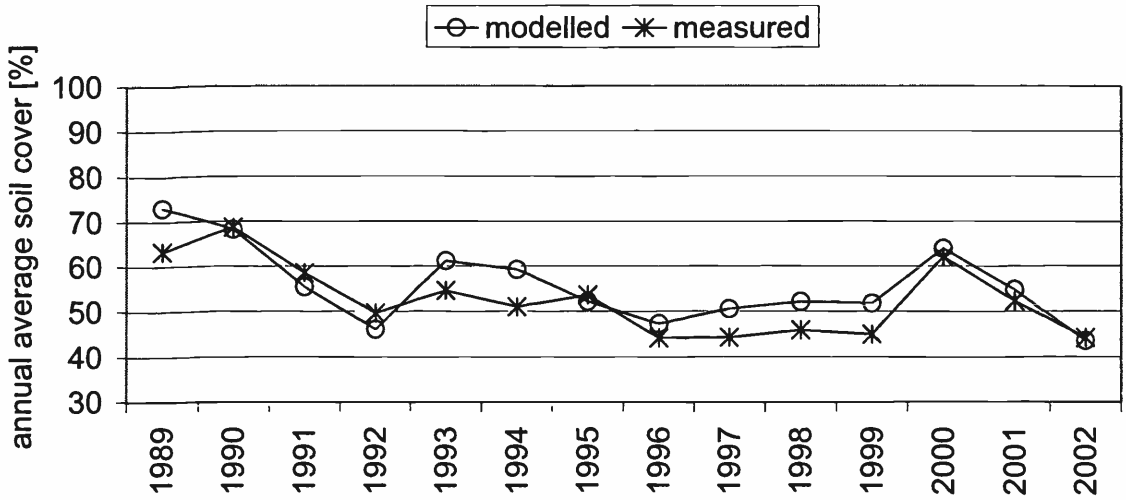

Figure 1: Modelled and measured annual average cover values for all RAP sites as time series.

Annual average cover correlations are in good agreement. Cover values are approximately 5% over-predicted. Trends in measured annual average cover do not necessarily follow trends in measured TDM (eg. 1991/92 and 1998/99). That is, increasing cover does not necessarily correspond with increasing TDM.

Average annual cover is a very coarse measure of soil protection against erosion. It does not quantify the area of a catchment at erosion risk. For instance, an average catchment cover of 40% can be made up from either the entire catchment at 40% cover or half the catchment at 80% cover and the other half bare. The area of the catchment below 40% cover (and therefore at erosion risk) would provide a better catchment indicator.

Area at erosion risk

To determine the area at erosion risk requires the analysis of the distribution of cover across the catchment. Averaging the last 13 years of data, the model estimates 24% of all RAP sites at risk whereas RAP measurements indicate 36% at risk (i.e. sum 0% to 40%). This relation is not as good as the average cover correlation and requires further work. Assuming that the RAP point measurements represent the Western CMA they can be interpreted as CMA areas.

Area at risk through time

As the drought progressed from May 2000 until late 2002, the modelled average cover for the Western CMA (light grey line in Fig. 2) gradually declined. In contrast, the modelled area of the CMA with more than 40% cover (black line in Fig. 2) declined at an increasing rate as the drought progressed. It also revealed seasonal variations in the decline. This highlights the importance of describing the CMA area at risk rather than the average CMA cover when assessing the erosion risk of a landscape.

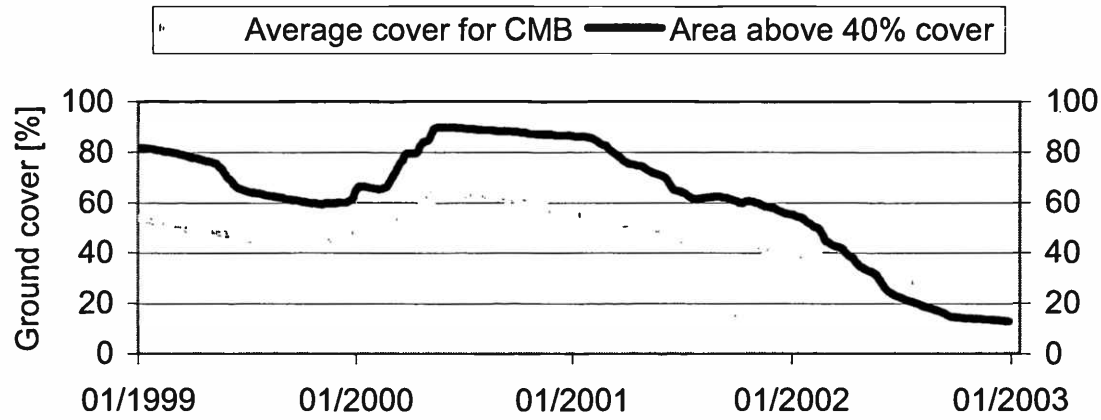

Figure 2: Modelled daily cover data for the Western CMA.

CONCLUSIONS

- AussieGRASS can estimate average ground cover level at a catchment scale.
- Modelling has the advantage of high temporal resolution – it is possible to fill gaps in remote sensing or measurements.
- Modelling can be used in conjunction with climate predictions to forecast cover level.
- Annual average cover is an inadequate tool for determining soil protection against erosion. The area at erosion risk (e.g. <40% cover) is a better indicator of the landscape condition.
- There is a need to develop methods to "add" non-dynamic cover components (e.g. rock).
- Further work is required to determine accuracy at vegetation community scale.

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