PROGRAM A

SATELLITE REMOTE SENSING AS A KEY TOOL FOR GRASSLAND CURING ASSESSMENT

Danielle Martin[a,b,c], Ian Grant[a], Simon Jones[b] and Stuart Anderson[c]

[a]Space Based Observations Section, Bureau of Meteorology, Melbourne.
[b]School of Mathematical and Geospatial Sciences, Royal Melbourne Institute of Technology, Melbourne.
[c]Bushfire Cooperative Research Centre, East Melbourne.
[d]Scion, Christchurch, New Zealand.

AIM: To improve the prediction of grassland curing (senescence) across Australia and New Zealand, using *in situ* observations and MODIS (MODerate resolution Imaging Spectroradiometer) satellite data.

BACKGROUND: Certain curing characteristics, which determine the vulnerability of grass to propagate a fire, are detected by certain wavelengths and hence vegetation indices. Beginning with NDVI (Band 2 – Band 1 / Band 2 + Band 1), Band 1 (red) detects chlorophyll content (Knipling, 1970) and Band 2 (NIR) detects factors such as cellular structure and canopy architecture (Fig.1). Band 5 (NIR) is also sensitive to cellular structure (Knipling, 1970) as well as dry matter content and transmittance of radiation through leaves (hence, soil background). While Bands 6 and 7 (MIR) can detect vegetation water content, the ratio of these bands is able to identify dry vegetation from bare soil, due to cellulose scattering (Guerschman et al., 2009).

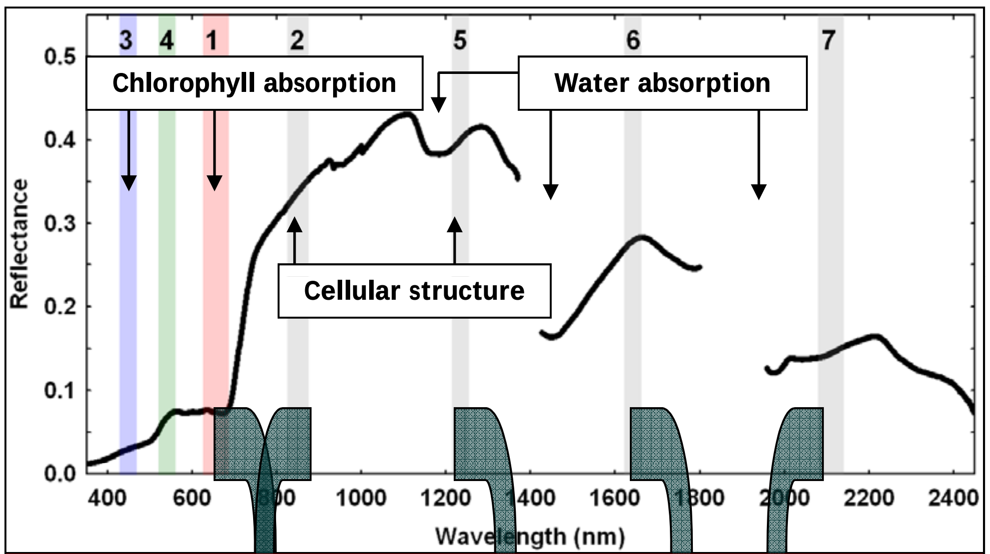

Fig.1 Reflectance spectra of grass labelled with 7 MODIS bands

Band2 - Band1 / Band2 + Band1 | **Band 5** | **Band7 / Band6**

RESULTS: The degree (%) of curing is predicted using a multiple linear regression (MLR) of Levy rod curing (field measurements) against: NDVI, Band 5, and a ratio of Band 7/6. This MLR is investigated for over 30 grassland field sites, which cover a variety of climate, topography, soil and grass types. These sites are divided into their known grass type (Fig.2).

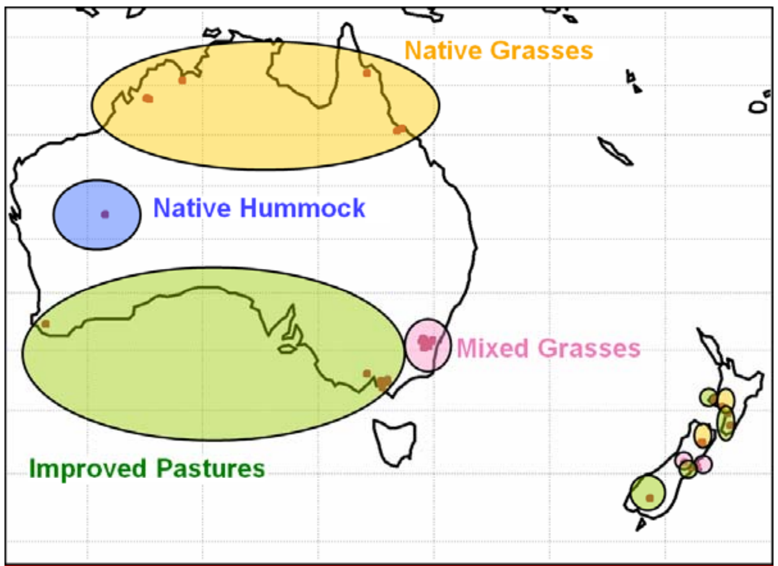

Fig.2 Map of field sites divided into grass types

DISCUSSION: To predict curing for each grass type (Fig.2) and for all sites together, the MLR (of NDVI, Band 5 and Band 7/6) was found to produce the smallest error (root mean square error - rmse) (Fig.3). For example, across all sites, curing is predicted by NDVI with a 13.45% error, by the Guerschman et al., (2009) MLR (of NDVI and Band 7/6) with a 10.49% error, and by the MLR (in Fig.3) with a slightly smaller error of 10.12%.

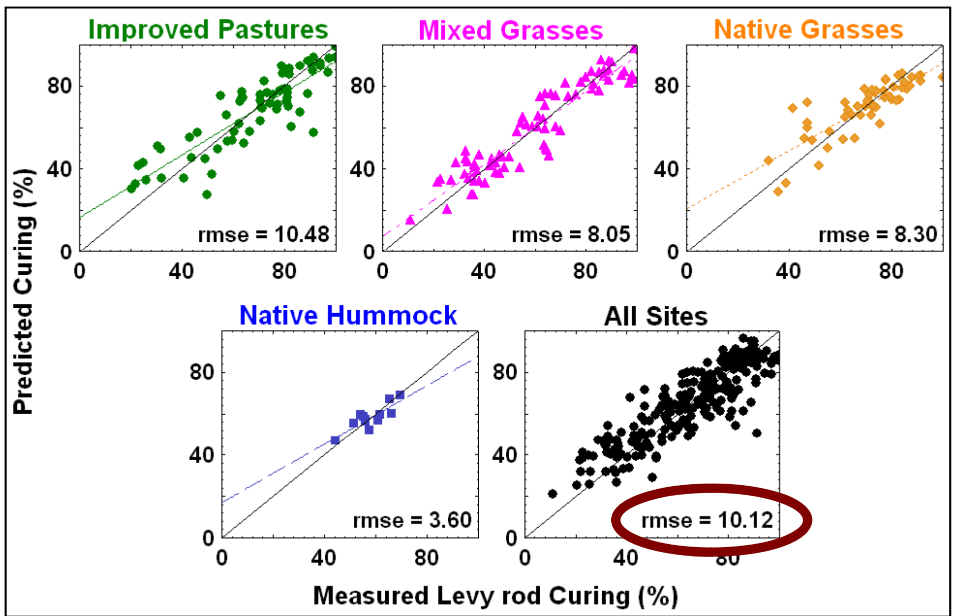

Fig.3 MLR (NDVI, Band 5, Band 7/6) correlations between measured curing and predicted curing at Australian field sites

CONCLUSIONS: This MLR has contributed to an improved prediction of grassland curing. The information produced from this research has led to improved assessments of the degree of curing in grasslands across Australia and New Zealand, thereby providing sound science to support fire management in protecting life and property from grassfires, as well providing for the safe and effective use of fire.

REFERENCES:

Guerschman, J.P. et al., 2009. Estimating fractional cover of photosynthetic vegetation, non-photosynthetic vegetation and bare soil in the Australian tropical savanna region upscaling the EO-1 Hyperion and MODIS sensors. Remote Sensing of Environment, 113: 928-945.

Knipling, E.B., 1970. Physical and physiological basis for the reflectance of visible and near-infrared radiation from vegetation. Remote Sensing of Environment, 1(3): 155-159.

Contact:
Tel. +61 3 9669 4406
Fax. +61 3 9669 4168
Danielle.Martin@bom.gov.au